A MACRO TO PRODUCE PRE-FORMATTED ELECTRONIC DOCUMENTS

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ABSTRACT

When a summary report using SAS® PROC TABULATE, PROC REPORT, DATA _NULL_ or any other techniques has been generated, additional conversions for different customized final documents are generally required.

This presentation discusses a SAS® Macro which provides a simple approach to save and to convert an output into a word processing table format that is ready for use in the final clinical report. The electronic output is easy to edit or modify, if needed, within any word processing software program. Our focus will be on Microsoft Word since it has been adopted as the standard software by FDA.

OVERVIEW

The MACRO adjusts the formatting issues of the table, such as titles, footnote, table number, location of the table (right-justified, left-justified, or center), calculation of number of pages of the table. It has several options to handle the output:

1) To print report in the SAS® Output Window as it is.
2) To save output in the external file that is ready to be used in a word processing software.
3) To save output in the external file as <any sign> delimited file (we can choose any sign for such a need) to generate a table in Microsoft Word. Then produce the final document by implementing a simple WORD MACRO.

EXAMPLE #1

1) Use PROC TABULATE to generate a report. Titles, footnotes and page numbers have the positions specified by words: “incenter”, “leftjust”, “rightjust”, “pagenumber”.

```
* general parameters *;
%let pages=38;
%let lines=128;

proc printto print=myout new ; run;

title1; /* always blank because of two kinds of output */
title2 "incenterPROTOCOL MYPROTOCOL";
title4 "incenter TABLE B " ;
title5 "pagenumber" ; * for the number of pages ;
title7 "incenterDEMOGRAPHIC DATA " ;

footnote1 "leftjust* Includes all patients";
footnote3 "leftjust Cross reference: Data Listing B";
footnote4 "rightjust Program name: h:\marina\tabb.sas";

proc tabulate data=myset order=internal missing;
class columns1 columns2 trt ;
format trt ftrt. columns1 cols1f. columns2 cols2f. ;
var valuenum percent ;
table columns1=' '*columns2=" " , trt=' '*(valuenum=''
min="n"f=8. , percentile='%min="n"f=8.2 ) /misstext=' ' ;
run;
```

```
*-----------------------------------;
*  3 options for OUTPUT       ;
*-----------------------------------;
filename myfile1  "h:\output\tabb1.lis" ;
filename myword1  "h:\output\tabbwor1.lis" ;

%THEEND(outto=print);
%THEEND(outto= myfile1 ) ;
%THEEND(outto=myword1 , dotable=Y, olddel="|", mydel="|" ) ;
```

2) Output

1) Report is printed in the SAS® OUTPUT Window.
2) The same report is saved in the file specified as “myfile1”.
3) The same report is saved as a “|” delimited file. Then we open this file in Microsoft Word and generate a table using Microsoft Word Macro Tools.
### DEMOGRAPHIC DATA *

<table>
<thead>
<tr>
<th>RACE</th>
<th>n</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
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<th>%</th>
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</table>

(Continued)

* Includes all patients

Cross reference: Data Listing B

Program name: h:\marina\tabB.sas
### TABLE B

(createdAt: October 10, 1997)

#### DEMOGRAPHIC DATA *

<table>
<thead>
<tr>
<th></th>
<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
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</table>

* Includes all patients

Cross reference: Data Listing B

Program name: h:\\marina\tabB.sas
### Table B

**Table Title:** DEMOGRAPHIC DATA

<table>
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<th>Drug #3</th>
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<td>100.00</td>
<td>31</td>
<td>100.00</td>
<td>95</td>
<td>100.00</td>
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<td>48.28</td>
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<td>41.94</td>
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<td>49.47</td>
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</tr>
<tr>
<td>Mean</td>
<td>410</td>
<td>455</td>
<td>463</td>
<td>461</td>
<td>460</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std</td>
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<td>187</td>
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<td>376</td>
<td>373</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Min</td>
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<td>348</td>
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<td>253</td>
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<tr>
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<td>953</td>
<td>1052</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Includes all patients

Cross reference: Data Listing B

Program name: h:\marina\tabB.sas
EXAMPLE #2

1) Use PROC REPORT to generate a report

```
* general parameters *;
%let pages=38;
%let lines=128;

proc printto print=myout new;
run;

title1;  
title2 "incenterPROTOCOL MYPROTOCOL";

footnote1 "underscore"; * for solid line at the end *;
footnote2 "leftjustCross reference: Data Listing 2";

proc report data=myset
headskip nowindows missing
norkeys center split='|' spacing=2
ls=&lines  ps=&pages;

column ( col1 col2 text trt ,( value num )     );

define col1 /group order=internal width=10 " 
    f=cols1f. flow;

define col2    /group noprint;

define text   /group order=internal width=15 left " 
    ;

define trt        / across order=internal width=10 center  " 
    f=ftrt. ;

define value    /width =15 left "__";

define num      /noprint;

break after col1/skip;
run;

* 3 options for OUTPUT ;
*-----------------------------;

filename myfile  "h:\marina\tabb.sas";
filename myword  "h:\output\tabbwor2.lis";
```

1) Report is printed in the SAS® OUTPUT Window.
2) The same report is saved in the file specified as “myfile”.
3) The same report is saved as a “$” delimited file. Then open this file in Microsoft Word and generate a table using Microsoft Word Macro Tools.

**HOW TO USE %THEEND MACRO**

```
%THEEND ( outto= , dotable= , olddel= , mydel=  )

Parameter Represents

outto  file name for output .
    PRINT <by default > for OUTPUT Window

dotable Y as “yes” if we want <any sign> delimited file
    N if we don’t want <any sign> delimited file,
    N <by default>

olddel Specify <sign> if we already had a table format ,
    “|” from PROC TABULATE,
    “ ” no table format before, like for PROC
    REPORT, DATA _NULL_
    “ ” <by default>

mydel Specify any sign that will be used in Microsoft
    Word to generate a table, like “|”, “$”, “,”
    “ ” <by default>
```

**A FEW STEPS INSIDE %THEEND MACRO**

1) Read output from MYOUT file the way that we want to use later. Create the variables LINE_NUM and PAGE_NUM for the line and page numbers. Create a variable START that is the very first position in the output that will be used for left or right justification.

2) Delete blank lines. This was done to relocate the footnotes immediately after the body of our table.

3) Fix formatting issues the way we want to see in the output ( dates, titles, footnotes, ...).

4) Print out converted file to the specified output.
## TABLE B

**DEMOGRAPHIC DATA**

<table>
<thead>
<tr>
<th></th>
<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RACE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>36 (100.0%)</td>
<td>35 (100.0%)</td>
<td>29 (100.0%)</td>
<td>31 (100.0%)</td>
<td>95 (100.0%)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>17 (47.2%)</td>
<td>22 (62.9%)</td>
<td>15 (51.7%)</td>
<td>15 (48.4%)</td>
<td>52 (54.7%)</td>
</tr>
<tr>
<td>Black</td>
<td>11 (30.0%)</td>
<td>7 (20.0%)</td>
<td>7 (24.1%)</td>
<td>6 (19.4%)</td>
<td>20 (21.1%)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 (22.2%)</td>
<td>5 (14.3%)</td>
<td>6 (20.7%)</td>
<td>4 (12.9%)</td>
<td>15 (15.8%)</td>
</tr>
<tr>
<td>Asian</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>3 (9.7%)</td>
<td>3 (3.2%)</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0.0%)</td>
<td>1 (2.9%)</td>
<td>1 (3.4%)</td>
<td>3 (9.7%)</td>
<td>5 (5.3%)</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th></th>
<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEX</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>36 (100.0%)</td>
<td>35 (100.0%)</td>
<td>29 (100.0%)</td>
<td>31 (100.0%)</td>
<td>95 (100.0%)</td>
</tr>
<tr>
<td>Male</td>
<td>23 (63.9%)</td>
<td>15 (42.9%)</td>
<td>15 (51.7%)</td>
<td>18 (58.1%)</td>
<td>48 (50.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>13 (36.1%)</td>
<td>20 (57.1%)</td>
<td>14 (48.3%)</td>
<td>13 (41.9%)</td>
<td>47 (49.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
</tr>
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<tbody>
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<td><strong>AGE</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
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Cross reference: Data Listing 2

Program name: h:\marina\tabB.sas
### TABLE B

#### DEMOGRAPHIC DATA

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<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
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<td>Caucasian</td>
<td>36 (100.0%)</td>
<td>35 (100.0%)</td>
<td>29 (100.0%)</td>
<td>31 (100.0%)</td>
<td>95 (100.0%)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>11 (30.6%)</td>
<td>7 (20.0%)</td>
<td>7 (24.1%)</td>
<td>6 (19.4%)</td>
<td>20 (21.1%)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 (22.2%)</td>
<td>5 (14.3%)</td>
<td>6 (20.7%)</td>
<td>4 (12.9%)</td>
<td>15 (15.8%)</td>
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</tr>
<tr>
<td>Asian</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>3 (9.7%)</td>
<td>3 (3.2%)</td>
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</tr>
<tr>
<td>Other</td>
<td>0 (0.0%)</td>
<td>1 (2.9%)</td>
<td>1 (3.4%)</td>
<td>3 (9.7%)</td>
<td>5 (5.3%)</td>
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<table>
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<th>n</th>
<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>23 (63.9%)</td>
<td>15 (42.9%)</td>
<td>15 (51.7%)</td>
<td>18 (58.1%)</td>
<td>48 (50.5%)</td>
<td></td>
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<tr>
<td>Female</td>
<td>13 (36.1%)</td>
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<th>n</th>
<th>Drug #1</th>
<th>Drug #2</th>
<th>Drug #3</th>
<th>Drug #4</th>
<th>Drug #5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>409.89</td>
<td>455.43</td>
<td>463.48</td>
<td>460.65</td>
<td>459.59</td>
<td></td>
</tr>
<tr>
<td>Std</td>
<td>80.04</td>
<td>180.57</td>
<td>195.02</td>
<td>186.68</td>
<td>185.08</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>342.0 - 659.0</td>
<td>348.0 - 1018.0</td>
<td>350.0 - 1052.0</td>
<td>253.0 - 953.0</td>
<td>253.0 - 1052.0</td>
<td></td>
</tr>
</tbody>
</table>

Cross reference: Data Listing 2
%THEEND MACRO

* Marina K. July 97 *
* macro to modify output *

%MACRO THEEND(outto= print , dotable=%str(N) ,
    olddel = " ", mydel="I"
);
proc printto; run;
*------------------------------------------------------------;
* Read output and calculate the number of pages *
*------------------------------------------------------------;
data result(drop=ccol) ;
length myline1 $&lines ;
tday=today();
wday=trim(left(put(tday,worddate20.)));retain line_num 0;
retain page_num 1;
retain start &lines ;
* read the file if we want to create a table later ***;
%if %UPCASE(&DOTABLE) eq Y %then %do;
infile myout missover pad lrecl= &lines recfm=v delimiter=&olddel ;
length word1-word20 $130 ;
length words1-words20 $131 ;
input word1-word20 ;
* put delimiter at the end *
%do i=1 %to 20;
if word&i ne " " then do;
    words&i=left(trim(word&i))||&mydel;
end;
%end;
* generate lines for titles and footnotes *
   myline1=trim(word1)
%do j =2 %to 20  ;
||" "||trim(word&j)
%end;
* delete extra llines that separated rows *
if (index(myline1, "---") ne 0 ) then delete;
if (index(myline1, "___") ne 0 ) then delete;
* calculate the first position for columns *
ccol= (input(put(&lines, 3.), length(trim(left(myline1))))/2 + 1 ;
if ( ccol < start ) and ( ccol ne 0 ) then start=ccol;
%end;
* read the file if we do not do a table at the end *
%else %do;
   infile myout missover pad lrecl= &lines recfm=v ;
   input myline1 SCHR&lines.. ;
   ccol= length(trim(myline1)) - length(trim(left(myline1)));end;
* calculate the page and line numbers, very usefull *
   line_num=line_num + 1 ;
   if line_num=eval( &pages + 1 ) then do ;
   line_num = 1 ;
   page_num = page_num + 1 ;
end;
run;

* delete blank lines for cute output *
*------------------------------------------------------------;
proc sort data=result; by page_num line_num; run;
data res(drop=drops gaps1 gaps2) ;
set result end=eof ;
retain drops gaps1 gaps2 0 ;
by page_num line_num;
retain flag 0 ;
* calculate the number of pages here *
if eof then do;
call syntput("lastpg", put(page_num, 3.));
call syntput("ccl", put(start, 3.));
end;
if first.page_num then flag=0;
%if &outto eq print %then %do;
if line_num=1 then delete;
%end;
if compress(myline1)=" " and drops=1 and gaps1=1 then gaps2=1;
if compress(myline1)=" " and drops=1 then gaps1=1;
if compress(myline1)=" " then drops=1;
if compress(myline1) ne " " then do; drops=0 ; gaps1=0;
gaps2=0; end;
if compress(myline1)=" " and gaps1=1 and drops=1 and
gaps2=1 then do ;
flag= flag + 1; delete;
end;
run;
*--------------------------------------*
* print in OUTPUT                    *
*--------------------------------------*
%let leng= %eval( &lines - 2*(&ccol) + 2) ;
**%put " First pos=&ccol   Leng=&leng ";
data_null : set res ;
by page_num line_num;
file &outto notitles ps=&pages ls=&lines nopad n=&ps ;
* fix the formatting issues *
if (index(myline1, "incenter") ne 0 ) then do;
   substr( myline1, 1, 9 ) = substr( trim(left(myline1)), 9,
      length(trim(left(myline1)))- 9 );
end;
if (index(myline1, "rightjust") ne 0 ) then do;
   substr( myline1, 1, &lines ) = substr( trim(left(myline1)),
         10, length(trim(left(myline1)))- 9 );
   start= input(put(&lines, 3.,3.),length(trim(left(myline1))))
      +2 +1;
if line_num=2 then put @start myline1 @%eval(&lines - 25) wday;else put @start myline1;
end;
else if (index(myline1, "leftjust") ne 0 ) then do;
   substr( myline1, 1, &lines ) = substr( trim(left(myline1)),
      10, length(trim(left(myline1)))- 9 );
   start= input(put(&lines, 3.,3.),length(trim(left(myline1)))-
      input(put(&ccol, 3.,3.),3.) + 1;
SOME ADDITIONAL TRICKS TO GENERATE A TABLE INSIDE MICROSOFT WORD

1. CHANGE THE FORMAT
Our file is created inside the SAS®. First, we have to change the format in our output to read the file properly. To set up the Microsoft Word Macro would be extremely helpful because we will use the same keys all the time.

1) Open the file
2) Convert file to the different format:

III. GENERATE THE TABLE
To convert output to the table we have to recognize titles, footnotes, the header and the body of the table. Titles and footnotes might be high-lighted or underlined or whatever. Header and the body of the table might be done all together or separate. Most of the time they have to be managed separately because they have different number of the columns and different widths of the columns. But the procedures that we work on them are always the same. We will set up another Microsoft Word Macro to execute this job with a simple single step.

1) Highlight the area of the text that we want to convert to the table. Do the headers of the table and the body separate.

2) Generate another MACRO to use all the procedures in one step for the future implementation:
MACRO RECORD
Macro Name:
   STEP2 (for example )
   <OK>
KEYBOARD
Press new Shortcut key:
   Ctrl+2 (for example)
ASSIGN
CLOSE
Record the following sequence of the keys:
1) FORMAT
   COLUMNS
   x Specify not equal column width
3) TABLE
   Convert Text to Table
Separate Text At:
   x OTHER “|”
   < OK >
STOP Recording

Now use the keys Ctrl+2 to do all these manipulations at once for highlighted area that might be related to the header or body of the desirable table.

CONCLUSION

It is generally considered that the most efficient way to generate a report is any way inside SAS ® environment. It is convenient if at the same time we can save our output for the future needs in Microsoft Word. Doing that, we are able to do some additional conversions with a file in case if we prefer Microsoft Word Table format. Due to the current trend of promoting electronic submission by FDA, it is deemed unavoidable that we have to think ahead how we can use the most updated technologies to produce electronic documents that are not only user friendly, but meet the regulatory requirements. The proposed procedure is the first step to fulfill the requirements. Note that presented MACRO is extremely easy to use, to modify, or to update.

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Ms. Kungurtseva received her Masters degree in Mathematics from St. Petersburg University in Russia. She has more than 10 year programming experience. She has been a SAS programmer in the pharmaceutical industry for 5 years.

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