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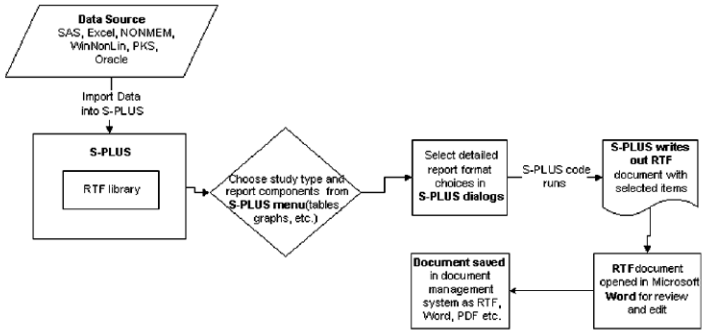

Fig. 1. Reporting Workflow: data access, summary statistics and graphics, RTF report including tabular and graphical components

Clinical Electronics

Automated analysis and reporting of clinical studies

BY MICHAEL O'CONNELL, PHD

DATA MANAGEMENT AND ANALYSIS OF CLINICAL and pre-clinical studies involves an enormous effort on the part of biostatisticians and statistical programmers. There are many FDA-required studies, and efficient data management, analysis and reporting can create enormous productivity and time-to-market gains. In addition, substantive regulatory pressures mandate a validated data management and analysis environment. This needs to be maintained in parallel to a creative statistical and graphical analysis sand-box, essential for understanding and demonstrating clinical effects throughout project teams.

Some of the required clinical study types include pharmacology studies such as bioequivalence, dose finding, drug interaction, hepatic impairment as well as a variety of formulation studies. Most of these studies include experiments on multiple analytes and experimental (treatment) conditions and assay results are often obtained for multiple time points. For example, in pharmacology studies, concentration-time profiles for each in-vitro or in-vivo experiment are of interest.

Data from these studies is obtained from a variety of sources depending on the assays used in the experiments. Data sources include LIMS, instruments, databases, excel files and statistical analysis systems files. In recent times, LIMS and data management software solutions allow management and analysis of data from a variety of sources in compliance with 21 CFR 11/GxP guidelines.

The desired summary reports depend on the type of experiment. Typically, the desired reports include a combination of tables and graphs in a format suitable for subsequent management and distribution to project teams through a document management system. In pharmacology studies, *e.g.* dose finding, two key report components are:

1. Tables of concentrations: individual tables of concentrations for each analyte and experimental (treatment) condition in the study; each table containing (assayed) concentrations for each experimental unit (*e.g.* subject) and time point, and
2. Figures of concentration by time profiles: one figure for each analyte and experimental (treatment) condition in the study, with profiles for each subject on each figure

Automation of analysis reports can create significant productivity gains while solidifying workflows so as to avoid errors and comply with 21 CFR 11/GxP guidelines. A statistical analysis and reporting tool can automate the reporting workflow.

In the workflow shown in Fig. 1, data are imported from multiple sources such as .txt, Excel, Oracle Clinical and SAS; summary statistics and graphics are calculated, *e.g.* mean, median, standard deviation, confidence intervals etc; and reports are generated as RTF, PDF or HTML. Tabular and graphical reports obtained by applying the workflow in Fig.1 to a simple dose finding study are shown in Fig. 2. (In this example, Insightful's S-PLUS Reporting Solution was used).

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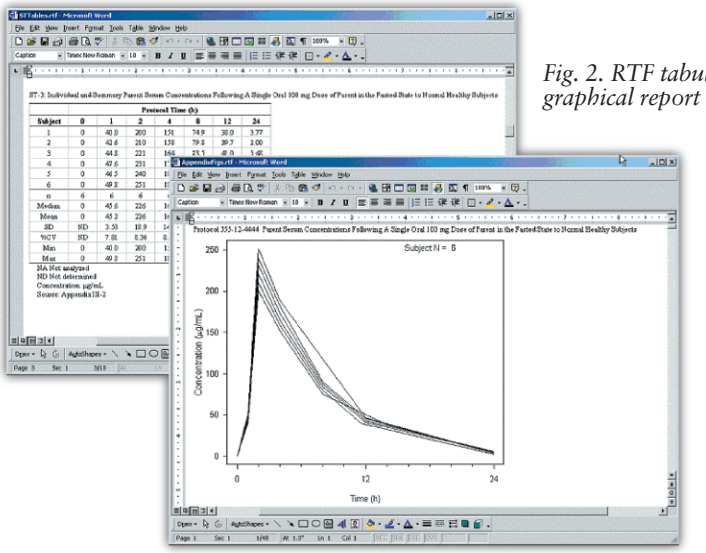

Fig. 2. RTF tabular and graphical report examples.