A Macro Solution for Updating Report Titles and Footnotes

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ABSTRACT
Modification of titles and footnotes is often inevitable during the course of clinical trial report generation. Traditionally this is done manually, which could be tedious with potential human errors. This paper introduces a macro solution, %editft, to insert footnotes into the program generating the report. The solution covers three aspects, adding footnotes to the program without pre-defined footnotes, inserting footnotes into the program between the pre-defined footnotes, and replacing the existing footnotes in the program. Finally, a real example is given to illustrate the use of the macro.

Key words: %editft, footnote, title

INTRODUCTION
Efficacy, immunogenicity, and safety reports are important documents generated in drug and vaccine clinical development. Modification of titles/footnotes for these reports is often necessary during the study process. The rest of the paper will only refer to footnotes, but the same approach also applies to titles. The need of modification may include the following three scenarios:

1. Adding footnotes to the report without pre-defined footnotes;
2. Inserting additional footnotes into the report with pre-defined footnotes;
3. Replacing the existing footnotes in the report.

Therefore, the SAS program generating the report needs to be updated accordingly. For instance, to insert a footnote as the second footnote into a report with 5 pre-defined footnotes, we will need to modify the footnote numbers for the four pre-defined footnotes following the first and the second (inserted) footnotes; to update titles for multiple reports, we will need to revise the titles in multiple programs. Sometimes, the update must be completed upon receiving a last-minute request. Traditionally, the program is modified manually, which could be tedious and time consuming with potential human errors.

In order to handle the change of report footnotes efficiently and accurately, we developed a macro, %editft, in SAS V9 to update the report generating program correspondingly. The following sections summarize the macro design, the macro code structure and parameters, and show examples of using the macro.

THE MACRO DESIGN
The macro is designed to handle the change of report footnotes accurately and conveniently. The objective is to update the SAS program with desired footnotes by using the minimum amount of information specified in a macro call outside the program. Three commonly encountered types of footnotes update are evaluated and covered in the macro, i.e. adding, inserting, and replacing footnotes. The report generated with the updated program should have the desired footnotes. An important feature of the macro is to combine the pre-existing and the macro specified footnotes, re-arrange the order of them and update the program with the newly ordered footnotes. For example, to insert a footnote between footnote1 and footnote2, the user only needs to define the inserted footnote as footnote1d2 in the macro call instead of renaming the existing footnote2 and the footnotes following it; as a result, the updated program will have footnotes in the order of footnote1, footnote2 (the inserted footnote1d2), footnote3 (the previous footnote2), and so on.
The macro processes the program update in the following steps:
1. Search the footnotes syntax for the specific report generated by the program/macro;
2. Re-arrange the pre-existing footnotes with the macro specified ones; and
3. Update the program with the required footnotes.

MACRO CODE STRUCTURE AND PARAMETERS
The main macro code structure is:

```sas
%macro editft(indir=,
inpgm=,
txtstr=,
addstr=,
drpstr=,
outdir=,
outpgm=,
runpgm=);

......
%s*------------------------------------------------------------------ *%
%s* Step 01: Search the footnotes to be updated in the program  *%
s*------------------------------------------------------------------ *%
......
%s*------------------------------------------------------------------ *%
%s* Step 02: Put the titles/footnotes (pre-defined and new) in order *%
s*------------------------------------------------------------------ *%
proc sql noprint;
  select trim(name) into: savetf separated by " "
  from sashelp.vmacro
  where name EQT "%upcase(&txtstr)"
  order by name;
quit;
......
%s*------------------------------------------------------------------ *%
%s* Step 03: Update the titles/footnotes                             *% 
%s*----------------------- ------------------------------------------ *%
*i-- Count the number of titles/footnotes -*;
  %let nstr=%eval(%sysfunc(count(&savetf,%str( )))+1);
*i-- Define the titles/footnotes in the updated program -*;
  %do i = &nstr %to 1 %by -1;
    %let &txtstr&i=%superq(%sysfunc(scan(%str(&savetf),&i,%str( ))));
  %end;
......
%s*------------------------------------------------------------------ *%
%s* Step 04: Update the program and run it                            *%
%s*------------------------------------------------------------------ *%
......
%mend editft;
```
%editft has eight parameters, four of them are required, and the rest are optional. The macro parameters are as the follows:

- `indir` directory path of the program to be revised (required parameter)
- `inpgm` name of the program to be revised (required parameter)
- `txtstr` text string in the title/footnote statement (required parameter)
- `addstr` footnotes to be added to the program (required parameter)
- `drpstr` previous footnotes to be dropped
- `outdir` directory path for the output file
- `outpgm` name of the output file
- `runpgm` run the program =N by default

**EXAMPLES OF USING THE MACRO**

The following example demonstrates how %editft is used to update the footnotes in a program.

1. Footnotes defined in the program before revision (Figure 1):

```
%let footer1=N = Subjects randomized and vaccinated;
%let footer2=n = Subjects contributing to the analysis;
```

Figure 1. Footnotes defined in program, s-imm.sas

2. Macro call syntax to update the footnote:

```
%editft (indir=C:\PharmSUG07,
inpgm=s-imm,
txtstr=foot,
addstr=%let footer1d2=m = Subject responded to the vaccine.);
```

Footnote to be inserted between the footnotes defined by &footer1 and &footer2.

3. Footnote definition in the program after the revision (Figure 2):

```
%let footer1=N = Subjects randomized and vaccinated;
%let footer2=m = Subjects responded to the vaccine;
%let footer3=n = Subjects contributing to the analysis;
```

Figure 2. Footnotes defined in the program, s-imm.sas, after the revision
DISCUSSIONS AND CONCLUSIONS

Clinical trial reports are generated with different approaches in SAS. Moreover, the footnotes can be defined in various parts of the program, which adds to the complexity of the search of footnotes for a particular report. Therefore, cautions need to be taken when handling the change of footnotes outside the program. The macro %editft is designed only for SAS program generating single report, offering a convenient way to update the program with revision in the title(s) and footnote(s). It handles the modification of footnotes outside the program instead of accessing each program manually. Meanwhile, it only requires the minimum amount of syntax in the macro call and therefore, streamlines the clinical report update due to the changes of footnotes.

REFERENCES:
Base SAS V9® 9.1.3 SAS Help and Documentation.

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