Get your SAS in gear – Automate Appendix Numbers, Titles and Footnotes

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ABSTRACT

When deadlines are looming it’s time consuming, as well as frustrating, to have to make last minute ‘cosmetic’ programming changes such as:

- Reordering the Appendices to accommodate for the insertion/deletion of a Table[Listing/Figure
- Modifying Titles and/or Footnotes to correct misspellings or to include additional explanations that could not have been anticipated until the data was unblinded

Defining Appendix Numbers, Titles, and Footnotes separate from SAS, such as in an Excel spreadsheet, allows the SAS programmer to concentrate on generating the body of the Table[Listing/Figure without having to worry about making modifications to the program every time a change to the Titles and/or Footnotes is required.

Responsibility for the maintenance of the Title and Footnote information can even be delegated to a non-programmer. Titles and Footnotes can be ‘previewed’ prior to running the SAS program.

INTRODUCTION

This paper discusses how to automate Appendix Numbers, Titles and Footnotes by creating a Dataset containing Title and Footnote information and using that information to define Macro Variables from which Titles and Footnotes can be generated and used by a Table[Listing/Figure (T/L/F) program.

Important considerations:

- How to Store Title and Footnote Information
  - What is the Context and Format for my Titles/Footnotes?
  - How and Where should Title/Footnote Information be stored?
  - What Information do I need to store?

- How to Copy Title and Footnote Information into SAS
  - How do I define a Macro Procedure that will Import the Title/Footnotes Information and Generate a permanent SAS File?

- How to Generate Titles and Footnotes
  - How do I define a Macro Procedure that will Automatically generate Title/Footnote Statements?

- How to Run the T/L/F Program
  - How do I integrate the Macro Procedures that will Automatically generate Titles/Footnotes into a T/L/F Program?
How to Store Title and Footnote Information

What is the Context and Format for my Titles/Footnotes?

Titles and Footnotes are usually a combination of Statements that are the same in every Study and Statements that are unique to the Study such as:

- Title 1 – Company Name
- Title 3 – Appendix Title
- Titles 4 thru n – Study Specific Titles
- Last Title – Underscores preceded by a blank line
- Footnote 1 – Underscores followed by a blank line
- Footnotes 3 thru n – Study Specific Footnotes
- Last Footnote – Program Name, Appendix Name and Date preceded by a blank line (if possible)

<table>
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<th>Informed Consent</th>
<th>Gender (Yrs)</th>
<th>Race</th>
<th>Age</th>
<th>Consent</th>
<th>Date of Birth</th>
<th>Primary Source of Pain</th>
<th>Rating</th>
<th>Subject of Pain is...</th>
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<td>20MAY1939</td>
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<td></td>
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<td></td>
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<td>01JAN1921</td>
<td>(N) OTHER PERIPHERAL NEUROPATHY-PERIPHERAL NEUROPATHY</td>
<td>MODERATE [2]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[1] Suboptimally responding to Current Analgesic Regimen
[2] Experiencing intolerable Side Effects

Program: X:\EN1234\001\PGMS\L_DEMOG1.SAS Output: X:\EN1234\001\OUTPUT\L_DEMOG1A.DOC Final Date: 06DEC2005
How to Store Title and Footnote Information

How and Where should Title/Footnote Information be stored?

Using Excel or MS-Access:
- A CSV File can easily be generated and copied into SAS
- Data entry is easy
- A non-SAS person can maintain the information

What Information do I need to store?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
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<td>app_name</td>
<td>pgm_name</td>
<td>tf_id</td>
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<td>tf_len</td>
<td>tf_text</td>
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<td>l_demog1</td>
<td>T01</td>
<td>L</td>
<td>44</td>
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<td>l_demog1</td>
<td>T04</td>
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<td>Patient Demographics and Characteristics</td>
</tr>
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<td>T06</td>
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<td>F03</td>
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<td>[1] Suboptimally responding to Current Analgesic Regimen</td>
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<td>L03</td>
<td>l_demog1a</td>
<td>l_demog1</td>
<td>F04</td>
<td>L</td>
<td>41</td>
<td>[2] Experiencing intolerable side effects</td>
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<td>L03</td>
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<td>F06</td>
<td>L</td>
<td>112</td>
<td>Program: X:\EN1234\001\PGMSI_l_demog1.sas Output: X:\EN1234\001\OUTPUT\l_demog1a.doc</td>
</tr>
</tbody>
</table>

Col

A  app_id – Appendix Identifier: Type (T=Table, L=Listing) & Number (2 characters)
B  pgm_name – Program Name – same as source program
C  app_name – Appendix Name – same as output document
D  tf_id - Title/Footnote Id: Type (T=Title, F=Footnote) & Number (2 characters)
E  tf_align – Title/Footnote Alignment: (C or Blank=Centered, L=Left Justified)
F  tf_len – Length of Text (automatically generated)
G  tf_text – Title/Footnote Text

Notes:
- First row contains variable names that will be used by SAS – these must not be changed
- Use Mock-ups to determine Appendix Numbers, Program Names and Appendix Names
- Program Name and Appendix Name together must be unique for each T/L/F
- Every Title and Footnote is defined
  - It is not necessary to define blank lines
- The Last Footnote (containing Program and Output Names) needs to have Date added at time of execution
- The length of the Text is automatically generated making it easier to format Titles/Footnotes that require more than one line – other than that it is not used
  - Use the Length Function (=len(Gx))
How to Copy Title and Footnote Information into SAS

How do I define a Macro Procedure that will Import the Title/Footnotes Information and Generate a permanent SAS File?

1) Read in Titles & Footnotes from Excel
   - Split Appendix ID to define Appendix Number and Appendix Type (Table/Listing/Figure)
   - Split Title & Footnote ID to define Title/Footnote Number and Type (Title or Footnote)
2) Create a Permanent SAS File

```
%macro tf_import;
/* (1) Read in Titles & Footnotes from Excel */
data app_mstr;
   infile 'E:\PharmaSUG 2006\app_mstr.csv' dlm=',';
   MISSOVER DSD lrecl=32767 firstobs=2;
   informat app_id $3. app_name $10. pgm_name $10. tf_id $3.
     tf_algn $1. tf_len best2. tf_text $132.;
   input app_id $ app_name $ pgm_name $ tf_id $
     tf_algn $ tf_len tf_text $;
/* Split Appendix ID (app_id) to Define Appendix Number (app_num) & Type (app_type) */
   length app_num 8. app_type $1.;
   app_num = input(substr(app_id,2),2.); /* Appendix Type */
   app_type = substr(app_id,1,1); /* Appendix Number */
/* Split Title & Footnote ID (tf_id) to Define Title & Footnote Number (tf_num) & Type */
   length tf_num 8. tf_type $1.;
   tf_num = input(substr(tf_id,2),2.); /* Title/Footnote Type */
   tf_type = substr(tf_id,1,1); /* Title/Footnote Number */
run;
/* (2) Create a permanent SAS File (app_mstr) */
proc sort data=app_mstr out=adata.app_mstr;
   by app_id app_name pgm_name descending tf_type tf_num;
run;
%mend;
```

How to Generate Titles and Footnotes

How do I define a Macro Procedure that will Automatically generate Title/Footnote Statements?

1) Cancel any previous Titles & Footnotes
2) Define a Macro Variable for each possible Title & Footnote text and alignment and initialize each to empty
3) Read the Appendix Master and generate a Macro Variable for each Title & Footnote Text and Alignment associated with the T/L/F
   - Extract Titles & Footnotes that match Program & Appendix Name
   - Add Current Date to Last Footnote
   - Assign values to Macro Variables for Text & Alignment
4) Define each Title and Footnote Statement
How to Generate Titles and Footnotes

%macro tf_add (pgm_name=, app_name=);
/* Parameters: */
/* pgm_name – Program Name as defined in Appendix Master */
/* app_name – Appendix Name as defined in Appendix Master */
/
(1) Cancel any previous Titles and Footnotes */
title;
footnote;
/* (2) Define Macro Variables title1-10, talgn1-10, footnote1-10, and falgn1-10 */
/* to contain Text & Alignment values for each Title & Footnote – Initialize each to empty */
%do i = 1 %to 10;
%let title&i = ; /* Title Text */
%let talgn&i = ; /* Title Alignment */
%let footnote&i = ; /* Footnote Text */
%let falgn&i = ; /* Footnote Alignment */
%end;
/* (3) Read the Appendix Master and generate a Macro Variable for each */
/* Title & Footnote Text and Alignment associated with the T/L/F */
data mstr;
set adata.app_mstr;
/* Extract Titles & Footnotes that match Program & Appendix Name */
if upcase(trim(left(pgm_name)))=upcase("&pgm_name") and
upcase(trim(left(app_name)))=upcase("&app_name");
/* Add Current Date to Last Footnote */
if tf_type = 'F' and tf_text =: 'Program:' then
substr(tf_text,110) = "Final Date: " ||
trim(left(put(date(),date9.)));
/* Assign values to Macro Variables for Text & Alignment */
if tf_type = 'T' then
call symput('title' || trim(left(put(tf_num,2.))), tf_text);
if tf_type = 'F' then
call symput('footnote' || trim(left(put(tf_num,2.))), tf_text);
call symput('titlealgn' || trim(left(put(tf_num,2.))), tf_algn);
call symput('footnotealgn' || trim(left(put(tf_num,2.))), tf_align);
run;
/* (4) Define each Title & Footnote Statements */
/* Define Alignment - L = Left, C or Blank = Center */
%do i = 1 %to 10;
/* Define Titles */
%if &&talgn&i = L %then
%do;
title&i "&&title&i"; /* Left Justify */
%end;
%if &&talgn&i = C or &&talgn&i =   %then
%do;
title&i "&&title&i"; /* Center */
%end;
/* Define Footnotes */
%if &&falgn&i = L %then
%do;
footnote&i "&&footnote&i"; /* Left Justify */
%end;
%if &&falgn&i = C or &&falgn&i =   %then
%do;
footnote&i "&&footnote&i"; /* Center */
%end;
%end;
%mend;
How to run the T/L/F Program

How do I integrate the Macro Procedures that will Automatically generate Titles/Footnotes into a T/L/F Program?

```sas
/* Import Titles/Footnotes */
%tf_import;

/* Define Titles/Footnotes */
%tf_add (pgm_name=l_demog1, app_name=l_demog1a);

/* Generate Table/Listing */
proc report data=demog headline headskip split='#' spacing=1 nowindows missing;
columns patid clinid genderc age race_x infco_dx
      birth_dx source_x painca_d ques_x;
define patid / order noprint;
define clinid / computed width=7 'Patient ID';
define genderc / width=6 'Gender';
define age / width=5 ' Age ' '(Yrs)';
define race_x / width=9 flow 'Race';
define infco_dx / width=9 'Date Informed Consent Signed';
define birth_dx / width=9 'Date of Birth';
define source_x / width=30 flow 'Primary Source of Pain'
      '(N)=Neuropathic (C)=Cancer';
define painca_d / width=8 'Rating of Pain';
define ques_x / width=7 flow 'Subject is...';
run;
```

Endo Pharmaceuticals Protocol Id: EN1234-001

Appendix 16.4, Listing 3

Patient Demographics and Screening Characteristics

<table>
<thead>
<tr>
<th>Date Informed Consent Signed</th>
<th>Date of Birth</th>
<th>Primary Source of Pain</th>
<th>Rating of Pain</th>
<th>Subject is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-001 MALE</td>
<td>64 BLK</td>
<td>29AUG2003</td>
<td>(N) DIABETIC NEUROPATHY (DN)</td>
<td>MODERATE [1]</td>
</tr>
<tr>
<td>100-002 MALE</td>
<td>79 CAUCASIAN</td>
<td>03SEP2003</td>
<td>(N) POST-HERPETIC NEURALGIA (PHN)</td>
<td>MODERATE [2]</td>
</tr>
<tr>
<td>100-003 MALE</td>
<td>65 CAUCASIAN</td>
<td>12SEP2003</td>
<td>(N) IDIOPATHIC SENSORY NEUROPATHY</td>
<td>MODERATE [1]</td>
</tr>
<tr>
<td>100-004 FEMALE</td>
<td>65 CAUCASIAN</td>
<td>16SEP2003</td>
<td>(N) OTHER PERIPHERAL NEUROPATHY-BILAT PERONEAL NEUROPATHY</td>
<td>MODERATE [1]</td>
</tr>
<tr>
<td>100-005 MALE</td>
<td>82 CAUCASIAN</td>
<td>01JAN1921</td>
<td>(N) OTHER PERIPHERAL NEUROPATHY-POORLY CONTROLLED PERIPHERAL NEUROPATHY (PHN)</td>
<td>MODERATE [2]</td>
</tr>
</tbody>
</table>

[1] Suboptimally responding to Current Analgesic Regimen
[2] Experiencing intolerable Side Effects

Program: X:\EN1234\001\PGMS\L_DEMOG1.SAS Output: X:\EN1234\001\OUTPUT\L_DEMOG1A.DOC Final Date: 06DEC2005
How can I further enhance this procedure to make it even more valuable?

Automate Standard Titles and Footnotes

Automating the Standard Titles and Footnotes significantly reduces the number of Titles and Footnotes that have to be defined, saving additional time and effort.

Delete Standard Title & Footnote Statements or those that can be easily derived from the Spreadsheet, leaving only Study Specific Titles/Footnotes, such as:

- Company Name (T1), Appendix Number (T3), Underscores at bottom of Titles (T6), Underscores at top of Footnotes (F1), Program Name (F6)

leaving only Study Specific Titles and Footnotes

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>pgm_name</td>
<td>tf_id</td>
<td>tf_algn</td>
<td>tf_len</td>
<td>tf_text</td>
</tr>
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<td>L03</td>
<td>l_demog1a</td>
<td>l_demog1</td>
<td>T04</td>
<td>L</td>
<td>50</td>
<td>Patient Demographics and Characteristics</td>
</tr>
<tr>
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<td>l_demog1a</td>
<td>l_demog1</td>
<td>F03</td>
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<td>l_demog1</td>
<td>F04</td>
<td>L</td>
<td>41</td>
<td>[2] Experiencing intolerable side effects</td>
</tr>
</tbody>
</table>

Modify the %tf_import Macro Procedure to generate Standard Titles & Footnote as well as Study Specific Titles & Footnotes

1) Read in Titles & Footnotes from Excel (Same as Step 1 in original Macro Procedure)
2) Define Macro Variables containing Compound & Protocol
3) Summarize Study Specific Title & Footnote Numbers to determine Last Title & Footnote Number
4) Generate a SAS Dataset containing Standard Titles & Footnotes
5) Combine Study Specific Titles & Footnotes with Standard Titles & Footnotes
6) Create Permanent SAS Dataset (Same as Step 2 in original Macro Procedure)

```sas
%macro tf_import;
/* (1) Read in Titles & Footnotes from Excel */
data app_stdy;
  infile 'E:\PharmaSUG 2006\app_mstr.csv' dlm=',';
  MISSOVER DSD lrecl=32767 firstobs=2;
  informat app_id $3. app_name $10. pgm_name $10. tf_id $3.
    tf_algn $1. tf_len best2. tf_text $132.;
  input app_id $ app_name $ pgm_name $ tf_id $
    tf_algn $ tf_len best2. tf_text $132.;
/* Split Appendix ID (app_id) to Define Appendix Number (app_num) & Type (app_type) */
  length app_num 8. app_type $1.;
  app_num = input(substr(app_id,2),2.);
/* Appendix Type */
  app_type = substr(app_id,1,1);
/* Appendix Number */
/* Split Title & Footnote ID (tf_id) to Define Title & Footnote Number (tf_num) & Type (tf_type) */
  length tf_num 8. tf_type $1.;
  tf_num = input(substr(tf_id,2),2.);
/* Title/Footnote Type */
  tf_type = substr(tf_id,1,1);
/* Title/Footnote Number */
run;
/* (2) Define Macro Variables containing Compound (&cmpnd) and Protocol (&prtcl) */
%let cmpnd=EN1234;
```
%let prtcl=001;

/* (3) Summarize Study Specific Title & Footnote Numbers */
/* to determine Last Title and Footnote Number */
proc summary data=app_stdy nway;
   class app_type app_num app_id app_name pgm_name tf_type;
   var tf_num;
   output out=app_lst (drop=_type_ _freq_) max=tf_lst;
run;

/* (4) Generate a SAS Dataset containing Standard Titles & Footnotes */
data app_stnd;
   set app_lst;
   /* Generate Number, Text and Alignment for Standard Titles & Footnotes */
   length tf_align $1. tf_text $132.;
   if tf_type eq 'T' then do;
      /* title1 (Company Name) */
      tf_num = 1;
      tf_text = "Endo Pharmaceuticals Protocol Id: &cmpnd.-&prtcl.";
      tf_align = 'L';
      output;
      /* title3 (Appendix Number) */
      tf_num = 3;
      if tf_type = 'L' then
         do;
            /* Appendix 16.4, Listing */
            tf_text = "Appendix 16.4, Listing " || trim(left(put(app_num,2.)));";
            output;
            /* Appendix 16.2.2, Table */
            tf_text = "Appendix 16.2.2, Table " || trim(left(put(app_num,2.)));";
            output;
         end;
      tf_align = 'C';
      output;
      /* last title (underscores) */
      tf_num = tf_lst + 2;
      tf_text = repeat('_', 132);
      tf_align = 'L';
      output;
   end;
   if tf_type eq 'F' then do;
      /* first footnote (underscores) */
      tf_num = 1;
      tf_text = repeat('_', 132);
      tf_align = 'L';
      output;
      /* last footnote (Program and Output Name) */
      tf_text = "Program:X:\&cmpnd.\NDA\&prtcl.\PGMS\" ||
               trim(left(pgm_name)) || ".SAS " ||
               "Output:X:\:\&cmpnd.\NDA\&prtcl.\OUTPUT\" ||
               trim(left(app_name)) || ".DOC";
      tf_align = 'L';
      output;
   end;
run;

/* (5) Combine Study Specific Titles & Footnotes (app_stdy) and Standard Titles & Footnotes (app_stnd) */
data app_mstr;
   set app_stdy app_stnd;
run;

/* (6) Create a Permanent SAS Dataset (app_mstr) */
proc sort data=app_mstr out=adata.app_mstr;
   by app_id app_name pgm_name descending tf_type tf_num;
run;
%mend;
Previewing Titles/Footnotes prior to generating the Table/Listing makes review and correction very easy saving additional time and effort.

Define a Macro Procedure that will automatically generate a Report with Titles/Footnotes

1) Create a Dummy SAS File containing only one record and one Variable
2) Execute %tf_add with an appropriate Program and Appendix Name
3) Generate a Dummy Report

```
%macro tf_test (pgm_name=, app_name=);
    /* (1) Create a Dummy SAS File containing only one record and one Variable */
    data test_ds;
        length test_var $80.;
        test_var = "Program Name: &pgm_name / Appendix Name: &app_name";
    run;
    /* (2) Execute %tf_add with an appropriate Program and Appendix Name */
    %tf_add (pgm_name=&pgm_name, app_name=&app_name);
    /* (3) Generate a Dummy Report */
    proc report data=test_ds headline headskip nowindows;
        columns test_var;
        define test_var /width=80 'Test Titles & Footnotes';
    run;
%mend;
```

Execute the Macro

```
/* Execute the Macro Procedure */
%tf_test (pgm_name=l_demog1, app_name=l_demog1a);
```

Endo Pharmaceuticals Protocol Id: EN1234-001

Appendix 16.2.2, Table 4
Patient Demographics and Screening Characteristics

<table>
<thead>
<tr>
<th>Test Titles &amp; Footnotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Program Name: l_demog1 / Appendix Name: l_demog1a</td>
</tr>
</tbody>
</table>

[1] Suboptimally responding to Current Analgesic Regimen
[2] Experiencing intolerable Side Effects

Program: X:\EN1234\001\PGMS\L_DEMOG1.SAS Output: X:\EN1234\001\OUTPUT\L_DEMOG1A.DOC  Final Date: 06DEC2005
CONCLUSION

Automating Titles and Footnotes allows the SAS programmer to spend more time on processing the data and generating the analyses needed to produce Appendices

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

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