

Paper 157-29

Evaluating Hospital Performance: Using SAS® ODS to Create a Hospital Scorecard

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ABSTRACT

In its role as a patient safety organization, The Virginia Health Quality Center (VHQC) serves as an independent organization that collects and analyzes patient safety data for the purpose of improving patient safety and health care outcomes. A current contract with a health plan involves financial incentives for hospitals that increase and/or sustain quality of care as measured by a set of indicators for patient safety, health outcomes and patient satisfaction.

Through the Output Delivery System (ODS), SAS Software provides a means for creating an attractive, concise, and functional scorecard for recording progress by participating hospitals. Because ODS is an object-oriented (OO) technology, it also provides the ability to move beyond template descriptions to complete output layout. This paper presents hospital and summary scorecards using: 1) in-line formatting combined with ODS templates, Proc Report, and compute and line statements as provided in version 8 of SAS, and 2) enhanced ODS layout capabilities of version 9 of SAS that allows a cell-by-cell creation of this Proc Report scorecard.

All examples were developed with version 8.2 or version 9 of SAS executing on a Windows 2000 or Windows XP platform. Examples are not platform specific and can be adapted by both beginning and advanced SAS users. Abbreviated SAS code is included in the paper.

INTRODUCTION

The Virginia Health Quality Center (VHQC), winner of the U.S. Senate Productivity and Quality Award for Progress in Performance Excellence, is a health care quality improvement organization and patient safety organization that assists healthcare providers in making meaningful changes in the way care is delivered, and in improving the outcomes of that care, especially for the Medicare community of Virginia. Services provided by the VHQC include assisting healthcare organizations with performance improvement techniques, reviewing health plan denials, statistical consulting and data analysis services, health education, credentials verification, clinical and claims database engineering, health care utilization and quality reviews, and coding/DRG validations.

In its role as a patient safety organization, the VHQC is tasked with the following:

- The conduct of efforts to improve patient safety and the quality of health care delivery.
- The collection and analysis of patient safety work product.
- The development and dissemination of evidence-based information to providers with respect to improving patient safety.
- The utilization of patient safety work product for the purpose of encouraging a culture of safety and of providing direct feedback and assistance to providers.
- The maintenance of confidentiality.
- The provision of appropriate security measures with respect to patient safety work product.
- The submission of non-identifiable information.

SAS software provides all the tools necessary for data validation, analysis, and results reporting. Until the advent of ODS, output would have been moved to other software for report formatting. In this paper, an attractive and informative scorecard is created with SAS and ODS without post processing.

Some of the features of ODS and ODS Layout illustrated by this project examples include:

- In-line formatting
- Cell-specific formatting
- Multi-column formatting
- Text specific indents
- Pre-image and post-image
- RTF (version 8.2) and HTML (version 9) output

THE OUTPUT DELIVERY SYSTEM

The Output Delivery System (ODS) provides a means for the flexible formatting of output from SAS procedures. This system is based on Output Objects, which, in the first implementation of ODS, exclusively meant a Data Object or tabular representation of a SAS data set modified by a Template Object. The Template Object contained style features such as color, font, justification, orientation, and other items necessary for formatting the Data Object.

While providing control over output, ODS, as originally released included several limitations. The data display could only be tabular. Once it was created the template was static and was intended for pre-processing. Additionally, ODS was expanded for use with graphics and other procedures that had originally not been supported. These features still did not easily lend themselves to reports that mix text, data tables, and graphics, a mix common to many production reports.

ODS LAYOUT

ODS LAYOUT, released as experimental in version SAS version 9.0, provides the ability to more easily combine text and graphics in a report. Absolute layout is supported, with the page divided into regions. ODS LAYOUT in its initial release is limited to a single page; however, page-spanning features are under development. SAS code to use LAYOUT consists of ODS statements, global statements, and procedures, but instead of placing the output as streaming output, each piece is placed into the identified region. ODS dimension units can be in centimeters (cm), millimeters (mm), inches (in), printers pt (pt), or pixels (px).

The syntax of ODS layout is as follows:

```
ODS LAYOUT START options;  
ODS REGION options;  
ODS LAYOUT END;
```

ODS LAYOUT START options include:

Width	Width of the overall layout
Height	Height of the overall layout

ODS REGION options include:

X	Relative to upper left corner of layout space
Y	Relative to upper left corner of layout space
Width	Width of the region
Height	Height of the region

Absolute layout is ideal for reports that use a very precise format and provides flexibility within that context. For reports where the size and location of items do not need to be fixed, a relative layout option, gridded layout, will be available as experimental beginning in SAS version 9.1. This will allow a series of rows and columns of different heights and widths and will also allow the expanding of space if the output does not fit in the "absolute" space. Both the absolute and gridded layout options allow regions to overlap.

APPLICATION: THE HOSPITAL SCORECARD

The purpose of a payment incentive program is to align financial incentives with improved performance in patient safety, health outcomes, and customer satisfaction. The scorecards that this code produces provide a means for graphic display of both an individual hospital's progress and the progress of the program as a whole. The VHQC process to create these scorecards is as follows:

:

- Receive aggregate data from hospitals
- Perform desk audits
- Perform data validation
- Score patient safety and health outcome sections
- Receive patient satisfaction survey results
- Compute the score for each hospital by indicator
- Roll up indicator scores into category scores
- Display results on scorecard
- Distribute scorecard to hospital and payment plan

Each area of the evaluation has a threshold score for achievement, based on national and state average rates. Each year the threshold will be raised. Scores are distributed by category as follows:

- Patient safety (30%)
- Patient outcomes (55%)
- Patient satisfaction (15%)

For each participating hospital, evaluation is a continual process. In addition to the annual report of performance, quarterly progress reports are sent to each facility. At the end of the year, payment reimbursements are adjusted based on the performance scores.

Examples provided with this paper show two types of scorecards: a payer summary scorecard created with version 8.2 of SAS and a hospital specific scorecard created with version 9. Text and sample code provided with each example illustrates the features used to create that scorecard.

Data as depicted in these examples are for illustration only and are not intended to depict any actual clinical results.

EXAMPLE ONE: PAYER SUMMARY SCORECARD

In this first example, a layout screen is created using ODS with the RTF destination, using version 8.2 of SAS. Steps to create the template with the necessary formatting and placements are as follows:

- Run the program with basic formatting
- Output to an .rtf file
- View the .rtf in notepad and save
- Making the template edits in the .rtf document
- Compare the before and after .rtf code for changes
- Including the .rtf in the template by trial and error.

Thanks goes to David Shannon for his 2002 SUGI paper that identified this undocumented ability for SAS to utilize much of the .rtf language.

Partial SAS Code:

```
ods rtf file="c:\abcbs\cardxyzxxx.rtf" style=qhiptop;
proc report data=scorecard nowd style=[font_face='Arial'];
column sect item hospitals achieved hall;
define sect / group "Section";
define item/ group " " flow order=data;
define hospitals/ "# Hospitals Scored" format=3.;
define achieved/"# Hospitals Achieved" format=percent8.;
define hall/"% Hospitals Achieved" format=percent8.;
break after sect /summarize suppress skip style=[font_weight=bold];
rbreak after/summarize style=[font_weight=bold];
compute before _page_ / style=[just=left preimage='c:\abcbs\logosm.jpg'
font_weight=bold font_size=6 foreground=cx993300];
line ' ';
line "Incentive Payment Plan of Virginia";
line "Quality-In-Sights Hospital Incentive Program";
line "XYZ Hospitals";
line "Quarterly Report: October 2003";
endcomp;
title ' ';
run;
ods html close;
```

SAS output for this example is included as Example One at the end of this paper.

Example Two: Hospital specific scorecard

This example takes advantage of ODS layout to create a hospital specific scorecard. The header and table are assigned regions and locations using the inch as the page positional unit. Upper left hand corner of the page is 0,0 for positioning. The printer destination, .pdf, is used for creation of the report since ODS layout does not yet support all destinations. An escape sequence is used to load the image. This is combined with the scaleheight option to scale the object to the region. Scaleheight sizes the image to the region and then adjusts the width proportionately. The table uses a SAS provided style template, fancyprinter.

Partial SAS Code:

```
options nodate nonumber nocenter orientation=landscape;
ods pdf file="a:\abcbs.pdf" color=yes style=fancyprinter;
ods layout start width=11in height=8in ;
ods region x=0 y=0 width=10in height=5in;
ods escapechar="^";
ods pdf text="^S={preimage='a:\qhip.jpg^scaleheight'}"; run;
ods region x=0 y=1.8in width=10in height=6in;
proc report data=scorecard nowd style=[font_face='Helvetica'];
  column sect section_item points_possible total ytd;
  define sect / group "Section";
  define section_item/ group " " flow order=data;
  define points_possible/ "Points Possible" format=3.;
  define total/ "% Points Current Quarter" format=percent6.1;
  define ytd/"% Points Year to Date" format=percent6.1;
run;
ods layout end;
ods _all_ close;
```

SAS output for this example is included as Example Two at the end of this paper.

CONCLUSION

SAS Software provides a variety of report writing solutions that allow the creation of reports from the very basic to the extremely complex. The in-line formatting and layout features of SAS ODS provide SAS programmers with the needed tools to design a functional and attractive scorecard and other preformatted reports without the need for post-processing. With the addition of more features and destinations in versions 9.1 and 9.2 of SAS, ODS layout is poised to become a powerful production report tool.

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EXAMPLES

These examples illustrate the SAS methodology in creating hospital scorecards and do not reflect any actual data or clinical information.

Example One:

 Incentive Payment Plan of Virginia Quality-In-Sights Hospital Incentive Program XYZ Hospitals Quarterly Report: October 2003				
Section		# Hospitals Scored	# Hospitals Achieved	% Hospitals Achieved
I. Patient Safety	1. Implementation of Patient Safety Program and Initiatives			
	a. Documented compliance in the six patient safety goals	80	32	40%
	b. Two patient safety indicators	80	40	50%
	c. Computerized Physician Order Entry (CPOE) system	80	32	40%
	d. ICU staffing standards	80	40	50%
	e. Automated Dispensing Devices (ADD)	80	32	40%
	Patient Safety Total			43.3%
II. Health Outcome	1. Participation in American College of Cardiology (ACC)'s National Cardiovascular Data Registry (NCDR™)	50	50	100%
	2. Cardiac Cath and PCI indicators	50	0	0%
	3. Two of the Four Core Measures (select one from each group)	50	25	50%
	a. First core measures (AMI or HF)	50	25	50%
	b. Second core measures (HF, PR, or CAP)	50	25	50%
	4. Coronary Artery Bypass Graft (CABG) indicators	50	0	0%
	Patient Health Outcome Total			25.0%
III. Patient Satisfaction	Patient Satisfaction Survey Minimum Received	80	0	0%
	Patient Satisfaction Survey Results	80	0	0%
	Patient Satisfaction Total		0	0%

Example Two:

 Incentive Payment Plan of Virginia Quality -In-Sights Hospital Incentive Program Scorecard for Hospital A Quarterly Report: January 2004				
Section		Points Possible	% Points Current Quarter	% Points Year to Date
I. Patient Safety	1. Implementation of Patient Safety Programs	15	67%	67%
	a. Documented compliance in the six JCAHO patient safety goals	10	50%	50%
	b. Two patient safety indicators	5	100%	100%
	2. Implementation of Patient Safety Initiatives	15	33%	33%
	a. Computerized Physician Order Entry (CPOE) system	5	0.0%	0.0%
	b. ICU staffing standards	5	0.0%	0.0%
	c. Automated Dispensing Devices (ADD)	5	100%	100%
II. Health Outcome	1. Participation of American College of Cardiology (ACC)'s National Cardiovascular Data Registry (NCDR)	5	0.0%	0.0%
	2. Cardiac Cath and Percutaneous Coronary Intervention (PCI) indicators	5	0.0%	0.0%
	3. Two JCAHO core measures	30	50%	50%
	a. First core measures (AMI or HF)	20	50%	50%
	b. Second core measures (HF, PR, or CAP)	10	0.0%	0.0%
	4. Coronary Artery Bypass Graft (CABG) Indicators	5	0.0%	0.0%
III. Patient Satisfaction	Patient Satisfaction Survey Results	25	100%	100%