

Biomedical Concepts – an emerging CDISC data standard

A stepwise approach for building a library of data definitions

Johannes Ulander, S-Cubed;
Kirsten Walther Langendorf, A3Informatics;

ABSTRACT

In the Quarter Four 2020 CDISC Newsletter it was announced that as part of the 360 project "Starting in January 2021, CDISC will kick off the CDISC 360 Implementation focused on Biomedical Concepts and collaborative curation." CDISC is introducing a new standard - the Biomedical Concepts (BCs) - in an iterative manner with the goal of showing specific and tangible value to the community.

To get this work started (Collaboration with CDISC) we developed a mining tool that will provide the first draft of the BCs from reading a set of define-xml files. A set of define-xml redacting scripts were developed to ensure that those who contributed define-xml files were comfortable sharing this information. The redacted define-xml files were read into the BC mining tool to provide the superset of information to create BCs to form a first version of a BC Library.

In this presentation we will present:

What is a biomedical concept and what are the benefits in using the BCs for data collection. This includes a demo of how BCs can make CRF/Form creation more efficient and standardised in a tool that uses Biomedical Concepts.

How were the BCs created using the BC mining tool? Is it feasible to kick-start the BC library using define-xml files? What are the challenges and how to proceed from this first step into an approved CDISC standard?

What are the tangible values to the community of CDISC users? Can BCs be of use with the systems that we have today?

INTRODUCTION

The process of collecting data measured on a subject to a standardized CDISC compliant data structure for data exchange can be lengthy. It often includes manual steps where a person will 'translate' one terminology and data structure to the next in the chain of data processing steps, see Figure 1.

Study Setup

Translating study protocol to actual implementations of data collection and reporting

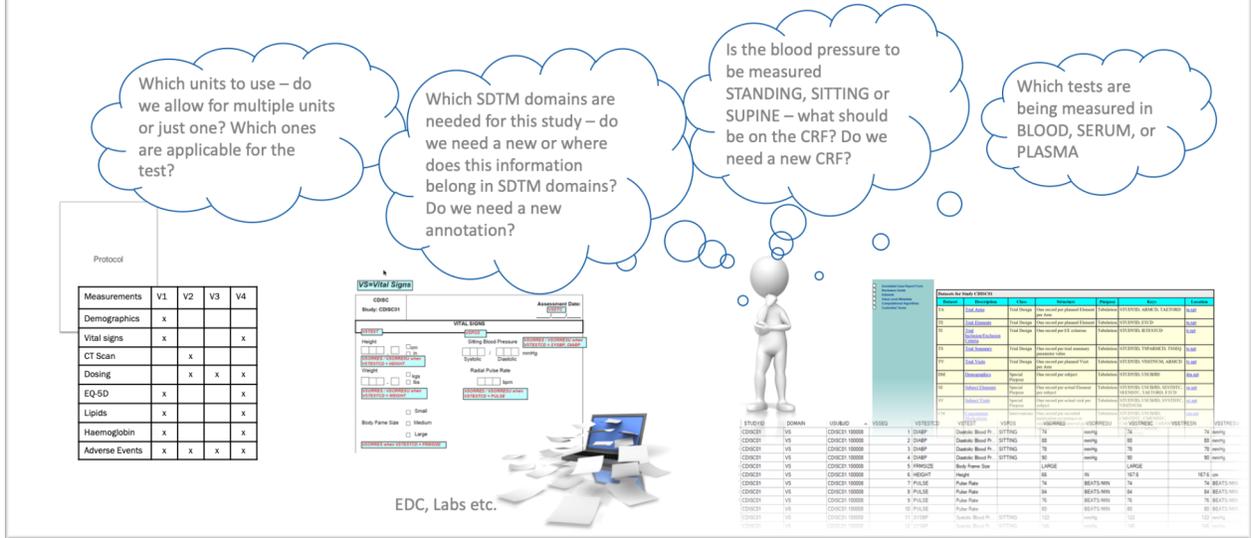


Figure 1 Study setup - different terminology and data structures

The protocol specifies Vital Signs (in a non-machine-readable format). This is then detailed in the CRF as e.g., Systolic/Diastolic blood pressure and Temperature with a specific question text and decision is taken on units and level of detail being collected such as location of subject during measurement (supine). The question text is then translated to a CDISC SDTM VSTESTCD such as SYSBP, DIABP and TEMP. These again have specific codes. The different information on the CRF will be mapped to specific columns in the final SDTM VS domain using specific controlled terminology.

Often the different data (protocol, CRF, SDTM) resides in different data silos and the traceability from protocol (Vital Signs), CRF (systolic/diastolic blood pressure) to SDTM (SYSBP/DIABP) can be a challenging exercise, see Figure 2.

Why is traceability hard - Silos

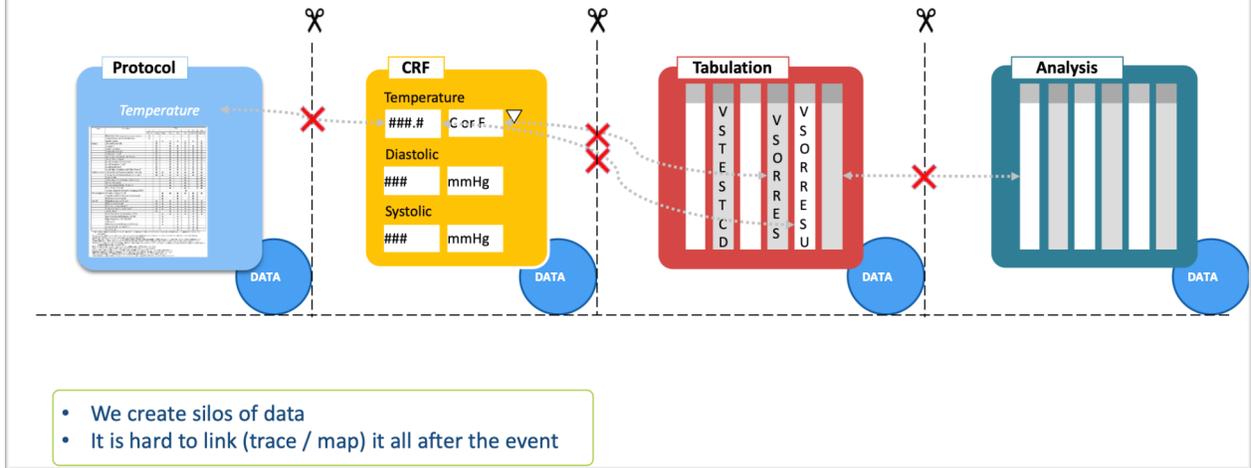


Figure 2 Data silos - challenge of describing traceability

The Biomedical Concept can be that 'glue' that ties the data silos together and facilitates a more machine-readable process as a Biomedical Concept contains explicit relationships on a more detailed level, see Figure 3.

Challenge - maintaining transformations and traceability effectively

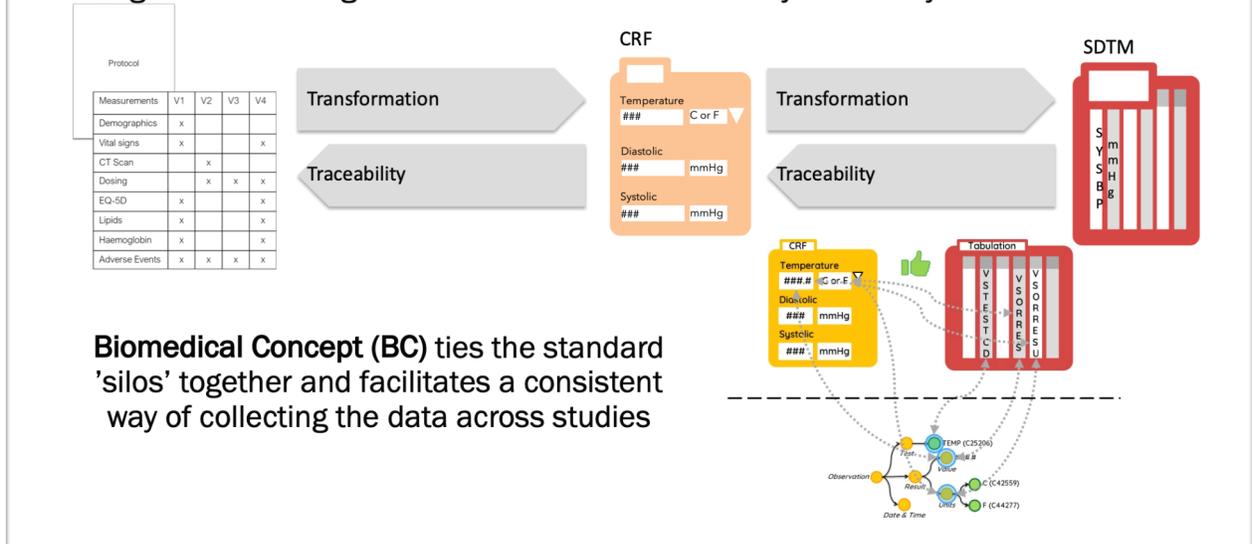


Figure 3 BC ties the data silos together

In the following we will describe how a BC can be defined. We will illustrate how using BS will provide a more efficient and standardized way of creating CRFs.

Recognising that many BCs have to be defined we have started a collaboration with CDISC and Sponsors to build up a BC library. We will share the approach and challenges during this work:

- How was the BCs created using the BC mining tool?
- Is it feasible to kick-start the BC library using define-xml files?
- What are the challenges and how to proceed from this first step into an approved CDISC standard?

Finally, we will provide some additional examples of benefits of using BCs and having a CDISC BC Library.

DEFINITION OF A BIOMEDICAL CONCEPT

A biomedical concept is a generic description of something that can be measured on a subject (e.g., Body Temperature) or other information such as events happened (reporting of pain in legs) or interventions made (e.g., administration of new drug to lower lipids or meals administered) in relation to a subject's health records. A biomedical concept can be used to define data collected in various contexts such as a clinical trial, epidemiological investigation etc.

For the BCs developed for the CDISC Library, relationship to the CDISC terminology will be used. This facilitates a consistent way of collecting the data that is to be CDISC compliant.

A simple biomedical concept of the findings class type could be defined as illustrated in Figure 4.

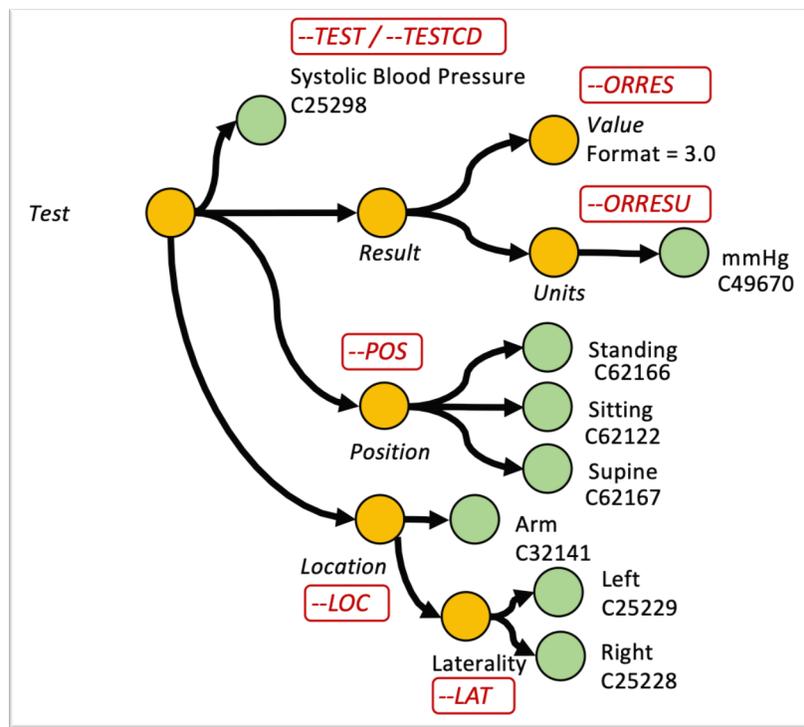


Figure 4 Example of a BC – SYSBP

The BC consists of a Test (or Topic) describing what is being measured. Then it has all the possible and relevant qualifiers that are needed to describe such a test in detail. The example in Figure 4 shows the definition of Systolic Blood Pressure, which has a numeric result and a unit and a set of additional qualifiers (Location, Position and Laterality).

USING BC TO CREATE A CRF/ACRF

Having a Library of BC defined will make the creation of CRF (and aCRF) easier and the user who creates a CRF is provided more guidance in that process. In Figure 5 and Figure 6 two different forms have been created using the same set of BCs (SYSBP, DIABP and TEMP).

The screenshot displays an 'aCRF View' for 'Vital Signs - Simple'. A teal header bar at the top contains the text 'aCRF View'. Below it, the title 'Vital Signs - Simple' is shown next to a teal button labeled 'VS=Vital Signs'. The form is organized into sections: 'Vital Signs', 'Applicable for all tests below', 'Systolic Blood Pressure', 'Diastolic Blood Pressure', and 'Temperature'. Each section contains a 'Result' field with a dropdown menu and a numeric input field, and a 'Unit' field with radio button options. The 'Date and time' field is a separate input with a date and time picker. The dropdown menus for 'Result' are labeled with BC codes: 'VSDTC where VSTESTCD=DIABP', 'VSDTC where VSTESTCD=SYSBP', 'VSDTC where VSTESTCD=TEMP', 'VSORRES where VSTESTCD=SYSBP', 'VSORRES where VSTESTCD=DIABP', and 'VSORRES where VSTESTCD=TEMP'. The 'Unit' options are 'Millimeter of Mercury' and 'Pascal' for blood pressure, and 'Degree Celsius' and 'Degree Fahrenheit' for temperature.

Figure 5 aCRF Vital Signs – simple

aCRF View

Vital Signs - Detailed VS=Vital Signs

Vital Signs

Blood Pressure

Applicable for Blood Pressure

Date and time VSDTC where VSTESTCD=DIABP VSDTC where VSTESTCD=SYSBP | D | D | / | M | M | M | / | Y | Y | Y | Y | H | H | : | M | M |

Body Position VSPOS where VSTESTCD=DIABP VSPOS where VSTESTCD=SYSBP Standing
 Sitting
 Supine Position

Location of Measurement VSLOC where VSTESTCD=DIABP VSLOC where VSTESTCD=SYSBP Arm

Laterality VSLAT where VSTESTCD=DIABP VSLAT where VSTESTCD=SYSBP Left
 Right
 Bilateral

Systolic Blood Pressure

Result VSORRES where VSTESTCD=SYSBP | # | # | . | # | # |

Unit VSORRESU where VSTESTCD=SYSBP Millimeter of Mercury
 Pascal

Diastolic Blood Pressure

Result VSORRES where VSTESTCD=DIABP | # | # | . | # | # |

Unit VSORRESU where VSTESTCD=DIABP Millimeter of Mercury
 Pascal

Temperature

Date and time VSDTC where VSTESTCD=TEMP | D | D | / | M | M | M | / | Y | Y | Y | Y | H | H | : | M | M |

Location of Measurement VSLOC where VSTESTCD=TEMP Ear
 Oral Cavity
 Rectum

Result VSORRES where VSTESTCD=TEMP | # | # | . | # | # |

Unit VSORRESU where VSTESTCD=TEMP Degree Celsius
 Degree Fahrenheit

Figure 6 aCRF Vital Signs – detailed

The SYSBP BC is defined as illustrated in Figure 7. The others are defined in similar ways.

Enabled	Collect	Alias	Question Text	Prompt Text	Datatype	Format	Terminology
✓	✓	--TESTCD			CD	8	SYSBP C25298 (VSTESTCD C66741 v24.0.0)
✗	✓	--STAT			BL		
✗	✓	--SCAT			CD		
✗	✓	--REASND			CD		
✓	✓	--POS	Body Position	Position	CD	40	STANDING C62166 (POSITION C71148 v8.0.0) SITTING C62122 (POSITION C71148 v8.0.0) SUPINE C62167 (POSITION C71148 v8.0.0)
✓	✓	--ORRESU	Unit	Unit	PQR	20	mmHg C49670 (VSRESU C66770 v18.0.0) Pa C42547 (VSRESU C66770 v18.0.0)
✓	✓	--ORRES	Result	Result	PQR	5.2	
✗	✓	--METHOD			CD		
✓	✓	--LOC	Location of Measurement	Location	CD	40	ARM C32141 (LOC C74456 v38.0.0) LEFT C25229 (LAT C99073 v4.0.0) RIGHT C25228 (LAT C99073 v4.0.0) BILATERAL C13332 (LAT C99073 v4.0.0)
✓	✓	--LAT	Laterality	Laterality	CD	40	
✓	✓	--DTC	Date and time	Date Time	DATETIME		
✗	✓	--CAT			CD		

Figure 7 Definition of BC - SYSBP

Creating the CRF allows the user to disable the enabled qualifiers/alias in Figure 7. The annotation is automatically added when the BC is associated to a domain, see Figure 8.

Owner: S-cubed | Identifier: VS 3x3

Vital Signs

Incomplete V 0.1.0

Show more

Biomedical Concept Associations

+ Add items Remove selected Remove all

Show 10 entries Search:

Select All Deselect All

Type	Owner	Version	Identifier	Label	Version Label
	S-cubed	0.1.0	BMI	BMI	<input type="radio"/>
	S-cubed	0.1.0	DIABP	Diastolic Blood Pressure	<input type="radio"/>
	S-cubed	0.1.0	HR	Heart Rate	<input type="radio"/>
	S-cubed	0.1.0	SYSBP	Systolic Blood Pressure	<input type="radio"/>
	S-cubed	0.1.0	TEMP	Temperature	<input type="radio"/>

Figure 8 Association of BC to domain

Another example of using the same BC to define different measurements is illustrated in Figure 9.

aCRF View

Different kinds of Glucose for same BC LB=Laboratory Test Results

BC = GLUC

FPG (Fasting Plasma Glucose)

Category LBCAT where LBTESTCD=GLUC Chemistry

Result LBORRES where LBTESTCD=GLUC

Unit LBORRESU where LBTESTCD=GLUC Milligram per Deciliter Millimole per Liter

Specimen LBSPEC where LBTESTCD=GLUC Plasma

Was the subject fasting overnight? Yes

CGM (Continuous Glucose Monitoring)

Category LBCAT where LBTESTCD=GLUC Continuous Glucose Monitoring

Result LBORRES where LBTESTCD=GLUC

Unit LBORRESU where LBTESTCD=GLUC Milligram per Deciliter Millimole per Liter

Specimen LBSPEC where LBTESTCD=GLUC Blood

Figure 9 Using BC GLUC to define different measurements of Glucose

The LBTESTCD=GLUC is to be used for both FPG and CGM measurements when creating SDTM. The specification of specimen and category (or method as CGM could be a method and not a category) or

other qualifiers will determine what is being measured and how it is done. All this information should not be aggregated into the LBTESTCD=FPG.

Other benefits of using BCs are provided in Section Other BENEFITS OF USING BCs below.

BUILDING THE INITIAL BC LIBRARY

In order to kick-start the use of the biomedical concepts to support a more automated end to end data process a library with definitions should be available to all CDISC users, irrespective of system being used.

APPROACH

To reuse existing content, it was decided to use define-xml value level metadata as initial input, see Figure 10.

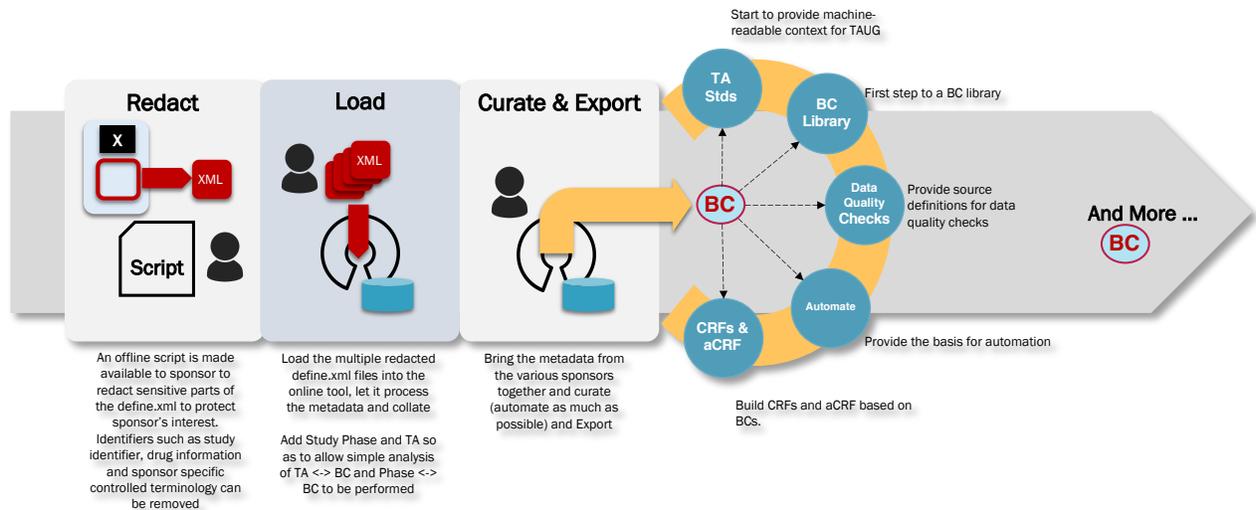


Figure 10 Initial BC mining approach

We developed a redaction script and provided that to selected sponsors. Redacted define-xml files were returned and read into the BC mining tool. The level of detail needed to create well defined BCs were not in place in the define-xml's value level metadata (VLM). As can be seen in the below example for VSORRES and VSORRESU, VLM is created for VSORRES whereas VSORRESU only references the full code list for vital sign units, so it is not possible to know which units have been used for a particular test code.

Variable	Label	Key	Type	Length	Controlled Terms or Format
VSORRES	Result or Finding in Original Units		text	5	
VSORRESU	Original Units		text	9	Original Units for Vital Signs

Figure 11 Details of value level metadata

To mitigate this, it was decided that it was necessary to add mining of the actual data as well, see Figure 12.

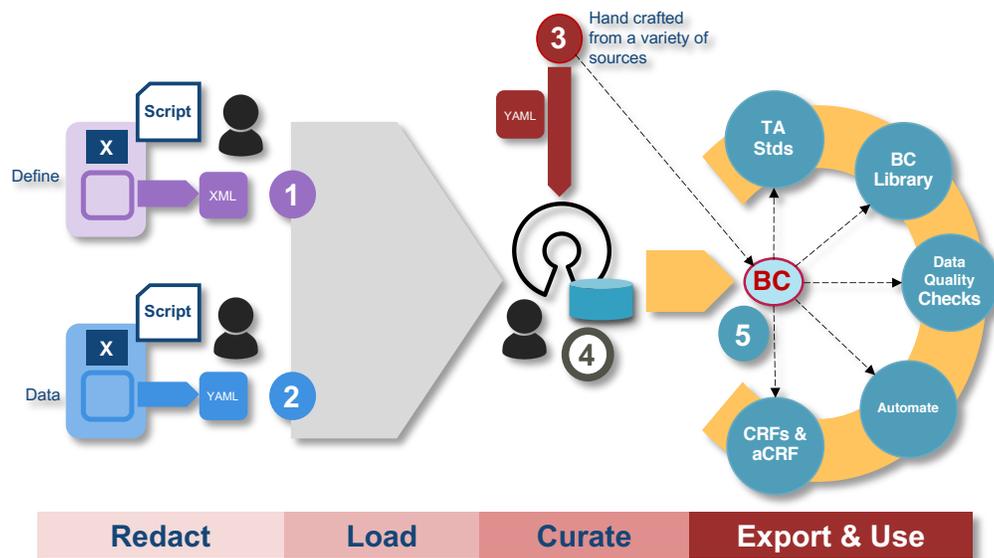


Figure 12 Updated BC mining approach

So, a new script was developed to work on SAS datasets instead, so that the value level metadata could be extracted and returned as an Excel file which then could be transformed and read into the BC mining tool.

Once the BCs were in the BC mining tool the CDISC staff would then start to curate the initial data.

CHALLENGES AND LEARNING'S

Even though define-xml version 2.0.0 has been around since 2013 it seems organisations struggle to incorporate the creation of it into their normal data flow and use it as a machine-readable specification for the study to be started and the CDISC deliverables. So, the workaround to mine the data as well was necessary, although it makes the process a bit more complicated as the variables in SDTM domains usually are over-loaded and contain different levels of detail for different tests. Examples of this are the Category and Sub-Category variables (--CAT and --SCAT) which are not well defined in most domains and might contain information from the CRF or something the programmers adds when in need to uniquely identify records within the domain as too little information exist in the collected data.

CURATION OF FIRST DRAFT

The curation work is still ongoing when this paper is being written. The initial set of VSTESTCDs have been loaded into the BC mining tool and is being curated by CDISC staff. Learning's will be presented at time of the conference.

NEXT STEPS

More draft BCs will be loaded into the mining tool. Initially BCs will be made based on --TESTCD's. This alone will provide a substantial number of BCs in the initial library.

After being mined and curated, following the CDISC process for releasing a standard, the BCs will then be loaded into the CDISC Library.

OTHER BENEFITS OF USING BCS

BCs are not only helpful when creating forms or value level metadata for your define.xml it can also be used throughout the data flow. Below are some examples, see Figure 13, Figure 14, Figure 15, and Figure 16.

Protocol

- What we talk about in Protocols are BCs or sets of BCs (assessments, instruments etc)
- We can start to align between the two
- Make transformation of protocols into machine readable designs better

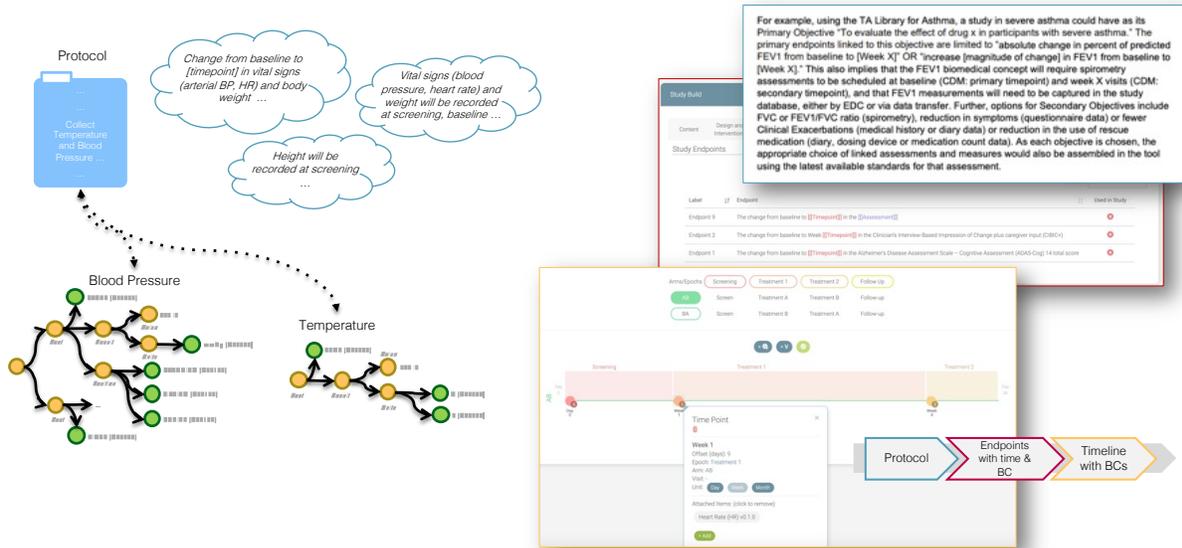


Figure 13 BCs for protocol specification

Using BCs in the protocol specification phase will provide the downstream details for data collection. BCs could be bundled together as an Assessment like Blood Pressure consisting of the SYSBP and DIAPB BCs to allow for a high-level protocol overview. Reference to the detailed BCs will provide the necessary collection details and references (e.g., to Forms).

Data Checking – allowable units

Alias	Question Text	Prompt Text	Datatype	Format	Terminology
--TESTCD			CD		8 DIABP C25299 (VSTESTCD C66741 v61.0.0)
--STAT			BL		
--SCAT			CD		
--REASND			CD		
--POS	Body Position	Position	CD	40	STANDING C62166 (POSITION C71148 v62.0.0); SITTING C62122 (POSITION C71148 v62.0.0); SUPINE C62167
--ORRESU	Unit	Unit	PQR	2	mmHg C49670 (VSRESU C66770 v59.0.0)
--ORRES	Result	Result	PQR	5,2	
--METHOD			CD		
--LOC	Location of Measurement	Location	CD	40	ARM C32141 (LOC C74456 v62.0.0) LEFT C25229 (LAT C99073 v57.0.0); RIGHT C...
--LAT	Laterality	Laterality	CD	40	ARM C32141 (LOC C74456 v62.0.0); BILATERAL C13332 (LAT C99073 v57.0.0)
--DTC	Date and time	Date Time	DATETIME		
--CAT			CD		

- Constructed example
- Tweaked VS to have Pa as unit for some observations
- The BC allows only mmHg
- Using the BC definition to check for allowable units

STUDYID	USUBJID	VISITNUM	VSTESTCD	VSORRES	VSORRESU
CDISCPIL0T01	01-701-1015	1	DIABP	64	mmHg
CDISCPIL0T01	01-701-1015	1	DIABP	83	mmHg
CDISCPIL0T01	01-701-1015	1	DIABP	57	mmHg
CDISCPIL0T01	01-701-1015	2	DIABP	68	mmHg
CDISCPIL0T01	01-701-1015	2	DIABP	59	mmHg
CDISCPIL0T01	01-701-1015	2	DIABP	71	mmHg
CDISCPIL0T01	01-701-1015	3	DIABP	56	mmHg
CDISCPIL0T01	01-701-1015	3	DIABP	51	mmHg
CDISCPIL0T01	01-701-1015	3	DIABP	61	mmHg
CDISCPIL0T01	01-701-1015	3.5	DIABP	8911	Pa
CDISCPIL0T01	01-701-1015	3.5	DIABP	61	mmHg
CDISCPIL0T01	01-701-1015	3.5	DIABP	65	mmHg
CDISCPIL0T01	01-701-1015	4	DIABP	56	mmHg
CDISCPIL0T01	01-701-1015	4	DIABP	50	mmHg
CDISCPIL0T01	01-701-1015	4	DIABP	54	mmHg
CDISCPIL0T01	01-701-1015	5	DIABP	64	mmHg
CDISCPIL0T01	01-701-1015	5	DIABP	55	mmHg
CDISCPIL0T01	01-701-1015	5	DIABP	53	mmHg
CDISCPIL0T01	01-701-1015	6	DIABP	72	mmHg
CDISCPIL0T01	01-701-1015	6	DIABP	8113	Pa
CDISCPIL0T01	01-701-1015	6	DIABP	53	mmHg

- The tweaked VS domain as input
- Create a 'report' with the check being run (check if VSRESU can be found in bc_allowable_unit)
- Status column shows that some observations have wrong units

STUDYID	USUBJID	VISITNUM	VSTESTCD	VSORRES	VSORRESU
CDISCPIL0T01	01-701-1015	1	DIABP	64	mmHg
CDISCPIL0T01	01-701-1015	1	DIABP	83	mmHg
CDISCPIL0T01	01-701-1015	1	DIABP	57	mmHg
CDISCPIL0T01	01-701-1015	2	DIABP	68	mmHg
CDISCPIL0T01	01-701-1015	2	DIABP	59	mmHg
CDISCPIL0T01	01-701-1015	2	DIABP	71	mmHg
CDISCPIL0T01	01-701-1015	3	DIABP	56	mmHg
CDISCPIL0T01	01-701-1015	3	DIABP	56	mmHg
CDISCPIL0T01	01-701-1015	3	DIABP	56	mmHg
CDISCPIL0T01	01-701-1015	3.5	DIABP	8911	Pa
CDISCPIL0T01	01-701-1015	3.5	DIABP	61	mmHg
CDISCPIL0T01	01-701-1015	3.5	DIABP	65	mmHg
CDISCPIL0T01	01-701-1015	4	DIABP	56	mmHg
CDISCPIL0T01	01-701-1015	4	DIABP	50	mmHg
CDISCPIL0T01	01-701-1015	4	DIABP	54	mmHg
CDISCPIL0T01	01-701-1015	5	DIABP	64	mmHg
CDISCPIL0T01	01-701-1015	5	DIABP	55	mmHg
CDISCPIL0T01	01-701-1015	5	DIABP	53	mmHg
CDISCPIL0T01	01-701-1015	6	DIABP	72	mmHg
CDISCPIL0T01	01-701-1015	6	DIABP	8113	Pa
CDISCPIL0T01	01-701-1015	6	DIABP	53	mmHg

STUDYID	USUBJID	VISITNUM	VSTESTCD	VSORRES	VSORRESU	status	bc_allowable_units
CDISCPIL0T01	01-701-1015	1	DIABP	64	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	1	DIABP	83	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	1	DIABP	57	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	2	DIABP	68	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	2	DIABP	59	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	2	DIABP	71	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	3	DIABP	56	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	3	DIABP	56	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	3.5	DIABP	8911	Pa	wrong unit	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	3.5	DIABP	61	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	3.5	DIABP	65	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	4	DIABP	56	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	4	DIABP	50	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	4	DIABP	54	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	5	DIABP	64	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	5	DIABP	55	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	5	DIABP	53	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	6	DIABP	72	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	6	DIABP	8113	Pa	wrong unit	mmHg C49670 (VSRESU C66770 v59.0.0)
CDISCPIL0T01	01-701-1015	6	DIABP	53	mmHg	unit ok	mmHg C49670 (VSRESU C66770 v59.0.0)

Figure 14 BCs for data checking

In the example in Figure 14, the BC's possible unit definition is being used for checking if data conform to the specified unit. Similar checks could be made for other BC qualifiers.

Used for TLF – study BC

Alias	Question Text	Prompt Text	Datatype	Format	Terminology
--TESTCD			CD		8 DIABP C25299 (VSTESTCD C66741 v61.0.0)
--STAT			BL		
--SCAT			CD		
--REASND			CD		
--POS	Body Position	Position	CD		4 STANDING C62166 (POSITION C71148 v62.0.0); SITTING C62122 (POSITION C71148 v62.0.0); SUPINE C62167 (POSITION C71148 v62.0.0)
--ORRESU	Unit	Unit	PQR		20. mmHg C49670 (VSRESU C66770 v59.0.0)

- The BCs can be helpful in TLFs when expected responses are not observed – example with position.
- Using BC definition (left)
- Used in a study the visits from SoA are added to form a study BC (below)

VSPOS	VSTESTCD	VISITNUM	Alias	Question Text	Prompt Text	Datatype	Format	Terminology
1	STANDING	DIABP	--POS	Position	Position	CD		40 STANDING C62166 (POSITIO...
2	STANDING	DIABP	--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
3	STANDING	DIABP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
4	SITTING	DIABP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
5	SITTING	DIABP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
6	SITTING	DIABP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
7	SUPINE	DIABP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
8	SUPINE	DIABP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
9	SUPINE	DIABP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
10	STANDING	SYSBP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
11	STANDING	SYSBP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
12	STANDING	SYSBP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
13	SITTING	SYSBP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
14	SITTING	SYSBP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
15	SITTING	SYSBP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
16	SUPINE	SYSBP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
17	SUPINE	SYSBP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
18	SUPINE	SYSBP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...

Used for TLF – study BC to display if missing observation

VSPOS	VSTESTCD	VISITNUM	Alias	Question Text	Prompt Text	Datatype	Format	Terminology
1	STANDING	DIABP	--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
2	STANDING	DIABP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
3	STANDING	DIABP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
4	SITTING	DIABP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
5	SITTING	DIABP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
6	SITTING	DIABP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
7	SUPINE	DIABP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
8	SUPINE	DIABP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
9	SUPINE	DIABP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
10	STANDING	SYSBP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
11	STANDING	SYSBP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
12	STANDING	SYSBP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
13	SITTING	SYSBP	1--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
14	SITTING	SYSBP	8--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...
15	SITTING	SYSBP	13--POS	Body Position	Position	CD		40 STANDING C62166 (POSITIO...

- The study BC (limit to show VSPOS)
- SAS allow for using CLASSDATA in reports
- Report will show if no data is observed (below)

```

proc tabulate data=report CLASSDATA=BC_POS_STUDY;
  where( VISITNUM IN (1,8,13));
  class VSPOS / ORDER=DATA MISSING;
  class vstestcd / ORDER=DATA MISSING;
  class visitnum / ORDER=DATA MISSING;
  var vsstresn;
  table visitnum='Visit' * VSTESTCD='Vital Sign Test',
        VSPOS * (VSSTRESN=' ' * Mean={LABEL="Mean"}*f=8.1 VSSTRESN=' ' * s
  title 'Summary of Blood Pressure (mmHg)';
run;

```

Visit	Vital Sign Test	Vital Signs Position of Subject					
		STANDING		SITTING		SUPINE	
		Mean	SD	Mean	SD	Mean	SD
1	DIABP	78.2	10.4	no obs	no obs	77.6	10.0
	SYSBP	138.5	19.0	no obs	no obs	141.5	18.6
8	DIABP	76.2	10.1	no obs	no obs	75.5	9.1
	SYSBP	134.7	17.2	no obs	no obs	137.1	16.9
13	DIABP	73.6	11.0	no obs	no obs	72.5	9.8
	SYSBP	127.8	17.5	no obs	no obs	130.8	17.7

Figure 15 BCs for TLF missing responses

The example in Figure 15 shows the usage of BC on study level. BC_POS_STUDY dataset is the metadata of the expected collected data for DIABP and SYSBP for the applicable visits in a study. This metadata represents the 'planned' observations for blood pressure.

The 'planned' response/qualifiers as defined in the BC is used to fill in the gaps in a table where data doesn't have outcomes/responses of one of the planned responses/qualifiers (position=sitting). This makes tabulation easier when missing observation occurs.

Therapeutic Area Guides

2015

Concept Metadata Displays for Pulmonary Function Tests

Forced Vital Capacity (FVC) - RE

CDISC TAUG-Admin v1.0 package

Domain: RE
TEST: Forced Vital Capacity
TESTCD: FVC

value(s)	BRIDG-based concept variable	Attribute	SDTM variable(s)
CL1468	FVC_OBS. DefinedObservation.targetAnatomicSiteCode.CD.code	Pre-specified target site	via DOMAIN.RE
LUNG	FVC_OBS. DefinedObservation.targetAnatomicSiteCode.CD.displayName.value		
CL1421	FVC_OBS. DefinedObservation.approachAnatomicSiteCode.CD.code	Pre-specified site of administration	RELOC
ORAL CAVITY	FVC_OBS. DefinedObservation.approachAnatomicSiteCode.CD.displayName.value		
SPIROMETRY	FVC_OBS. DefinedObservation.methodCode.CD.code	Method	REMETHOD
from codelist C85492	FVC_OBS. DefinedObservation.methodCode.CD.displayName.value		
free text	FVC_OBS. DefinedObservation.methodCode.CD.originalText.value		
isotime	FVC_OBS. PerformedObservation.dateRange.FL.<TS>.low.value	Date Range	REDTC
integer	FVC_OBS. PerformedObservation.studyDayRange.FL.<INT>.low.value	Study Day Range	REDY
TRUE, FALSE (SDTM NOT DONE, null)	FVC_OBS. PerformedObservation.negotiationIndicator.BL.value	Negotiation Indicator	RESTAT
free text	FVC_OBS. PerformedObservation.negotiationReason.DSET.<SC>.item.value	Negotiation Reason	REASNO
free text	FVC_RES. PerformedClinicalResult.valueNullFlavorReason.ST.value	Value NullFlavor Reason	REASNO
free text	FVC_RES. PerformedClinicalResult.value.PQ.originalText.value		REORRES, RESTRESIC, RESTRESN
decimal	FVC_RES. PerformedClinicalResult.value.PQ.value	Result value	RESTRESU
C8254, C48505	FVC_RES. PerformedClinicalResult.value.PQ.unit.code	Result unit	REORRESU, RESTRESU
ml, L	FVC_RES. PerformedClinicalResult.value.PQ.unit.displayName.value		
TRUE, FALSE (SDTM Y, null)	FVC_RES. PerformedClinicalResult.baselineIndicator.BL.value	Baseline Indicator	REBLFL
formula for predicted normal value	FVC_RES. ReferenceResult.value.PQ.expression.value	Reference result value	REORREFR, RESTREFR
decimal	FVC_RES. ReferenceResult.value.PQ.value	Reference result value	RESTREFR
C8254, C48505	FVC_RES. ReferenceResult.value.PQ.unit.code	Reference result unit	see
ml, L	FVC_RES. ReferenceResult.value.PQ.unit.displayName.value	Reference result unit	see

Terminology	BRIDG Mapping	Alias - Natural Language Tag	Mapping
Spirometer	Device used in testing		SPEVID
Percent Predicted FVC	Normalized value derived from this result		

- Would be useful to have TA Guides expressed in BCs
- Consistent Format
- Complete
- Machine Readable

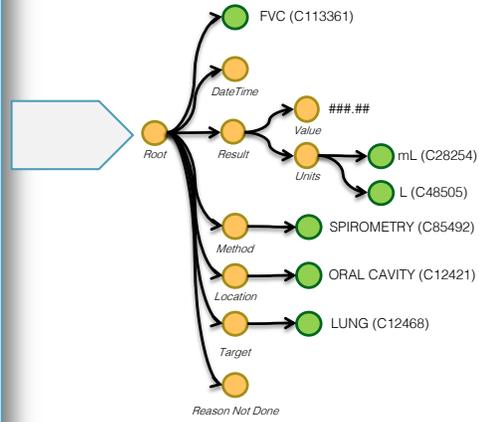


Figure 16 BCs for defining TAs

Finally, Figure 16 illustrates the use of BCs for making the definition of a Therapeutic Area more specific and machine readable. Much of the TA definitions are in pdfs and the released metadata doesn't provide the actual references to e.g., CDISC terminology.

CONCLUSION

Adopting Biomedical Concepts as a new standard will help facilitate the vision of the CDISC 360 project (ref. [1]) and facilitate the removal of the data silos. To accelerate the creation of the BC library we are mining the data together with sponsors to provide usable BC definitions. At this point we are at an early stage of the library, but from the data we have received we are confident that a first version of library can be built within this year.

Adopting the Biomedical Concepts by the users then requires training, examples of usage and tools that can utilise the BCs. This work will continue as we build the BC library.

REREFRENCES

- [1] CDISC, 2019. "CDISC 360 Project." <https://www.cdisc.org/restricted/cdisc-360>

RECOMMENDED READING

- *Base SAS® Procedures Guide*
- *SAS® For Dummies®*
- [PHUSE EU Connect 2018, SI13, Easing Your Pain with Biomedical Concepts](#)
- [PHUSE 2017, TT01, Helping the Define.xml User](#)

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

Johannes Ulander

S-cubed Aps

+45 31 45 15 01

ju@s-cubed.dk

www.s-cubed-global.com

Kirsten Walther Langendorf

A3Informatics

Mobile: +45 31 65 76 55

Email: kl@a3informatics.com

Web: www.a3informatics.com

Any brand and product names are trademarks of their respective companies.