

Patient Profile Graphs using SAS

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Patient Profile Graphs

In this presentation, we will review creation of graphs for patient profile reports.

These graphs are created using the Statistical Graphics Procedures first released with SAS 9.2.

SG Procedures

The Statistical Graphics (SG)
Procedures include:

- The SGPLOT Procedure
- The SGPANEL Procedure
- The SGSCATTER Procedure

SG Procedures

With SAS 9.3 release (Spring 2011), the SG Procedures provide improved support for clinical graphs.

I have used the SAS 9.3 procedures to implement some of the graphs presented here.

SAS 9.2 version of the same graphs are also discussed.

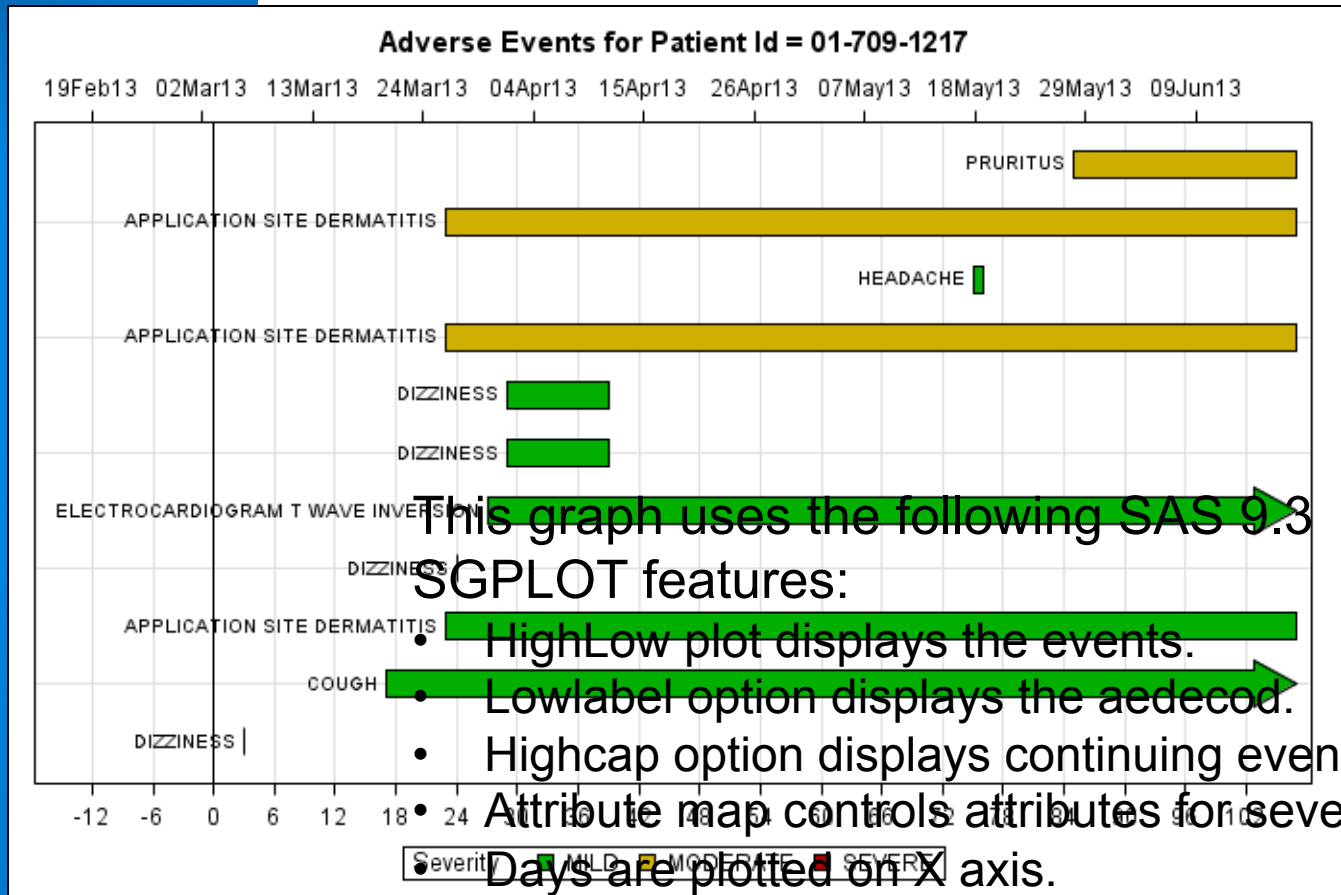
CDISC Data

The sample CDISC data sets used to create the graphs are:

- AE
- CM
- DM
- LB
- VS

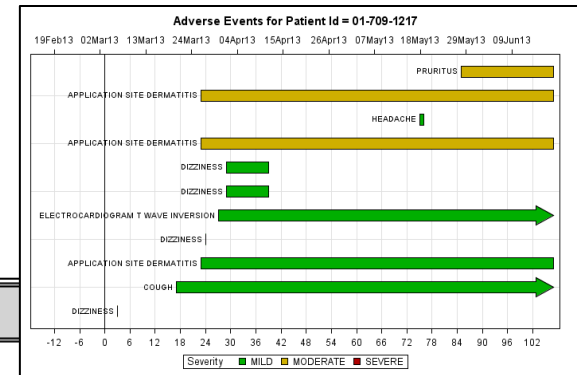
Let us review the graphs and the code

SAS 9.3 AE Graph



SAS 9.3 AE Code

Obs	AESEQ	AESTDY	AEENDY	aestdate	aesev	aedecod
1	.	.	.	.	MILD	
2	.	.	.	.	MODERATE	
3	.	.	.	.	SEVERE	
4	1	3	3	2013-03-06	MODERATE	DIZZINESS
5	2	17	107	2013-03-20	MILD	COUGH
6	3	23	107	2013-03-26	MILD	APPLICATION SITE DERMATITIS
7	4	24	2	2013-03-27	MILD	DIZZINESS
8	5	27	107	2013-03-30	MILD	ELECTROCARDIOGRAM T WAVE INVERSION
9	6	29	39	2013-04-01	MILD	DIZZINESS
10	7	29	39	2013-04-01	MILD	DIZZINESS
11	8	23	107	2013-03-26	MODERATE	APPLICATION SITE DERMATITIS
12	9	75	76	2013-05-17	MILD	HEADACHE
13	10	23	107	2013-03-26	MODERATE	APPLICATION SITE DERMATITIS
14	11	85	107	2013-05-02	MODERATE	PRURITUS

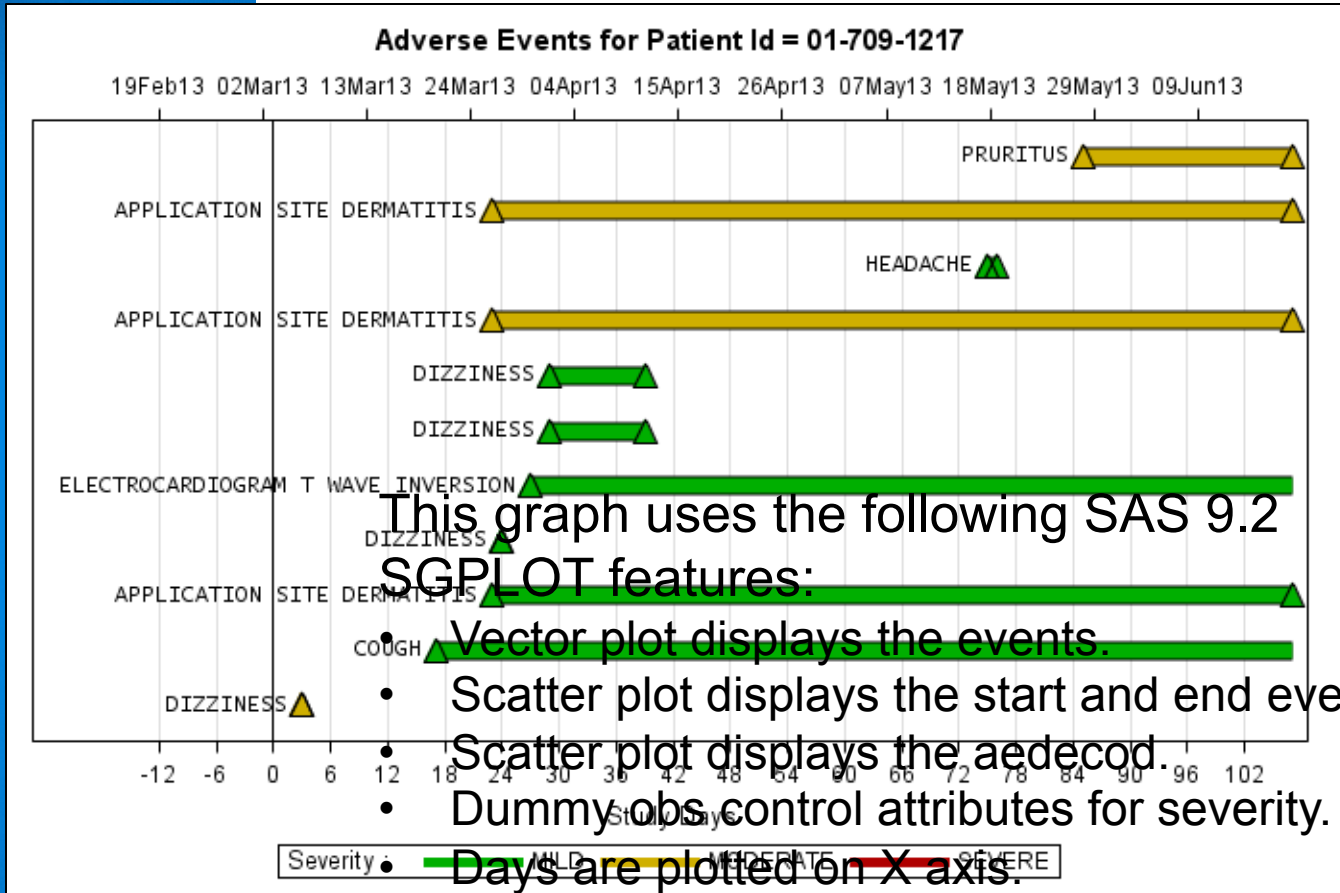


```

title "Adverse Events for Patient Id = &pid";
proc sgplot data=AE_Cap dattrmap=attrmap,
format aestdate date7.;
refline 0 / axis=x lineattrs=(color=black);
highlow y=aeseq low=aestdy high=aeendy / type=bar
group=aesev lineattrs=(color=black pattern=solid)
barwidth=0.8 lowlabel=aedecod highcap=highcap
attrid=Severity;
scatter y=aeseq x=aestdate / x2axis
markerattrs=(size=0);
xaxis grid display=(no label) offsetmax=0.02
values=(&minday2 to &maxday by 2);
x2axis display=(no label) offsetmax=0.02
values=(&mindate2 to &maxdate);
yaxis grid display=(noticks novalues no label);
run;

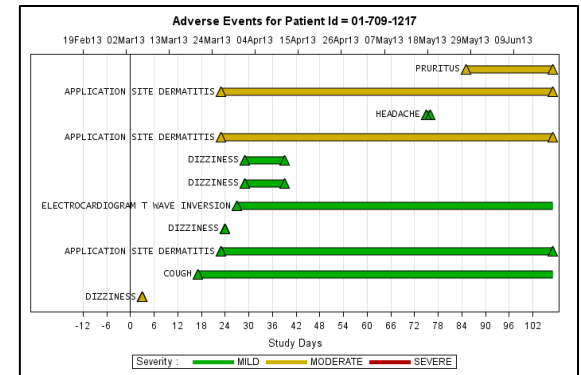
```

SAS 9.2 AE Graph



- Vector plot displays the events.
- Scatter plot displays the start and end events.
- Scatter plot displays the aedecod.
- Dummy obs control attributes for severity.
- Days are plotted on X axis.
- Dates are plotted on X2 axis.

SAS 9.2 AE Code



```
title "Adverse Events for Patient Id = &pid";
```

```
proc sgplot data=ae noautolegend nocycleattrs;
```

```
refline 0 / axis=x lineattrs=(thickness=1 color=black);
```

```
1 vector x=xs y=aeseq / xorigin=-110 yorigin = aeseq group=aesev
```

```
2 lineattrs=(thickness=5px pattern=solid) name='sev';
```

```
vector x=lastday y=aeseq / xorigin=aestdy yorigin=aeseq noarrowheads
```

```
3 lineattrs=(thickness=10px pattern=solid color=black);
```

```
4 vector x=lastday y=aeseq / xorigin=aestdy yorigin=aeseq noarrowheads
```

```
5 lineattrs=(thickness=8px pattern=solid) group=aesev;
```

```
scatter x=aestdy y=aeseq / markerattrs=(size=11px symbol=trianglefilled) group=aesev;
```

```
6 scatter x=aesdy y=aeseq / markerattrs=(size=11px symbol=trianglefilled) group=aesev;
```

```
7 scatter x=aestdy y=aeseq / markerattrs=(size=13px symbol=triangle color=black);
```

```
8 scatter x=aesdy y=aeseq / markerattrs=(size=13px symbol=triangle color=black);
```

```
scatter x=aestdy y=aeseq / markerchar=buffer
```

```
markercharattrs=(family='Lucida Console' size=9);
```

```
scatter x=aestdate y=aeseq / markerattrs=(size=0) x2axis;
```

```
yaxis display=(nolabel noticks novalues);
```

```
xaxis grid label='Study Days' offsetmin=&offsetmin offsetmax=0.02
```

```
values=(&minday2 to &maxday by 2);
```

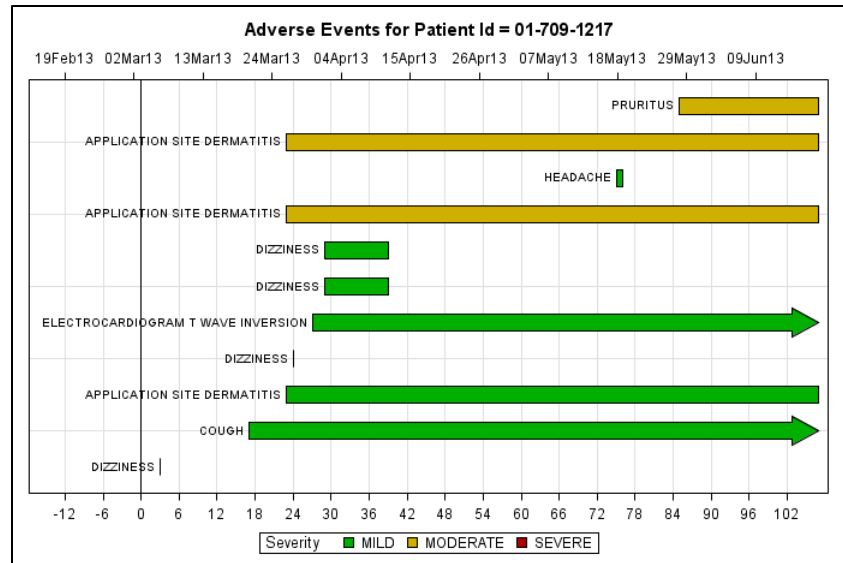
```
x2axis notimesplit display=(nolabel) tickvalueformat=date7. offsetmin=&offsetmin
```

```
offsetmax=0.02 values=(&mindate2 to &maxdate);
```

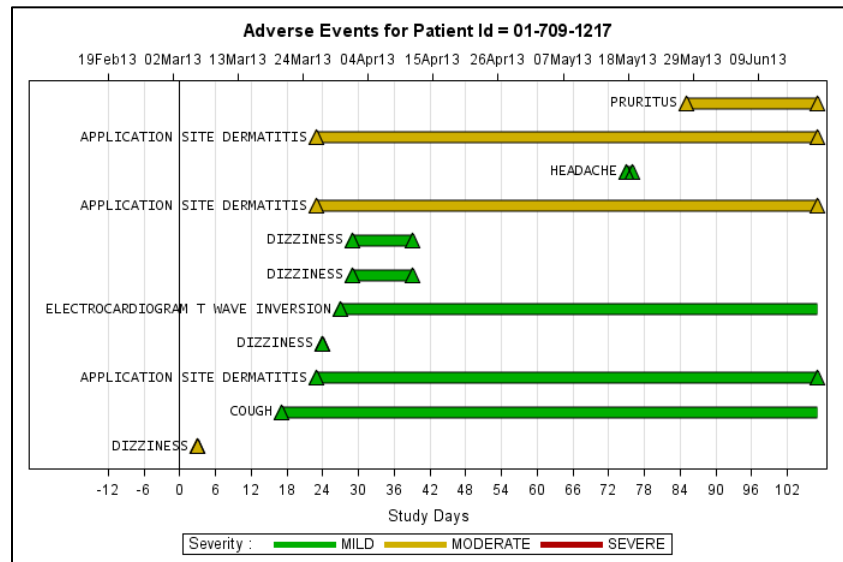
```
keylegend 'sev' / title='Severity :';
```

```
run;
```

AE Graphs

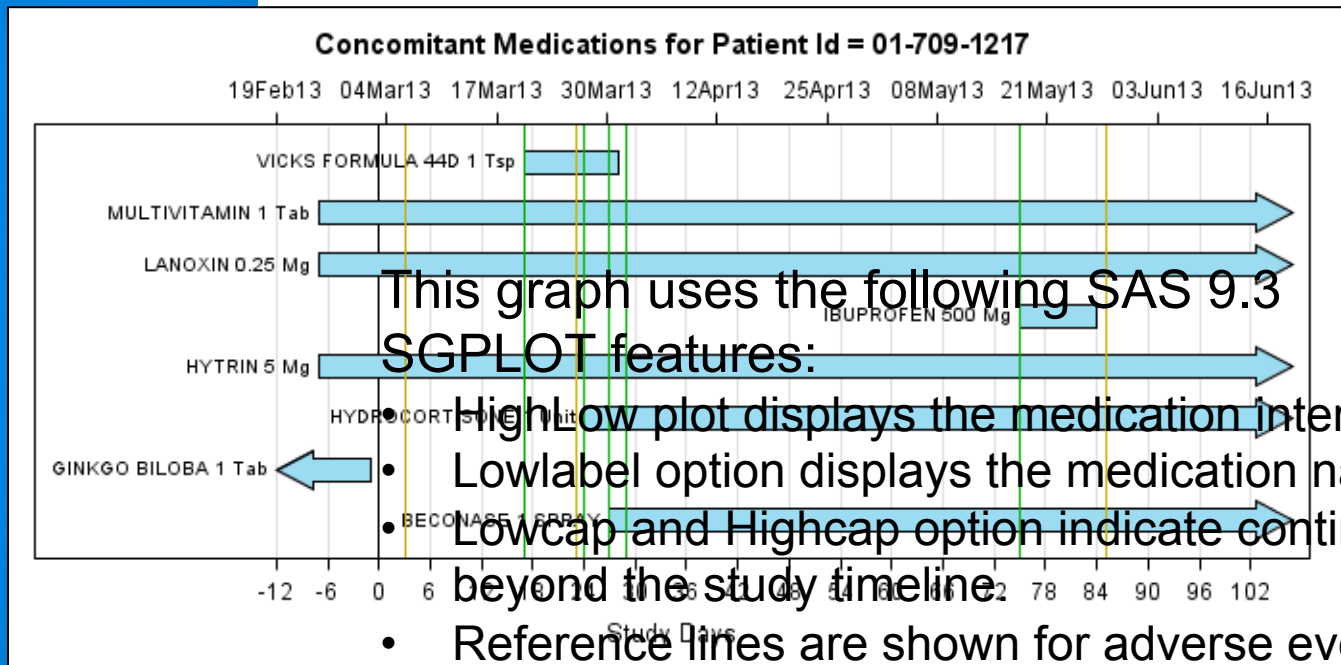


SAS 9.3



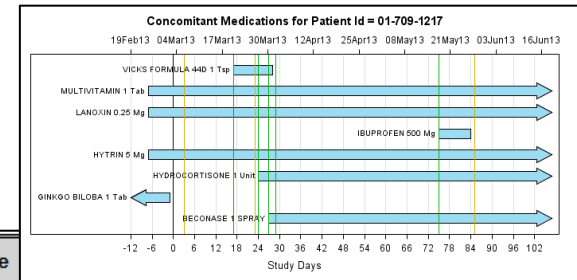
SAS 9.2

SAS 9.3 CM Graph



SAS 9.3 CM Code

Obs	Y	stday2	enday2	CMMED	STARTDATE	mild	moderate	severe
1	0.0	27	107	BECONASE 1 SPRAY	2013-03-30	.	.	.
2	0.2	-12	-1	GINKGO BILOBA 1 Tab	2013-02-16	.	.	.
3	0.4	24	107	HYDROCORTISONE 1 Unit	2013-03-30	.	.	.
4	0.6	-7	107	HYTRIN 5 Mg	2013-02-16	.	.	.
5	0.8	75	84	IBUPROFEN 500 Mg	2013-05-25	.	.	.
6	1.0	-7	107	LANOXIN 0.25 Mg	2013-02-16	.	.	.
7	1.2	-7	107	MULTIVITAMIN 1 Tab	2013-02-16	.	.	.
8	1.4	17	28	VICKS FORMULA 440 1 Tsp	2013-03-30	.	.	.

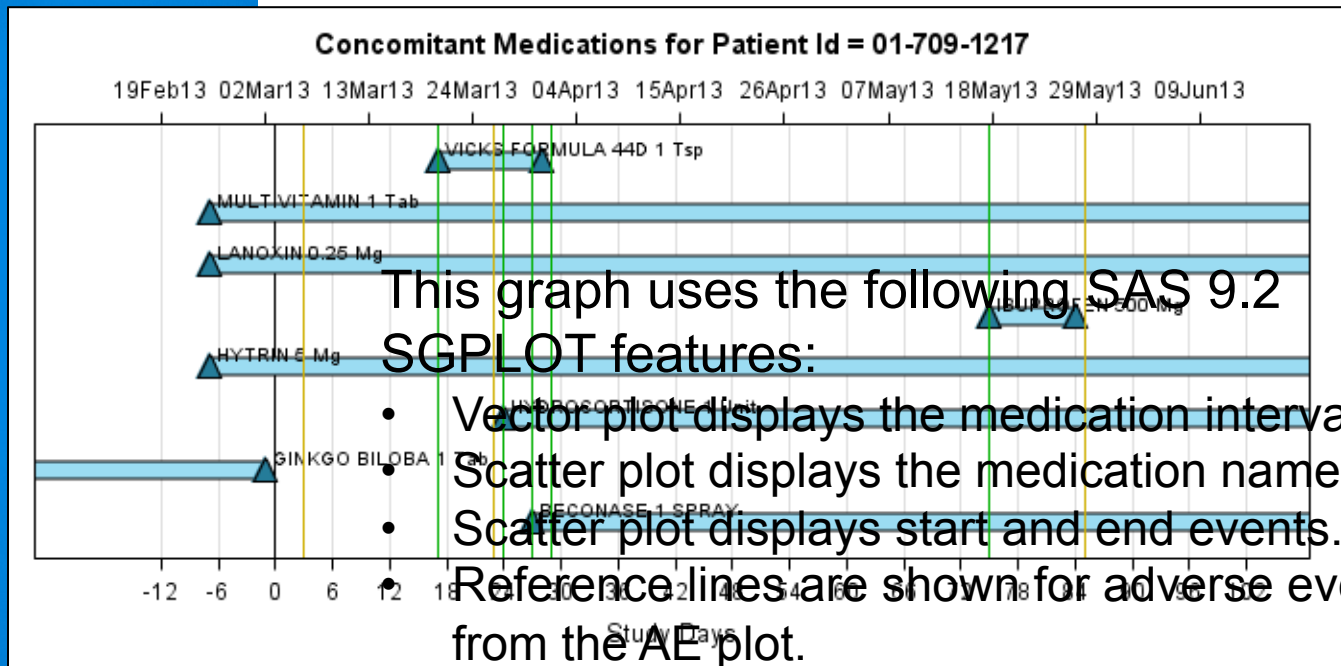


```

title "Concomitant Medications for Patient Id = &pid";
proc sgplot data=Meds2 Cap noautolegend nocycleattrs;
  refline 0 / axis=x lineattrs=(thickness=1 color=black);
  highlow y=y low=stday2 high=enday2 / type=bar
  lineattrs=(color=black pattern=solid) fillattrs=(color=cx9BDCF2)
  barwidth=0.8 lowcap=lowcap highcap=highcap lowlabel=cmmmed;
  scatter y=y x=STARTDATE / markerattrs=(size=0) x2axis;
  refline mild / axis=x lineattrs=graphdata1(pattern=solid);
  refline moderate / axis=x lineattrs=graphdata2(pattern=solid);
  refline severe / axis=x lineattrs=graphdata3(pattern=solid);
  yaxis display=(nolabel noticks novalues) min=0;
  xaxis grid label='Study Days' offsetmax=0.02
  values=(&minday2 to &maxday2 by 2);
  x2axis notimesplit display=(nolabel) tickvalueformat=date7.
  offsetmax=0.02 values=(&mindate2 to &maxdate);
run;

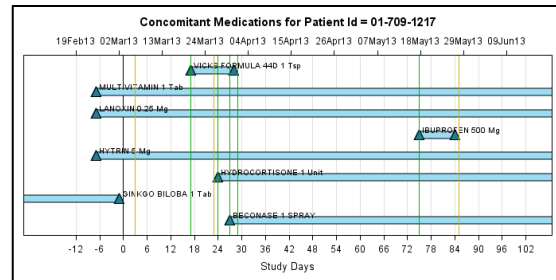
```

SAS 9.2 CM Graph



- Days are plotted on X axis.
- Dates are plotted on X2 axis.

SAS 9.2 CM Code

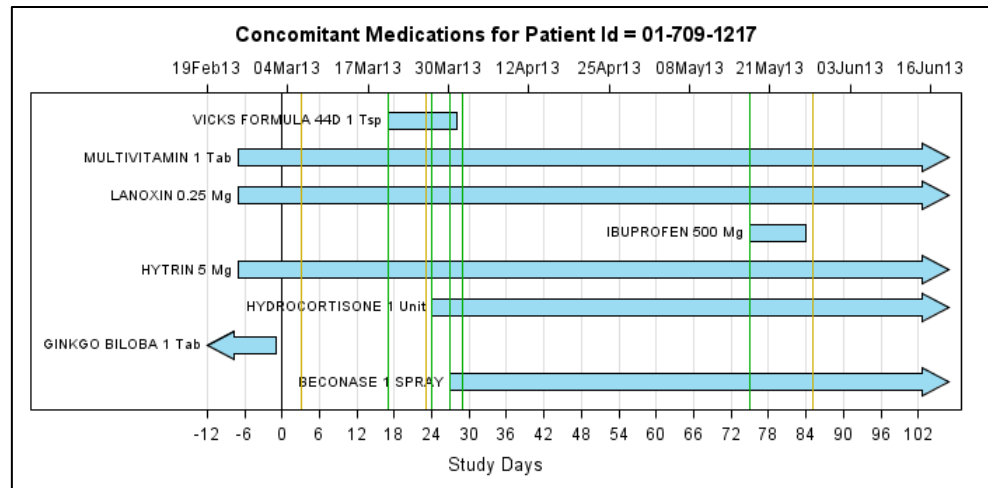


```

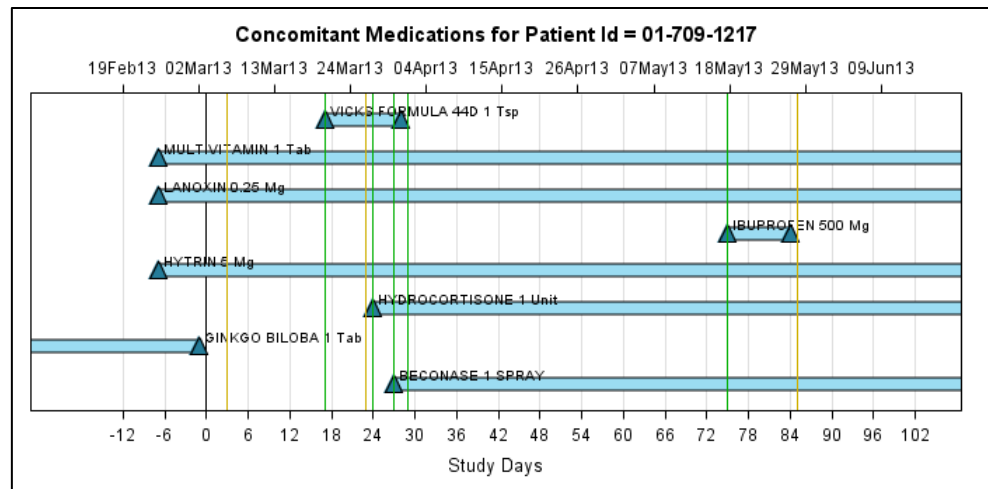
title "Concomitant Medications for Patient Id = &pid";
proc sgplot data=meds2 noautolegend nocycleattrs tplout='meds.sas';
  refline 0 / axis=x lineattrs=(thickness=1 color=black);
  vector x=STARTDAY y=y / xorigin=ENDDAY yorigin=y noarrowheads
    lineattrs=(thickness=10px pattern=solid color=black);
  vector x=STARTDAY y=y / xorigin=ENDDAY yorigin=y noarrowheads
    lineattrs=(thickness=8px pattern=solid color=cx9BDCF2);
  scatter x=STARTDAY y=y / group=cmtrt markerattrs=(<attributes>);
  scatter x=ENDDAY y=y / group=cmtrt markerattrs=(<attributes>);
  scatter x=STARTDAY y=y / group=cmtrt markerattrs=(<attributes>);
  scatter x=ENDDAY y=y / group=cmtrt markerattrs=(<attributes>);
  scatter x=STARTDATE y=y / markerattrs=(size=0) x2axis;
  scatter x=lbdlay y=y / markerattrs=(size=0) datalabel=cmmed;
  refline mild / axis=x lineattrs=graphdata1(pattern=solid);
  refline moderate / axis=x lineattrs=graphdata2(pattern=solid);
  refline severe / axis=x lineattrs=graphdata3(pattern=solid);
  yaxis display=(nolabel noticks novalues) min=0;
  xaxis grid label='Study Days' offsetmin=&offsetmin offsetmax=0.02
    values=(&minday2 to &maxday by 2);
  x2axis notimesplit display=(nolabel) tickvalueformat=date7.
    offsetmin=&offsetmin offsetmax=0.02 values=(&mindate2 to &maxdate);
run;

```

CM Graphs

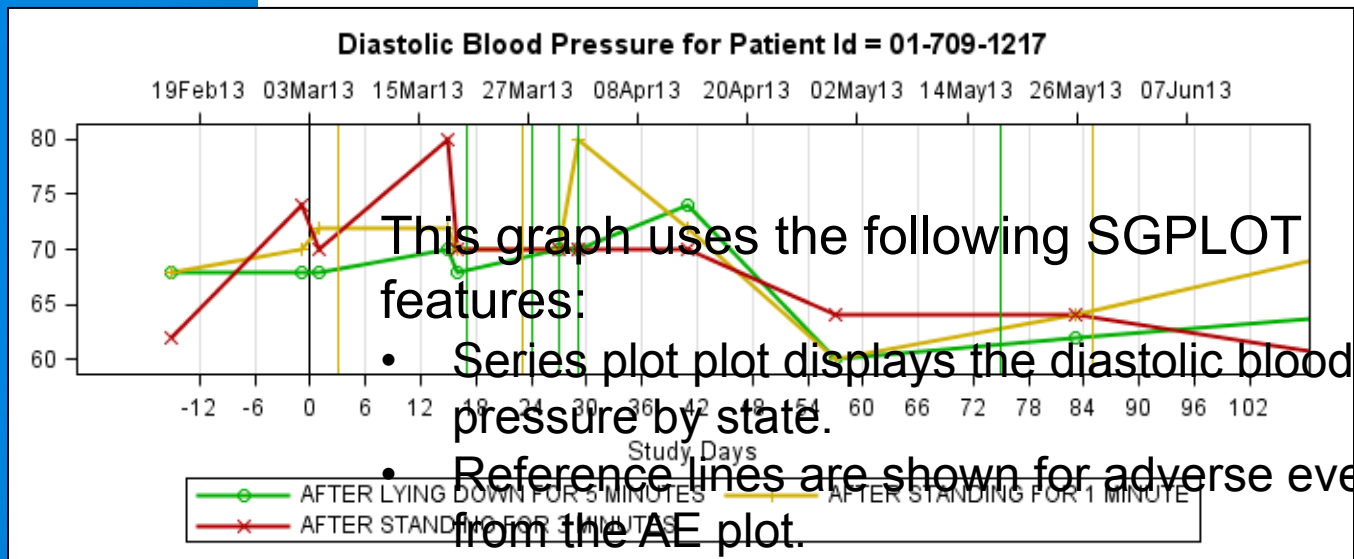


SAS 9.3



SAS 9.2

VS Graph



- Days are plotted on X axis.
- Dates are plotted on X2 axis.

VS Code

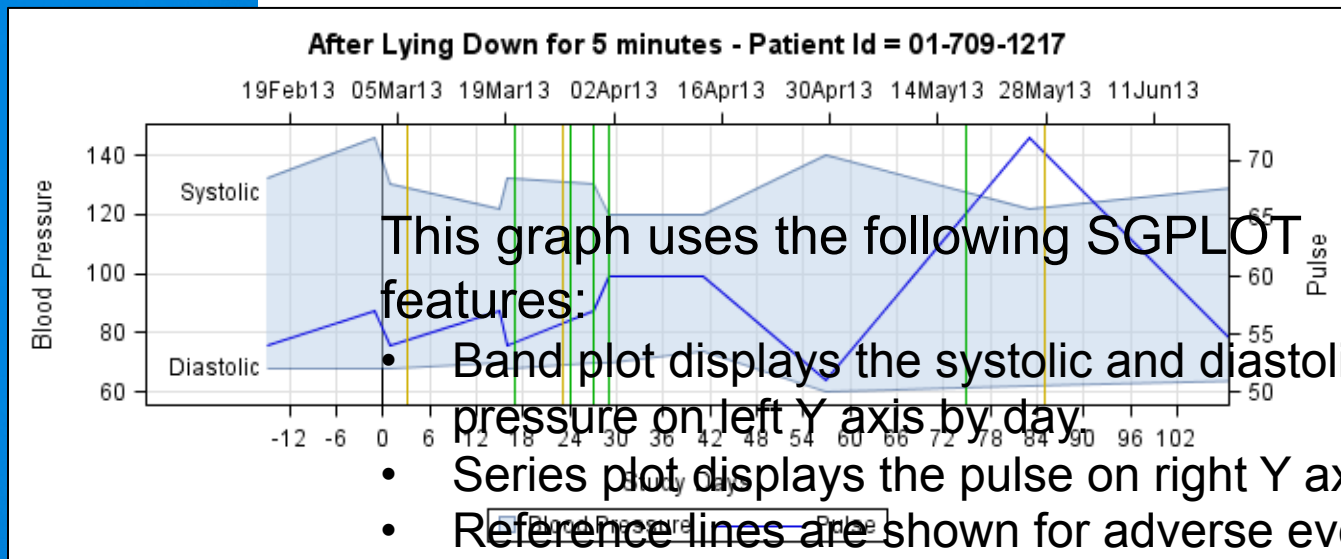
Obs	VSDY	vsdate	VSSTRESN	vstpt	mild	moderate	severe
1	-15	16FEB13	68	AFTER LYING DOWN FOR 5 MINUTES	.	.	.
2	-15	16FEB13	68	AFTER STANDING FOR 1 MINUTE	.	.	.
3	-15	16FEB13	62	AFTER STANDING FOR 3 MINUTES	.	.	.
4	-1	02MAR13	68	AFTER LYING DOWN FOR 5 MINUTES	.	.	.
5	-1	02MAR13	70	AFTER STANDING FOR 1 MINUTE	.	.	.
6	-1	02MAR13	74	AFTER STANDING FOR 3 MINUTES	.	.	.
7	1	04MAR13	68	AFTER LYING DOWN FOR 5 MINUTES	.	.	.
8	1	04MAR13	72	AFTER STANDING FOR 1 MINUTE	.	.	.
9	1	04MAR13	70	AFTER STANDING FOR 3 MINUTES	.	.	.
10	15	18MAR13	68	AFTER LYING DOWN FOR 5 MINUTES	.	.	.

```

title "Diastolic Blood Pressure for Patient Id = &pid";
proc sgplot data=vs2 noautolegend nocycleattrs;
  refline 0 / axis=x lineattrs=(thickness=1 color=black);
  series x=vsdy y=vsstresn / group=vstpt
    lineattrs=(pattern=solid thickness=2) nomissinggroup
    markers name=bp;
  scatter x=vsdate y=vsstresn / markerattrs=(size=0) X2axis;
  refline mild / axis=x lineattrs=graphdata1(pattern=solid);
  refline moderate / axis=x lineattrs=graphdata2(pattern=solid);
  refline severe / axis=x lineattrs=graphdata3(pattern=solid);
  keylegend 'bp';
  yaxis display=(nolabel);
  xaxis grid label='Study Days' offsetmin=&offsetmin
    offsetmax=0.02 values=(&minday2 to &maxday2 by 2);
  x2axis notimesplit display=(nolabel) tickvalueformat=date7.
    offsetmin=&offsetmin offsetmax=0.02
    values=(&mindate2 to &maxdate);
run;

```

VS-2 Graph



- Days are plotted on X axis.
- Dates are plotted on X2 axis.

VS-2 Code

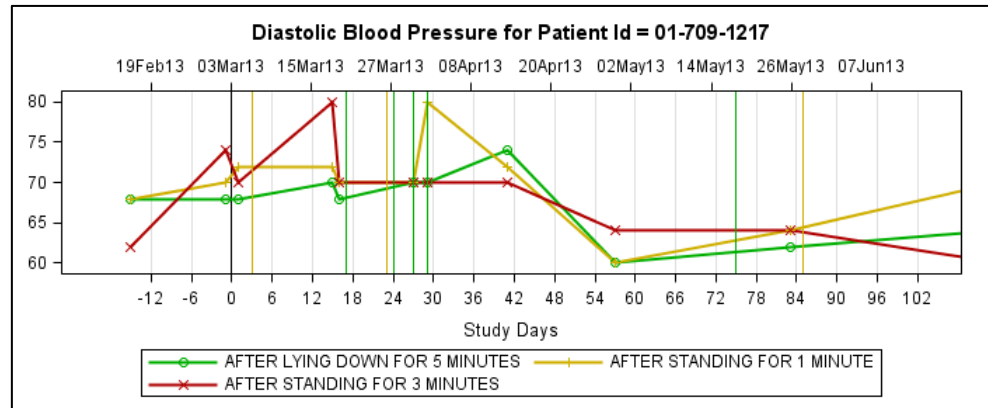
Obs	VSDY	vsdate	Systolic	Diastolic	Pulse	mild	moderate	severe
1	-15	16FEB13	110	65	65	.	.	.
2	-1	02MAR13	110	65	65	.	.	.
3	1	04MAR13	110	65	65	.	.	.
4	15	18MAR13	110	65	65	.	.	.
5	16	19MAR13	110	65	65	.	.	.
6	27	30MAR13	110	65	65	.	.	.

```

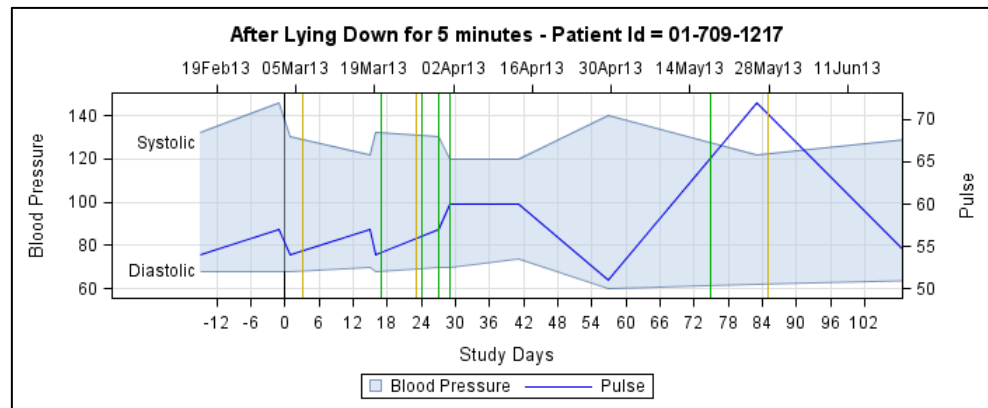
title "After Lying Down for 65 minutes - Patient Id = &pid";
proc sgplot data=vs_cols2 nocycleattrs;
  refline 0 / axis=x lineattrs=(thickness=1 color=black);
  band x=vsdy upper=systolic lower=diastolic / fill outline transparency=0.5
  curvelabelupper='Systolic' curvelabellower='Diastolic' curvelabelpos=start
  name='a' legendlabel='Blood Pressure';
  series x=vsdy y=pulse / y2axis name='b';
  scatter x=vsdate y=systolic / markerattrs=(size=0) X2axis;
  refline mild / axis=x lineattrs=graphdata1(pattern=solid);
  refline moderate / axis=x lineattrs=graphdata2(pattern=solid);
  refline severe / axis=x lineattrs=graphdata3(pattern=solid);
  discretelegend 'a' 'b';
  yaxis label='Blood Pressure' grid offsetmin=0.05 offsetmax=0.05;
  y2axis offsetmin=0.05 offsetmax=0.05;
  xaxis grid label='Study Days' offsetmax=0.02 values=(&minday2 to &maxday2 by 2);
  x2axis notimesplit display=(nolabel) tickvalueformat=date7. offsetmax=0.02
    values=(&mindate2 to &maxdate2);
run;

```

VS Graphs

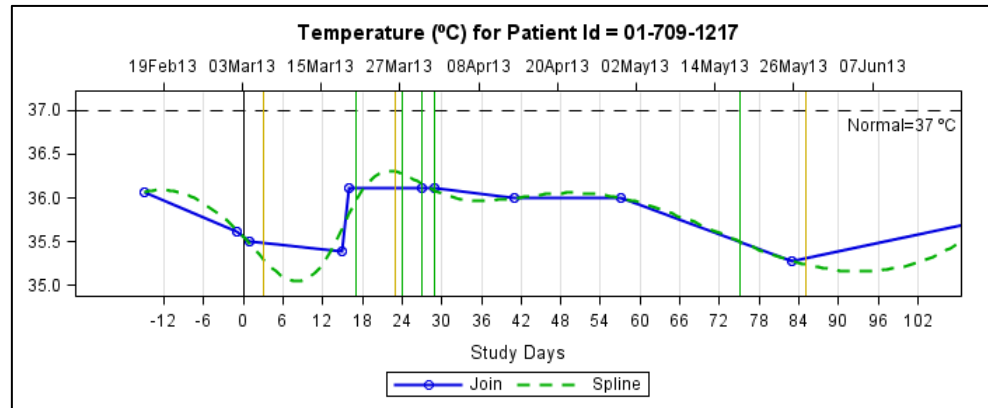


Diastolic by day and state

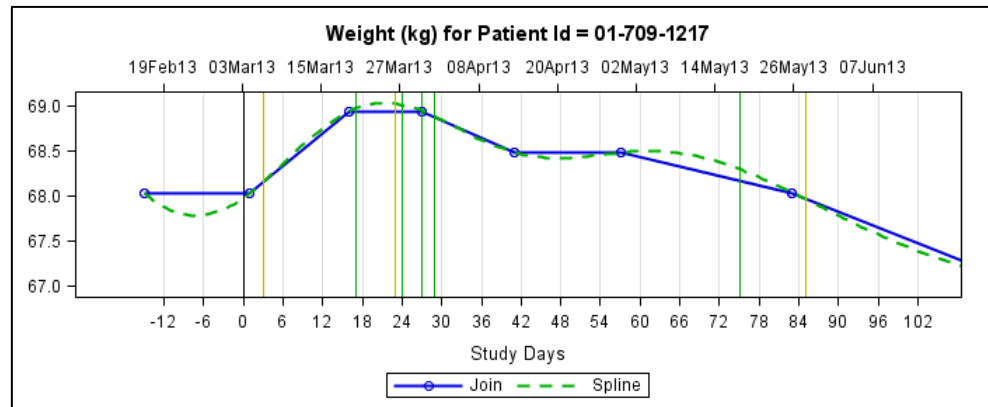


BP and Pulse by day after lying down for 5 Minutes

VS Graphs

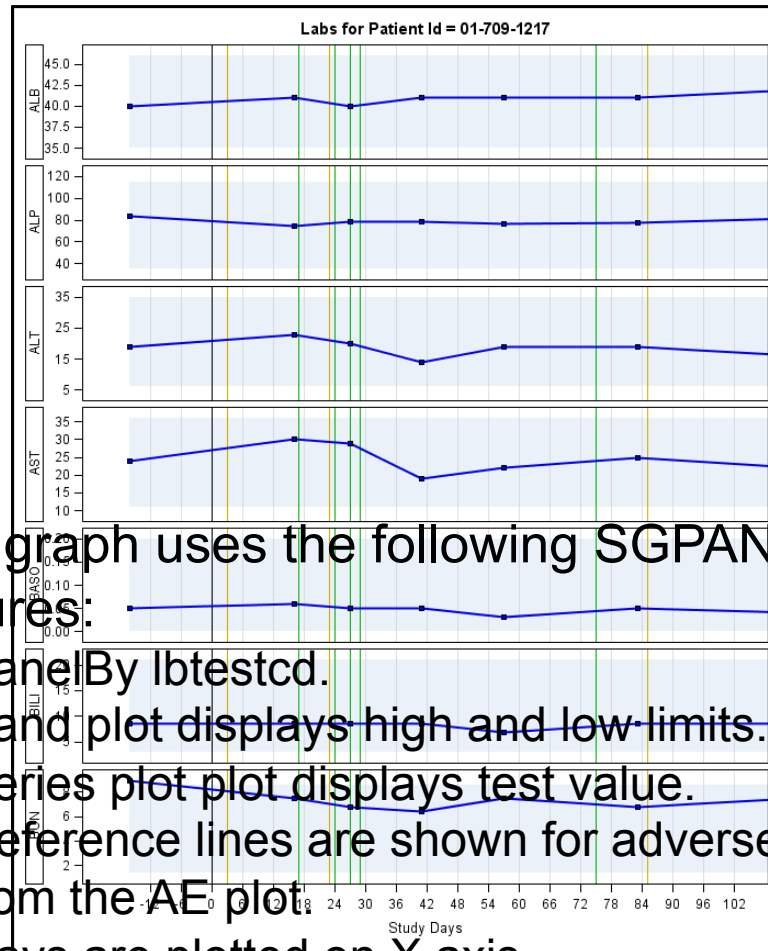


Temperature by day with smoother and reference line



Weight by day with smoother

LB Graph



This graph uses the following SGPANEL features:

- PanelBy lbtestcd.
- Band plot displays high and low limits.
- Series plot displays test value.
- Reference lines are shown for adverse events from the AE plot.
- Days are plotted on X axis.

LB Code

For lbtestcd='ALB'

Obs	LBDY	LBSTNRLO	LBSTNRHI	LBSTRESN	mild	moderate	severe
1	-16	35	46	40	.	.	.
2	16	35	46	41	.	.	.
3	27	35	46	40	.	.	.
4	41	35	46	41	.	.	.
5	57	35	46	41	.	.	.
6	83	35	46	41	.	.	.
7	114	35	46	42	.	.	.
8	.	.	.	.	.	.	.
9	.	.	.	.	.	.	.

```

title "Labs for Patient Id = &pid";
proc sgpanel data=lb2 noautolegend;
panelby lbtestcd / columns=1 uniscale=column spacing=5
rows=7 layout=rowlattice rowheaderpos=left novarname;
band x=lbdy lower=lbstnrlo upper=lbstnrhi / transparency=0.7;
refline 0 / axis=x lineattrs=(thickness=1 color=black);
refline mild / axis=x lineattrs=graphdata1(pattern=solid);
refline moderate / axis=x lineattrs=graphdata2(pattern=solid);
refline severe / axis=x lineattrs=graphdata3(pattern=solid);
series x=lbdy y=lbstresn / markers
markerattrs=( symbol=squarefilled size=8px)
lineattrs=graphdatadefault(pattern=solid thickness=2);
scatter x=lbdy y=lbstresn /
markerattrs=( symbol=square size=10px color=black);
rowaxis display=(nolabel);
colaxis grid label='Study Days' offsetmin=&offsetmin
offsetmax=0.02 values=(&minday2 to &maxday by 2);
run;

```

Summary

The SG Procedures can be used to create the graphs necessary for a patient profile report from CDISC data.

The SAS 9.3 release provides improved support for creating such graphs.

Shameless plug:
[blogs.sas.com.GraphicallySpeaking](http://blogs.sas.com/GraphicallySpeaking).

Q & A



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