Paper 237

# Developing Standardized Requirements, Specifications and Programs for Clinical Trials Reports

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## ABSTRACT

The purpose of this paper is to demonstrate a standard table development methodology and to explain the resulting program design.

## BACKGROUND

Several years ago, the Clinical Research Division (CRD) of Parke-Davis began an analysis of its procedures. This initiative investigated the way CRD processed clinical trials data and from it several process improvement projects were suggested. Our assigned project was to design and develop a common method for gathering requirements and reporting specifications to be used across all therapy areas. The goal was to eliminate routine programming tasks and reduce the amount of validation required for individual programs.

### OLD PROCESS:

In the old clinical trials reporting environment, each therapy area independently developed requirements, specifications and reporting programs.
This process:

- Consumed many person-hours
- Duplicated efforts
- Required separate validation for each new program
- Impeded the implementation of new technology across the organization

### NEW PROCESS:

The new process begins with a common set of requirements and specifications implemented throughout the CRD organization, leading to the development of a common set of reporting programs.

The benefits of the new process are:

- Requirements, specifications and programs are reused across therapy areas.
- Consistent data handling rules
- Requirements, specifications and programs are structured to accommodate variations in study design
- Modular design allows for replacement of components to take advantage of changing technology
- The programs used to create these standard tables are validated. No additional validation needs to be completed if a standard table is used for the study.

Each Workgroup follows a common set of steps to develop their reporting tables. They are as follows:

Step 1. A Workgroup consisting of Clinical Reporting Systems (CRS) developers and requestors, including but not limited to clinical scientists, medical writers, and statisticians meet to discuss requirements. Standard sets of CRD reporting requirements are brought to this meeting.

Step 2. A requirements/tables checklist form is completed and appropriate options are selected to customize the tables for their specific study.

Step 3. The CRS developer files the document in their project file. This document is now used as the specification and validation documentation.

Step 4. The CRS developer selects the table and applies the options via a web based interface, which runs the SAS® programs and produces the specific study tables.

## REQUIREMENTS AND SPECIFICATIONS

Requirements and specifications of similar reporting tables are combined into a single document (i.e., All adverse events tables are contained in one document). The document consists of three sections

**Part I.** Technical Specifications -This section describes a standard data extraction module as well as parameters used to customize a data manipulation module. The data manipulation module produces the reports for a specific study.

**Part II.** Requirements / Specifications Checklist **for Tables -** Filled out and signed off by all requestors and CRS developers for a specific study(s).

**Part III. Data Reporting Module (default version of table) -These** are either used as examples of, or as actual, requirements and specifications. These generic tables have default options applied.

The underlying assumption of this process is that all data must be collected and stored according to previously defined Parke-Davis standards. Figure 1 illustrates the process.

### PART I. TECHNICAL SPECIFICATIONS

The Technical Specifications are designed to serve as detailed requirements and specifications for use in development of a standard reporting system, which produces groups of related reports (e.g. adverse event summaries, clinical laboratory reports, etc.). The specifications define common data processing and exception-handling rules for all Parke-Davis clinical studies. However, they are flexible enough to allow for customization. The main components of the Technical Specifications section are:

- Data processing flow-describes input datasets, merging requirements, and defines variables needed for later subsetting.
- Data Extraction Module (DEM) - describes a SAS® dataset created from Oracle Clinical views containing all of the fields necessary for reporting.
- Data Manipulation and Computation -defines common

rules for data processing and describes options for customization.
- Report content definition -defines page headers, footers, breaks, and other table layout information.
- Table layout and appearance – includes hypertext links to the Requirements/Specifications Checklist and generic output tables.

The Data Extraction Module (DEM) is a detailed record layout of the SAS® dataset obtained by combining multiple Oracle Clinical views. An example of the record layout for the DEM is seen in Figure 2.

The Data Manipulation and Computation section comprises the biggest piece of the Technical Specifications section. This section describes the options available for development of the Data Manipulation Module (DMM). The DMM is used to create the output tables. It consists of the following subsections:

- Patient retention rule options – allows clients to choose which patients to include.
- Sorting options -describes sort order resulting from the DMM.
- Row subsetting options – allows clients to further subset data based on additional criteria
- Column grouping options – allows clients to select columns for grouping data, e.g. by treatment group, sex, phase, etc.

For each of these subsections, a default option is specified. This section also describes common data handling rules that apply for all studies, such as the number of decimal places displayed on the table, how to determine the maximum intensity for a patient with multiple occurrences of a given adverse event, and how laboratory retests are to be handled.

PART II. REQUIREMENTS / SPECIFICATIONS CHECKLIST FOR TABLES

The Requirements / Specifications Checklist is a tool for selecting standard tables to be run for an individual study, and for choosing options to customize those tables to accommodate study reporting requirements. The Data Manipulation and Computation section of Part I contains detailed instructions for specifying each option. The checklist must be filled out and signed by both the requesters and developers, and serves as requirements and specifications documentation.

The following sections are contained in this section:

- Study information
- Signatures for final acceptance
- A checklist of tables
- Customized table titles, subtitles, and footnotes
- Patient retention option
- Sort Order
- Subsetting and grouping options for rows and columns
- Other sections PRN

PART III. DATA REPORTING MODULE

The Data Reporting Module consists of table templates, including specific rules that apply to each table. At present, these are Excel workbooks with multiple worksheets and serve as a point of reference for applying customization. We plan to convert to SAS® version 7.0 and utilize ODS features.

## RESULTING PROGRAM DESIGN

Programs developed via this system follow the same structure as the requirements and specifications. Data Extraction Engines are created for retrieving data from each of the individual Oracle Clinical views, combining them, and storing the result in a dataset according to the DEM. The Data Extraction Engines are written to be reusable across different types of reports, and are stored as SAS® macros.

The Data Manipulation Module performs all of the calculations described in the Data Manipulation and Computation section of the document based on the options specified in the Requirements / Specifications Checklist. The default code for handling each option is stored either as a macro variable if it is simple (a single keyword, for example), or if it is more complicated, in a separate macro. We were able to gain still more flexibility by allowing these macro variables to contain macro calls. Thus, if a study is unable to use the default routines, the developer can replace them with their own macros, and simply change the corresponding macro variables to point to their macros instead. Only their macros need to be formally validated, though the final results still must be verified.

For example, suppose the default code for reading in patient treatment groups is stored in a macro called %RXGRP. The option to use this default setting is triggered by the statement:

```
%LET rxgrp = %NRSTR(%rxgrp);
```

If a developer needs to write a separate routine to read in treatment groups for their study, they can store their code in a separate macro called %NEWRXGRP and execute their code with the statement:

```
%LET rxgrp = %NRSTR(%newrxgrp);
```

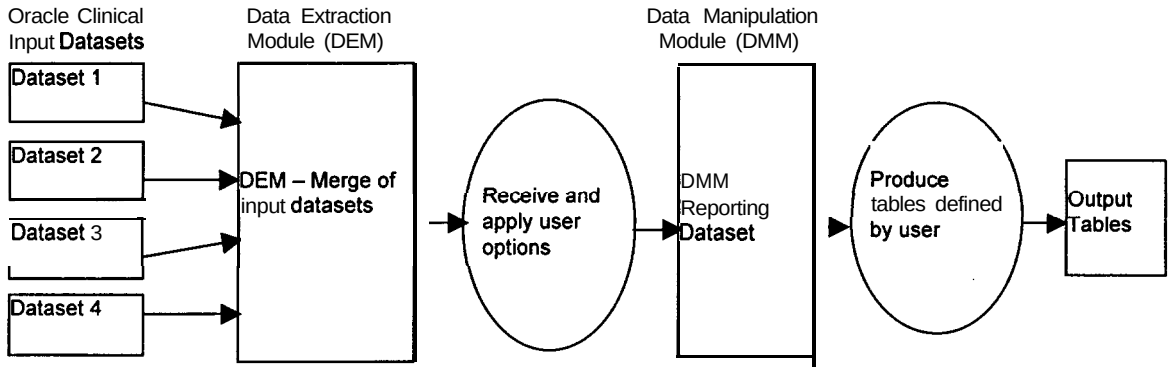
Complete documentation on what the standard option macros expect and produce is required, so that the customized pieces may be substituted without causing errors.

Initially, the values of the macro variables representing the various options were specified in a SAS® program by applying %LET statements. The developer then had to manually edit this program to set each combination of tables and options detailed on the Requirements I Specifications Checklist. We are currently working on a web-based interface to allow the developer to select the tables and options they need for their study. The web application runs a CGI script to build the options specification program on the fly. This program then calls the appropriate SAS® macros to produce the desired table.

## CONCLUSION

The new process has reduced validation time for the CRS developers, reduced the time needed to complete reports for studies, and allowed for customization within the therapy areas.

FIGURE 1




## Data Extraction Module (DEM) (Figure 2)

*(Please note: SAS dataset types and lengths may differ from the OC attributes.)*

| SAS Field Name | SAS type,len | SAS dataset name | Oraclin name | Oraclin type,len | IPM ref or other source. | Field Description |
|---|---|---|---|---|---|---|
| CI | N 8 | AE | STUDY | C 15 | A.1.1 | CI Number |
| PROT | N 8 | AE | STUDY | C 15 | A.1.1 | Protocol Number |
| SITE | N 8 | AE | INVSITE | C 10 | A.1.1 | Site Number |
| PTID | N 8 | AE | PT | C 10 | A.2.1 | Patient Identification |
| DAY1DT | C 9 | SMEDDOSE or DEMO | DAY1DT | Date | Derived | Start date of study medication calculated from the first day on study drug |
| RXGRP | N 8 | DEMO | RXGRP | C 2 | Gidiams | Drug treatment group |
| RANDNO | N 5 | DEMO /STATUS / N/A | RANDNO | C 10 | A.2.3 | Randomization number |
| AGE | N 3 | DEMO | AGE | N 3 | B.1.1 | Age |
| SEX | C 6 | DEMO | SEX | C 6 | B.2.1 | Sex |
| RACE | C 40 | DEMO | RACE | C 40 | B.3.1 | Race |
| HORMONE | C 15 | DEMO | HORMONE | C 15 | B.2.1 | Hormonal Status |
| AETX | C 60 | AE | AETX | C 60 | D.7.1 | Adverse Event Text |

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