

A dynamic reporting system

Catering to the needs of many

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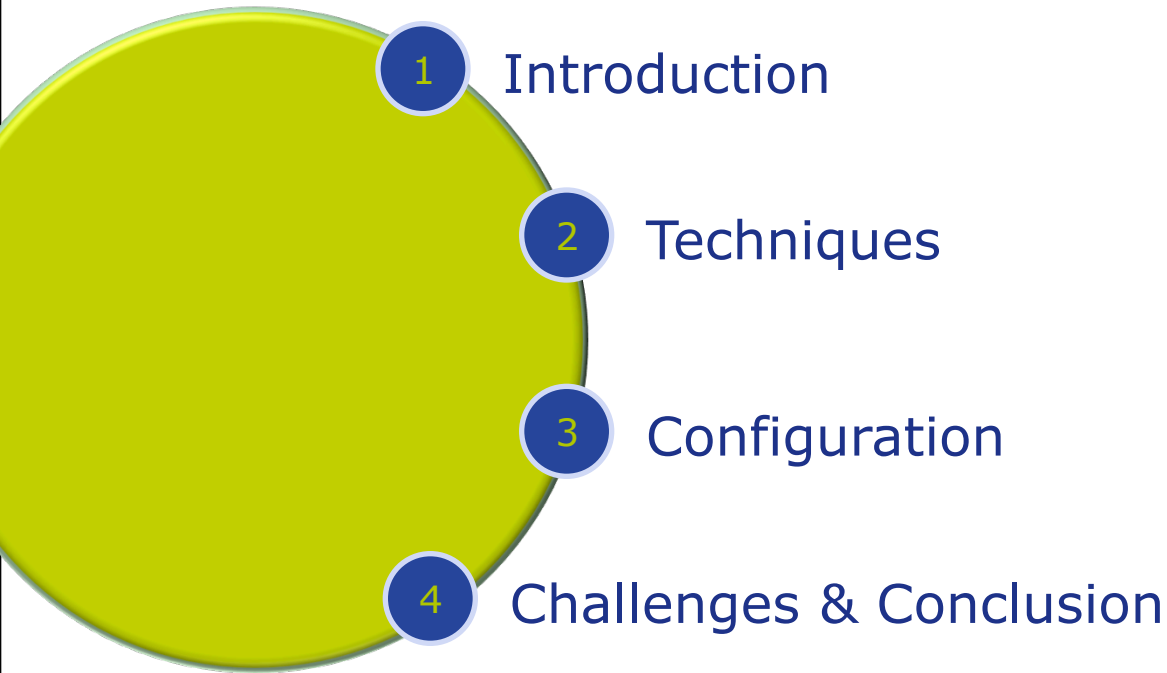
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DRIVE YOUR PERFORMANCE

Topics



Topics

1

Introduction

2

Techniques

3

Configuration

4

Challenges & Conclusion

Objectives



DISPLAY SAF.2 ADVERSE EVENTS: TABULATION OF ALL EVENTS
ITT POPULATION

PHASE = ██████████

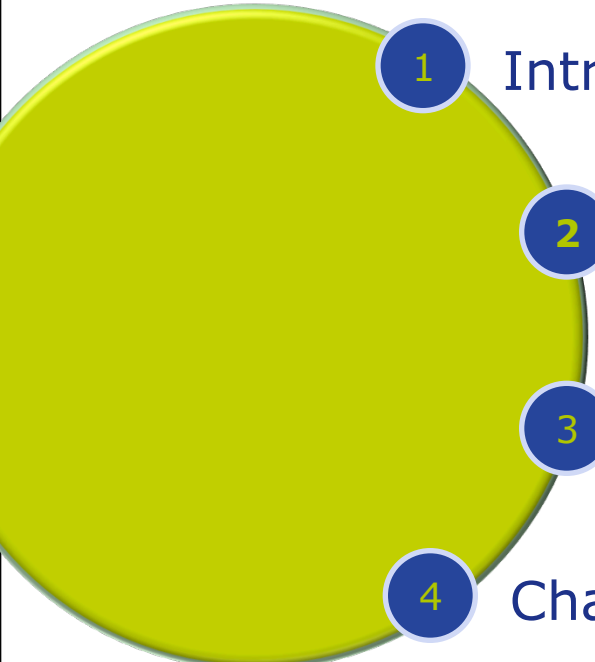
BODY SYSTEM OR ORGAN CLASS PREFERRED TERM	A n=65 N (%)	B n=68 N (%)	C n=65 N (%)	D n=67 N (%)	E n=64 N (%)	F n=64 N (%)	G n=64 N (%)	OVERALL n=457 N (%)
SUBJECTS HAVING ANY EVENT	60 (92.3%)	61 (89.7%)	61 (93.8%)	64 (95.5%)	58 (90.6%)	59 (92.2%)	55 (85.9%)	418 (91.5%)
BLOOD AND LYMPHATIC SYSTEM DISORDERS	13 (20.0%)	11 (16.2%)	12 (18.5%)	22 (32.8%)	15 (23.4%)	17 (26.6%)	7 (10.9%)	97 (21.2%)
ANAEMIA	5 (7.7%)	2 (2.9%)	3 (4.6%)	8 (11.9%)	10 (15.6%)	5 (7.8%)	2 (3.1%)	35 (7.7%)
LEUKOPENIA	1 (1.5%)	2 (2.9%)	3 (4.6%)	3 (4.5%)	2 (3.1%)	1 (1.6%)	1 (1.6%)	13 (2.8%)
LYMPHOPENIA	0	0	0	1 (1.5%)	0	1 (1.6%)	0	2 (0.4%)
NEUTROPENIA	6 (9.2%)	8 (11.8%)	9 (13.8%)	15 (22.4%)	8 (12.5%)	15 (23.4%)	3 (4.7%)	64 (14.0%)
PANCYTOPENIA	0	0	0	1 (1.5%)	0	0	0	1 (0.2%)
THROMBOCYTOPENIA	2 (3.1%)	0	2 (3.1%)	2 (3.0%)	0	1 (1.6%)	1 (1.6%)	8 (1.8%)
CARDIAC DISORDERS	2 (3.1%)	0	1 (1.5%)	3 (4.5%)	2 (3.1%)	3 (4.7%)	2 (3.1%)	13 (2.8%)
ANGINA PECTORIS	0	0	0	0	0	0	1 (1.6%)	1 (0.2%)
BUNDLE BRANCH BLOCK LEFT	0	0	0	0	1 (1.6%)	0	0	1 (0.2%)
PALPITATIONS	1 (1.5%)	0	0	2 (3.0%)	1 (1.6%)	0	1 (1.6%)	5 (1.1%)
SUPRAVENTRICULAR EXTRASYSTOLES	0	0	1 (1.5%)	0	0	0	0	1 (0.2%)
TACHYCARDIA	1 (1.5%)	0	0	1 (1.5%)	0	2 (3.1%)	1 (1.6%)	5 (1.1%)
VENTRICULAR EXTRASYSTOLES	0	0	0	0	0	1 (1.6%)	0	1 (0.2%)
CONGENITAL, FAMILIAL AND GENETIC DISORDERS	0	0	0	1 (1.5%)	0	0	0	1 (0.2%)
GILBERT'S SYNDROME	0	0	0	1 (1.5%)	0	0	0	1 (0.2%)

N = NUMBER OF SUBJECTS WITH THAT PARTICULAR AE.

% = PERCENTAGE OF SUBJECTS WITH THAT PARTICULAR AE, COMPUTED AGAINST THE TOTAL NUMBER OF SUBJECTS WHO ARE STILL IN THE TRIAL IN THAT PHASE.

FOR AEs THAT HAVE NOT BEEN CODED, THE BODY SYSTEM IS CONSIDERED UNKNOWN AND THE VERBATIM TERM IS SHOWN INSTEAD OF THE PREFERRED TERM.

Topics

- 
- 1 Introduction
 - 2 **Techniques**
 - 3 Configuration
 - 4 Challenges & Conclusion

Techniques used in our standard macro

- Meta-programming
- Mimicking higher generation languages
- Shielding from bad input

Meta-Programming

- No fixed report layout
 - Template driven
 - » Guarantees flexibility
- Interpretation for dynamic code generation
 - Writing code that writes code
 - » Simplifies configuration
- Caution is advised
 - Code becomes increasingly hard to understand
 - » Ease of use <-> Development complexity

Mimicking higher generation languages

- Divide functionality
 - Think about deliverables upfront
- Requires controller macro
 - Calls 'functions'
 - Maintains process overview
 - Bug isolation
 - Easy to disable a step in the process
 - Facilitates customization

Proc

S

LIFE SCIENCES

- Missed errors
- Locked datasets
- Loss of time
- Dirty logs
- « Black box » frustration

```
12
13 *-- Retrieve laboratory analysis data --*;
14 *-----*
15
16 proc sort data = work.lbad (where = (use = "I" and phasen = 39) and analtpn > 0 and lbstresn
17 ! > .))
```

WARNING: The Base Product product with which SORT is associated will be expiring soon, and is currently in warning mode to indicate this upcoming expiration. Most typically this warning period runs for 45 days. Please run PROC SETINIT to obtain more information on your warning period.

```
18 by subjid armcd phasen phase analtpn analtp t lbparam lbstresn
19 ! lbstresc lbstchg1)
```

ERROR: Libname AD is not assigned.

```
18 by subjid armcd phasen phase analtpn analtp t lbparam lbstresn lbstresc lbstchg1;
19
20 run;
```

NOTE: The SAS System stopped processing this step because of errors.

WARNING: The data set WORK.LBAD may be incomplete. When this step was stopped there were 0 observations and 0 variables.

NOTE: PROCEDURE SORT used (Total process time):

```
real time      0.01 seconds
cpu time       0.01 seconds
```

- Possible solutions:

- Build checks around parts to verify user input

- Throw warnings, custom errors, ...

```
25 data lab1;
26 merge dmad (in = in_dm)
27 lbad (in = in_lb);
28 by subjid;
29 if in_dm and not in_lb then put "NOTICE: in DM but not in LB " subjid=;
30 if not in_dm and in_lb then put "NOTICE: not in DM but in LB " subjid=;
31 if in_dm and in_lb;
32 run;
```

NOTE: variable subjid is uninitialized.

ERROR: BY variable subjid is not on input data set WORK.DMAD.

ERROR: BY variable subjid is not on input data set WORK.LBAD.

NOTE: The SAS System stopped processing this step because of errors.

WARNING: The data set WORK.LAB1 may be incomplete. When this step was stopped there were 0 observations and 1 variables.

NOTE: DATA statement used (Total process time):

```
real time      0.32 seconds
cpu time       0.07 seconds
```

- Downsides:

- Cumbersome scrolling through huge logs or finding the right keyword to filter on

Program Shield

- Check input *before* running process
 - Error weight
 - Data feedback
- Draws attention to errors/invalid output that might otherwise have been overlooked

```
12:37 Wednesday, June 2, 2010 1

*****
REPORT GAF2D UNSUCCESSFULLY RUN.
*****

-----
POSSIBLE PROCESS MALFUNCTIONS
-----

Critical process errors:

Input dataset not found.
Title dataset not found.

Will affect report outcome:

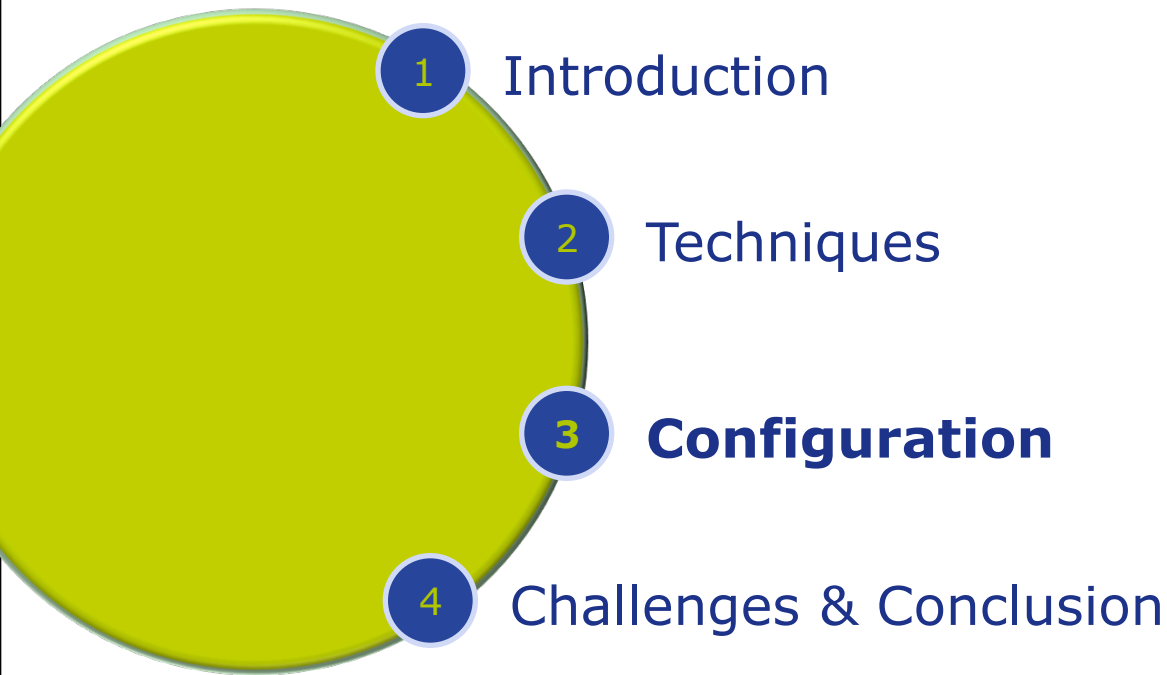
Variable 1 of report section 'b' has not been assigned.
Variable 2 of report section 'b' has not been assigned.
Variable 3 of report section 'b' has not been assigned.
Variable 4 of report section 'b' has not been assigned.
Variable 5 of report section 'b' has not been assigned.
Variable 6 of report section 'b' has not been assigned.
Variable 7 of report section 'b' has not been assigned.
Variable 1 of report section 't' has not been assigned.
Variable 2 of report section 't' has not been assigned.
Variable 3 of report section 't' has not been assigned.
Variable 4 of report section 't' has not been assigned.
Variable 5 of report section 't' has not been assigned.
Variable 6 of report section 't' has not been assigned.
Variable 7 of report section 't' has not been assigned.

Could affect report outcome:

No denominator dataset defined.

*****
```

Topics



- Headers/Footers
- Denominators
- Dynamic/Hardcoded Data
- By-variables
- (Summary) Statistics
- Split pages
- ...

Configuration: 4 simple steps

1. Creation of a template
2. Initialization of the reporting process
3. Assigning variables to template positions
4. Calling the main reporting macro

- Report variables
 - Title variable sequences
 - Header variable to use sequences
 - @date@: date position
 - @time@: time position
 - 'Page x of y': page numbering
 - Hardcoded values

[illegible]

2. Initialization of the reporting process

- `%init_reporting;`
 - Clears work library
 - Sets global variables
 - Resets section counters

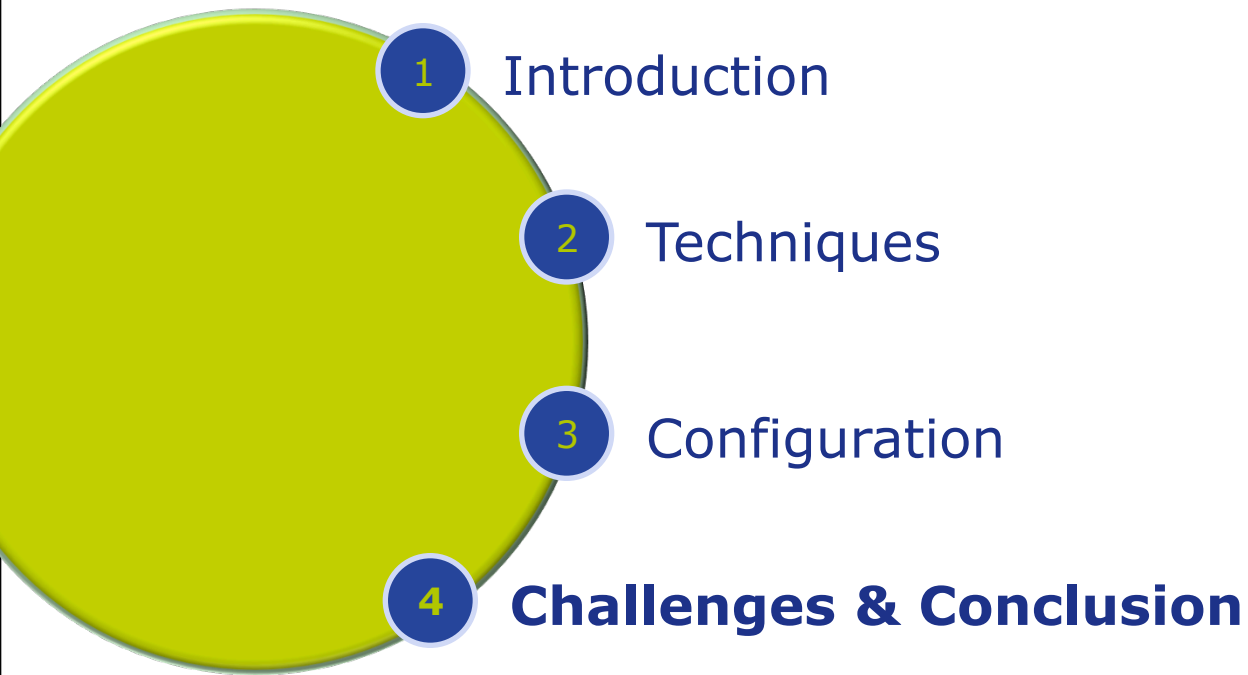
3. Assigning variables to template positions

- `%assign_variable(<parameters>);`
 - **Report_part**
 - **Variable**
 - Variable_type
 - alignment
 - group_skip
 - split_value
 - hard_split
 - default_blank_split

4. Calling the main reporting macro

- `%macro create_report(<parameters>);`
 - **template_path**
 - **input_dataset**
 - **title_dataset**
 - denominator_dataset
 - population
 - output
 - output_library
 - **program_name**
 - program_suffix
 - by_var
 - grouper_variable
 - split
 - pagesize
 - empty_report_string
 - page_spread

Topics



Challenges

- Finding one dynamic solution to suit numerous clients' needs
- Development is an time consuming investment
 - Allowing for macro disabling
 - Several remodeling attempts
 - Restructuring dynamic code is harder than fixed code
- Adding multipage functionality to a one-page template

Conclusions

- Building a dynamic solution is time intensive
 - Design with no results to show for it
 - Harder to estimate timeframes for development
- Most additions require no redesigning
 - Saves time for future updates
 - Templates are very easy to adjust
- Can handle many more situations than the fixed code solution
- Worth it in the end

Questions



**Thank you
for your attention**

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