

C-SSRS Questionnaire Dataset Design for Assessing Suicide Risk in Neuroscience Studies

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ABSTRACT

The Columbia-Suicide Severity Rating Scale (C-SSRS) questionnaire is widely used in Neuroscience studies to determine the presence of suicidal ideation or behavior. The first administration of the CSSRS within a clinical trial is conducted with respect to one or more pre-dose reference periods (PRP) (e.g., lifetime, last 6 months), with subsequent administrations conducted relative to the last visit.

Information is collected on three broad categories: suicidal ideation, suicidal behavior, and non-suicidal self-injurious behavior, with the former two categories typically analyzed as ordinal measures, each containing 5 levels. When treatment-emergent events are of interest, relative to the given PRP, it is inappropriate to include subjects for those ordinal levels for which that subject experienced that given event. For example, if the PRP is 'lifetime' and the subject experienced Suicidal Ideation at some point during their lifetime, then that subject is not able to experience a treatment-emergent event of Suicidal Ideation, and thus must be excluded from the observed Suicidal Ideation counts and percents. This accounting results in the potential for different denominators for the different ordinal levels within a given category. However, when considering the ordinal levels in a "cumulative" way, i.e., to ascertain how many subjects had an event "as bad or worse" than the given ordinal category, all denominators should be the same across all ordinal categories. This combined accounting presents for unique programming.

This paper emphasizes deriving ADCSSRS dataset and event summary display to support the unique analysis of the ordinal levels in assessing patients suicide risk.

INTRODUCTION

C-SSRS was designed to provide a standardized measure of suicidality. The Scale allows clinicians and researchers to assess the severity of suicidal behavior and ideation and can be used to monitor treatment outcomes and establish suicide risk.

Two versions of the Columbia Suicide Severity Rating Scale are available for use in clinical practice. The **Lifetime version** allows practitioners to gather a lifetime history of suicidality as well as any recent suicidal ideation or behavior. The **Since Last Visit version** of the scale assesses suicidality since the individual's last visit.

Scoring in terms of suicidal ideation is queried with five aspects: Wish to be Dead, Non-Specific Active Suicidal Thoughts, Active Ideation without Intent to Act, Active Ideation with Some Intent to Act, and Active Ideation with some Specific Plan or Intent. Similarly, in terms of suicidal behavior, the scale is divided into Actual Attempts, Interrupted Attempts, Aborted Attempts, and Preparatory Acts or Behavior. Interviewers establish the presence or absence of these behaviors both throughout the lifetime or with reference to last visit period (In the last 6 months or 2 months).

Severity, from lowest to highest within Suicidal Ideation goes from 'Wish to be Dead' to 'Active Ideation with some Specific Plan or Intent'. Severity, from lowest to highest, within Suicidal Behavior goes from 'Preparatory Actions' or 'Behaviors through to Completed Suicide'.

This paper describes the step-by-step process by which the collected scores are incorporated into the ADaM dataset to facilitate the desired tabulation(both observed and cumulative) for the Most Severe Treatment-Emergent Suicidal Ideation and Behavior Event summary table on different reference periods.

SDTM DATA WITH THE QUESTIONNAIRE VALUES

An example of the C-SSRS questionnaire with Suicidal Ideation's first question is shown with annotation based on the QS domain in Figure 1.

QS=Questionnaires
The Columbia Suicide History Form QSCAT=C-SSRS SCREENING VERSION
Suicidal Ideation QSSCAT= SUICIDAL IDEATION
 Questions QSORRES and QSSTRESC
 1. Wish to be Dead QSTEST=Wish to be Dead QSTESTCD=CSSXX1A Yes No
 (Did you wish you were dead or wished you could go to sleep and not wake up ?)

Figure 1: Example with C-SSRS Suicidal Ideation question 1 with SDTM annotation

Table 1 below is shown with SDTM QS domain mapped based on the annotated values in Figure 1. CDISC SDTM Controlled Terminology should be used for the complete codelist definitions based on the versions.

STUDYID	USUBJID	DOMAIN	QSCAT	QSSCAT	QSTEST	QSORRES	QSSTRESC
ABC	ABC-001	QS	C-SSRS SCREENING VERSION	SUICIDAL IDEATION	CSS-Wish to be Dead	No	No
ABC	ABC-001	QS	C-SSRS SCREENING VERSION	SUICIDAL BEHAVIOR	CSS- Preparatory Acts/Behavior	No	No

Table 1: Example with QS domain mapped values

RECODED PARAMETERS FOR ADAM

A set of parameters needed to represent the collected values. For traceability and for clear mapping between SDTM and ADaM data, PARCAT, PARAM, PARAMCD values are derived from QSSCAT, QSTEST and QSTESTCD respectively. Table 2 shows how each PARCAT2 value is mapped to multiple PARAMCD and equivalent PARAMN values.

PARCAT1	PARCAT2	PARAMCD	PARAMN
C-SSRS	SUICIDAL IDEATION	CSSRS101, CSSRS102, CSSRS103, CSSRS104, CSSRS105	101, 102, 103,104,105
C-SSRS	SUICIDAL BEHAVIOR	CSSRS201, CSSRS202, CSSRS203, CSSRS204, CSSRS205	201, 202, 203,204,205

Table 2: PARCAT1 and PARCAT2 mapped with PARAMCD and PARAMN values

Based on QSTESTCD values, PARAMCD and PARAM derivations are listed below in Table 3.

Variable	Origin	Define Derivation
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX1A', 'CSSXX1B') then PARAMCD='CSSRS101'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX2A', 'CSSXX2B') then PARAMCD='CSSRS102'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX3A', 'CSSXX3B') then

		PARAMCD='CSSRS103'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX4A', 'CSSXX4B') then PARAMCD='CSSRS104'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX5A', 'CSSXX5B') then PARAMCD='CSSRS105'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX1C', 'CSSXX1D') then PARAMCD='CSSRS201'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX2C', 'CSSXX2D') then PARAMCD='CSSRS202'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX3C', 'CSSXX3D') then PARAMCD='CSSRS203'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX4C', 'CSSXX4D') then PARAMCD='CSSRS204'
PARAMCD	Assigned	If QS.QSTESTCD in ('CSSXX5') then PARAMCD='CSSRS205'
PARAMCD	Derived	Set to 'CSSRS199'
PARAMCD	Derived	Set to 'CSSRS299'
PARAM	Assigned	Set PARAM='Passive' where PARAMCD='CSSRS101'
PARAM	Assigned	Set PARAM='Active - nonspecific (no method, intent or plan)' where PARAMCD='CSSRS102'
PARAM	Assigned	Set PARAM='Active - method, (but no intent or plan)' where PARAMCD='CSSRS103'
PARAM	Assigned	Set PARAM='Active - method and intent, (but no plan)' where PARAMCD='CSSRS104'
PARAM	Assigned	Set PARAM='Active - method, intent and plan' where PARAMCD='CSSRS105'
PARAM	Assigned	Set PARAM='Preparatory actions' where PARAMCD='CSSRS201'
PARAM	Assigned	Set PARAM='Aborted attempt' where PARAMCD='CSSRS202'
PARAM	Assigned	Set PARAM='Interrupted attempt' where PARAMCD='CSSRS203'
PARAM	Assigned	Set PARAM='Suicide attempt' where PARAMCD='CSSRS204'
PARAM	Assigned	Set PARAM='Completed suicide' where PARAMCD='CSSRS205'
PARAM	Derived	Set PARAM='Suicidal ideation' where PARAMCD='CSSRS199'
PARAM	Derived	Set PARAM='Suicidal behavior' where PARAMCD='CSSRS299'

Table 3: PARAMCD and PARAM definitions

ASSIGNING AVALCAT AND BASECAT FOR DERIVED PARAMETERS

To derive the analysis value category (AVALCAT) and baseline value category (BASECAT) for the derived parameters (Suicidal Ideation and Behavior), we need to derive AVALC and BASEC values. By default, AVALC is assigned with QSSTRESC. For derived PARAM, select the records for subcategory

'Suicidal Ideation' with PARAMN<105(refer Table 2), AVALC is assigned with PARAM values if AVALC is equal to 'Yes', otherwise AVALC is assigned with 'No' (which is the lowest severity). BASEC and BASECAT is set from AVALC and AVALCAT respectively for Baseline observations. BASETYPE is assigned with the appropriate reference period (Lifetime or Fixed time). AVALCAT values with Severity from lowest to highest for Suicidal Ideation is shown below in Table 4.

AVALCAT1	AVALCAT1N
Passive	1
Active - nonspecific (no method, intent, or plan),	2
Active - method, (but no intent or plan)	3
Active - method and intent, (but no plan)	4
Active - method, intent, and plan	5

Table 4: AVALCAT and numeric code AVALCATN

Also, from the subset of baseline records the Last worst record will be selected for baseline:

```
data base1;
  set base;
  by usbjid parcat1n parcat2n paramn basetype baseca1n adt adtm;
  if last.basetype;
run;
```

CRIT BASED ON PRE-DEFINED VALUES

CRIT values are derived based on AVALCAT and BASECAT values for the post dose observations. Numeric severity values assigned to BASECATN are compared to the AVALCATN severity values. CRIT flag is set if the value has worsened compared to baseline.

Sample code shown below for CRIT Flag:

```
data qs1;
  length crit1 $100 crit1fl $1;
  set qs;
  *** Derived CRIT1 and CRIT1FL ***;
  if paramcd in ('CSSRS199' 'CSSRS299') and avisitn^=0 and avalca1n>. and
  baseca1n>. and baseca1n ne 5 then do;
  crit1 = 'Worsen compared to baseline';
  if baseca1n<avalca1n then crit1fl = 'Y';
  else crit1fl = 'N';
  end;
run;
```

CATEGORY BASED EVENTS SUMMARY TABLE

A sample table for the Most Severe Treatment-Emergent Suicidal Ideation and Behavior Event summary is provided in Table 5. To start with, for the derived categories (PARAMCD in CSSRS199 and CSSRS299) observations are picked if CRIT value is not missing (CRIT1^="").

In the observed column, for the numerator counts, participants are picked if the event/criteria are met(CRIT1FL='Y'). Participants are included in the Observed denominators, if they did not experience that given ordinal level (or less) during the PRP. For example, for the ordinal ideation level of 'Active - nonspecific (no method, intent, or plan)' participants are only included in the denominator if they did not experience an ideation of level 'Active - nonspecific (no method, intent, or plan)' or greater during the

PRP. Thus, the denominators for Observed are not the same across the category levels.

For the numerator of the cumulative counts, participants are accounted for the given ordinal level or higher. For example, for 'Active - nonspecific (no method, intent, or plan)' ideation, counts are based on AVALCATN (2 to 5). Denominators are counted the same for all the ordinal levels, from lowest to highest severity level (under the assumption that no participants are enrolled who have experienced the highest ordinal level during the PRP) . Hence cumulative denominator counts are same across all the ordinal levels in each category.

	TRT A	TRT A	TRT B	TRT B
Category	Observed	Cumulative	Observed	Cumulative
Suicidal ideation				
Passive	1/23	3/25	1/32	1/32
Active - nonspecific (no method, intent, or plan)	1/24	2/25	0/32	0/32
Active - method, (but no intent or plan)	1/24	1/25	0/31	0/32
Active - method and intent, (but no plan)	0/25	0/25	0/31	0/32
Active - method, intent, and plan	0/25	0/25	0/31	0/32
Suicidal Behavior				
Preparatory actions	1/25	2/25	1/32	1/32
Aborted attempt	0/24	1/25	0/32	0/32
Interrupted attempt	1/23	1/25	0/31	0/32
Suicide attempt	0/25	0/25	0/31	0/32
Completed suicide	0/25	0/25	0/31	0/32

Table 5: Sample mockup of Suicidal Ideation and Behavior Events Summary

Sample code for Numerator observed and cumulative:

```

Data num_cnt;
  set adcssrs;
  If CRIT1FL='Y';
  if paramn in (199 299) then do;
  *Observed;
  _col1=strip(avalc);output;

  *Cumulative;
  if 1=<avalca1n<=5 then do;_col1=strip(avalc);output;end;
  if 2=<avalca1n<=5 then do;_col1=strip(avalc);output;end;
  if 3=<avalca1n<=5 then do;_col1=strip(avalc);output;end;
  if 4=<avalca1n<=5 then do;_col1=strip(avalc);output;end;
  if 5=<avalca1n<=5 then do;_col1=strip(avalc);output;end;
  end;
run;

```

Sample code for Denominator observed and cumulative:

```
Data den_cnt;
  set adcssrs;
  If CRIT1^="";
  if paramn in (199 299) then do;
  *Observed;
  if baseca1n=0 then do;seq=(paramn-99)+1; output;end;
  if 0=<baseca1n<=1 then do;seq=(paramn-99)+2;output;end;
  if 0=<baseca1n<=2 then do;seq=(paramn-99)+3;output;end;
  if 0=<baseca1n<=3 then do;seq=(paramn-99)+4;output;end;
  if 0=<baseca1n<=4 then do;seq=(paramn-99)+5;output;end;

  *Cumulative;
  if 0=<baseca1n<=4 then do;seq=(paramn-99+300)+1;output;end;
  if 0=<baseca1n<=4 then do;seq=(paramn-99+300)+2;output;end;
  if 0=<baseca1n<=4 then do;seq=(paramn-99+300)+3;output;end;
  if 0=<baseca1n<=4 then do;seq=(paramn-99+300)+4;output;end;
  if 0=<baseca1n<=4 then do;seq=(paramn-99+300)+5;output;end;
end;
run;
```

CONCLUSION

This paper presents steps in developing the Columbia-Suicide Severity Rating Scale (C-SSRS) questionnaire dataset and events summary table in assessing patients suicide risk. It also provides step-by-step explanation with some code snippets. The author of this paper hopes that presenting this process of developing the dataset and table for C-SSRS will work as a guide for users.

REFERENCES

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