

# CDISC 2020 US Interchange

A Virtual Event | 7-8 October 2020





# CDISC 360 Workstream 1

## Biomedical Concepts: What Did We Learn

Presented by Bess LeRoy and Jon Neville  
CDISC

7-8 October 2020

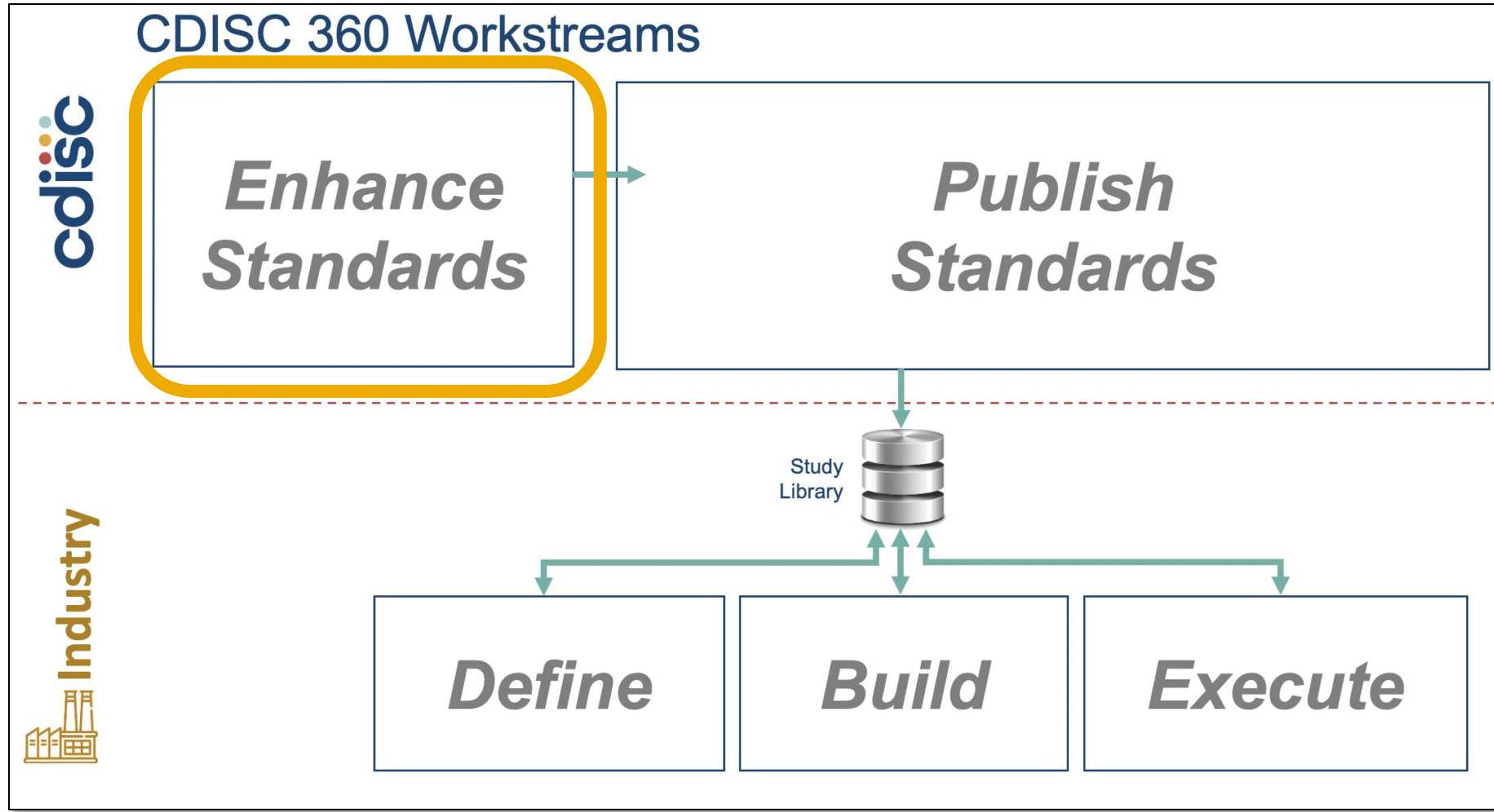




# Agenda

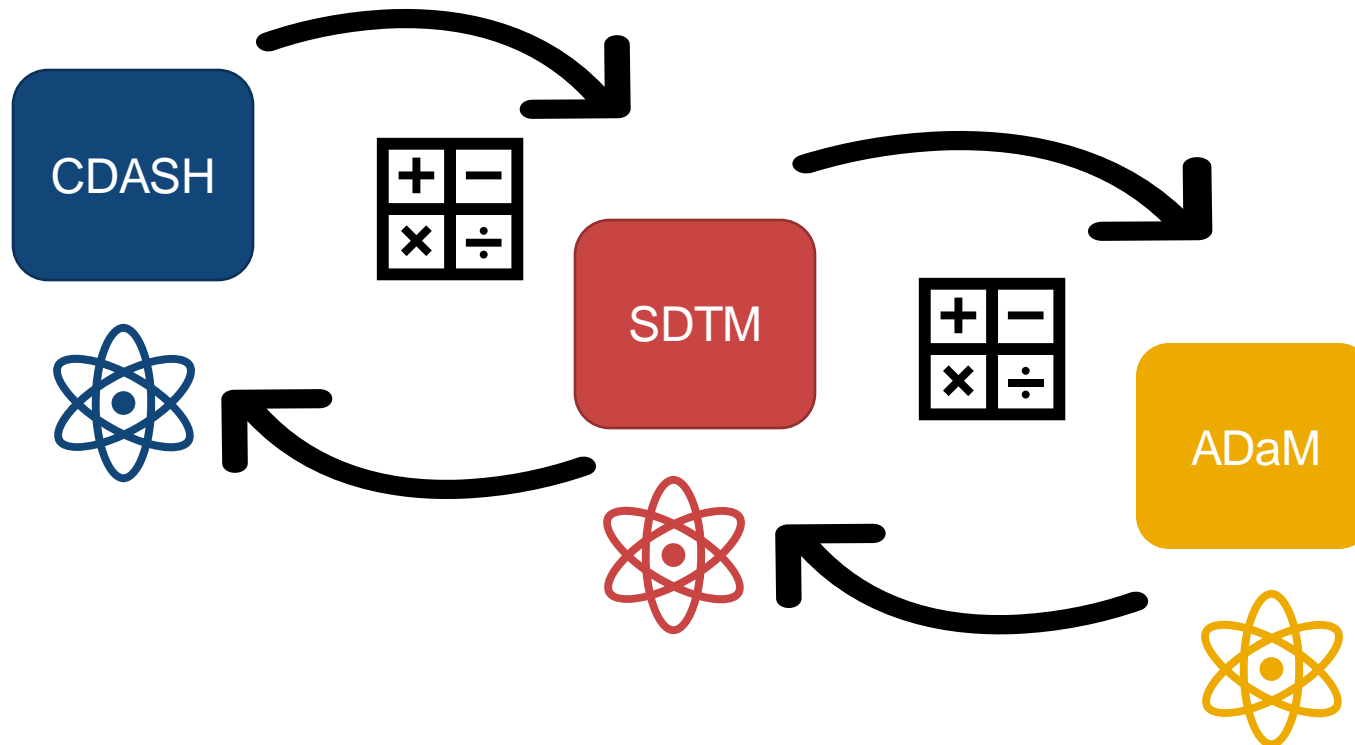
1. Workstream 1 goals and objectives
2. Initial work with biomedical concepts (BCs)
3. Rethinking BCs using ISO11179
4. BC Metadata files (library bindings and mapping files)
5. Conclusions/Next steps

# What Was the Goal of Workstream 1?



# Enhancing CDISC Standards

- Define linkage across standards including derivations and transformations
- Develop linked biomedical concept metadata to enable end to end automation



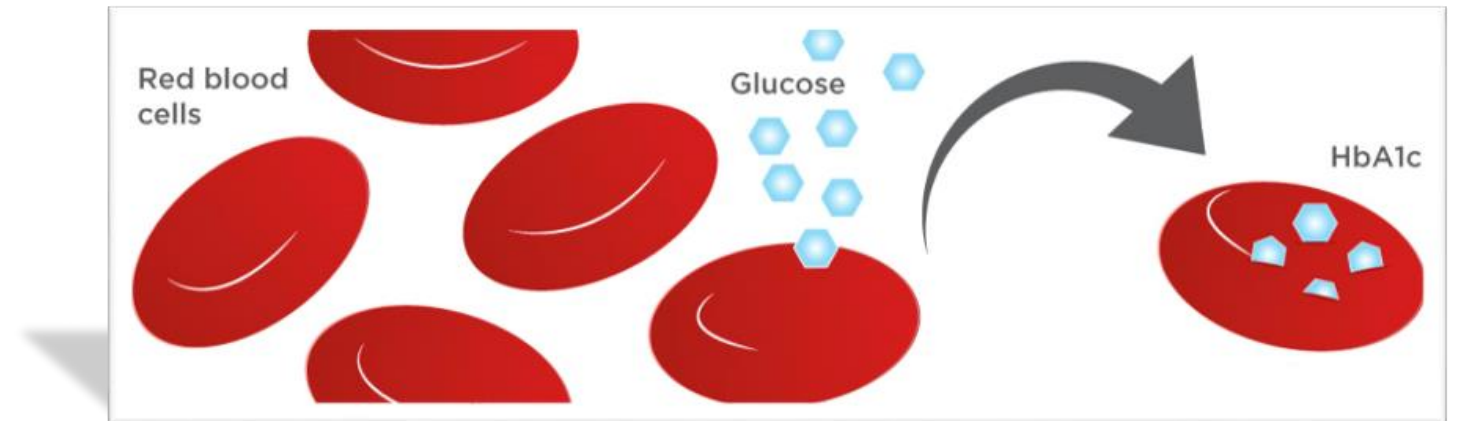
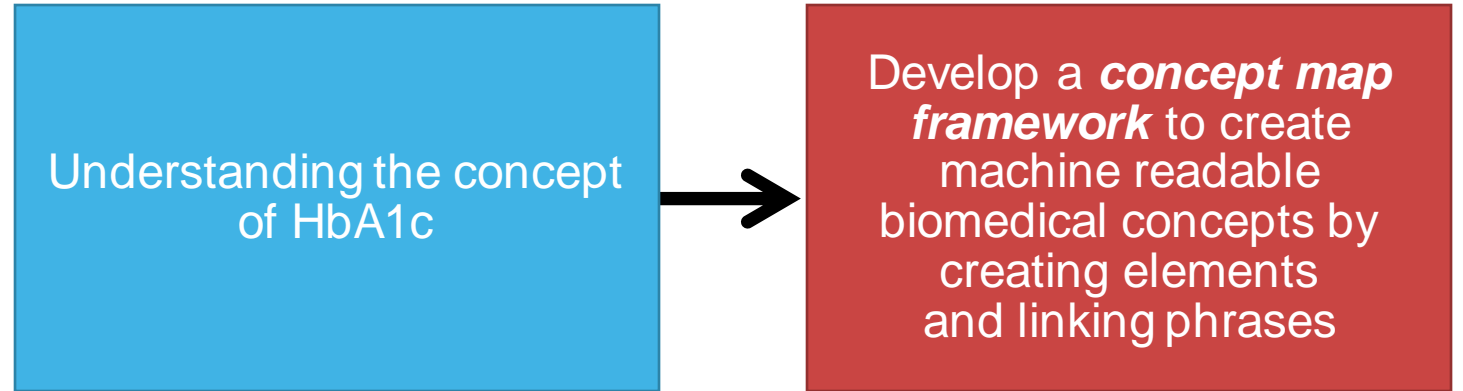


# What Are Biomedical Concepts (BCs)?

- Biomedical concepts are high-level **building blocks** of clinical research information that encapsulate lower level **implementation details** like variables and terminologies
- A BC is a **unit of knowledge** created by a unique combination of characteristics
- A BC specifies an **observation concept**, or what should be observed for a specific subject assessment in a clinical study, but not how to capture the data or how to group observations together
- BCs **exist independently** of any given standards implementation, such as SDTMIG v3.2 or CDASHIG v2.0



# Where Did We Start?



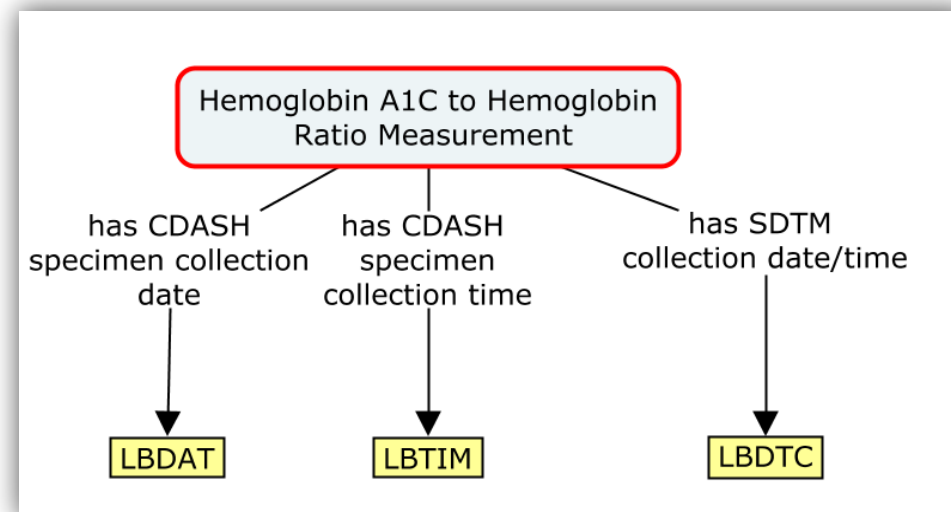
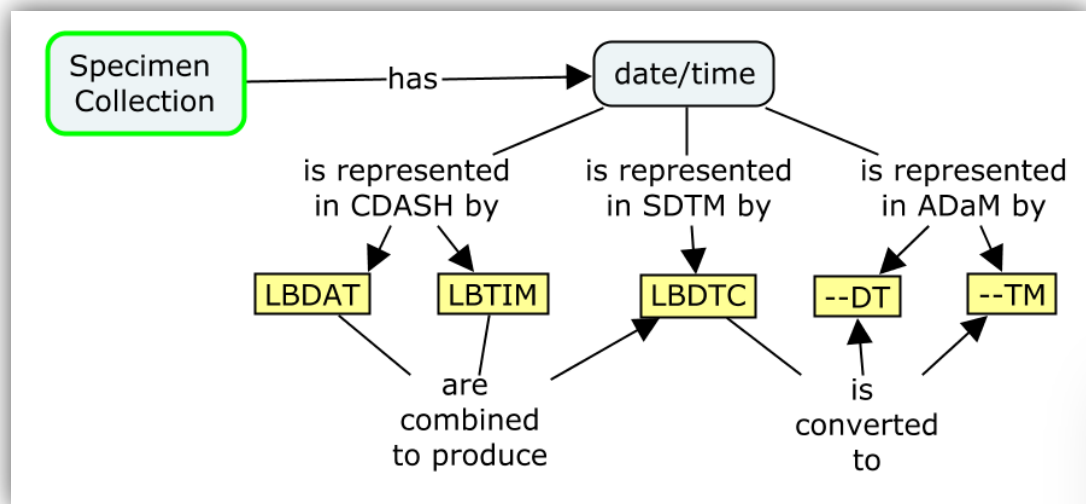
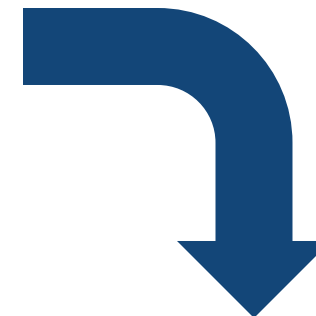
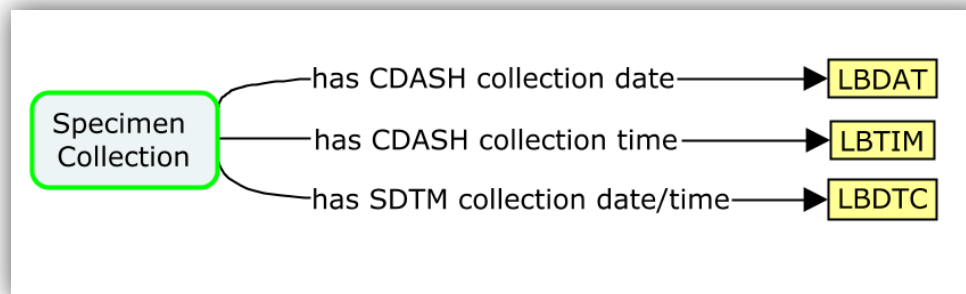
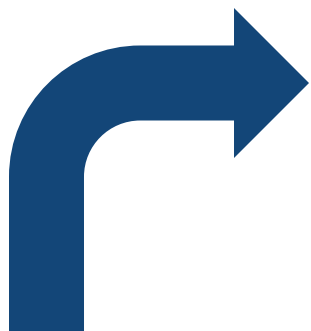
# What are Concept Maps?

- **Visual** illustrations of BCs
- Show data elements and their relationships
  - Variables
  - BC-specific terminology
  - Derivations
- Are machine-readable

Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mayHave	Specimen Type (C70713)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mayHave	Reference Range (C71474)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mayHave	Planned Time Points (C2826271)
Unit (C71620)	defaultCode	% (C25613)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mustHave	Collection Date/Time (C82515)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mustHave	Laboratory Test Code (C83322)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mayHave	Logical Observation Identifiers Names and Codes (LOINC) (C82502)
Laboratory Test Name (C67154)	usesCode	Hemoglobin A1C/Hemoglobin (C111207)
Laboratory Test Code (C65047)	usesCode	HBA1CHGB (C111207)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mustHave	Baseline Flag (C82526)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mayHave	Specimen Condition (C83024)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mustHave	Laboratory Test Name (C117142)
Unit of Measure (C25709)	usesNCIcodeList	Unit (C71620)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mustHave	Unit of Measure (C25709)
If LB.LBSTRESN ne to "."and LB.LBTESTCD = "HBA1CHGB" and LB.LBDTC is	uses	Laboratory Test Code (C83322)
Planned Time Points (C2826271)	specify	Time Points
Laboratory Test Result (C36292)	mayBeUsedIn	Reference Range Comparison (C122757)
		ABNORMAL(C78802); HIGH (C78800); LOW (C78801); NORMAL (C78727)
Reference Range Indicator (C78736)	usesCode	Laboratory Test Result (C36292)
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	mustHave	BLOOD (C12434)
Specimen Type (C78734)	usesCode	LB
Hemoglobin A1C to Hemoglobin Ratio Measurement (C111207)	belongsTo	Specimen Condition (C78733)
Specimen Condition (C83024)	usesNCIcodeList	Collection Date/Time (C82515)
If LB.LBSTRESN ne to "."and LB.LBTESTCD = "HBA1CHGB" and LB.LBDTC is	uses	Reference Range Comparison (C122757)
Reference Range (C71474)	mayBeUsedIn	Laboratory Test Code (C65047)
Laboratory Test Code (C83322)	usesNCIcodeList	Laboratory Test Result (C36292)
If LB.LBSTRESN ne to "."and LB.LBTESTCD = "HBA1CHGB" and LB.LBDTC is	uses	% (C25613); mmol/mol (C111253); fraction of 1 (C105484)
Unit (C71620)	usesCode	



# Building a Framework using Elements and Linking Phrases



# Challenges of Building Our Own Framework

- You don't know, what you don't know
  - Hard to define robust enough rules to make it work for every situation
  - Spent a long time getting bogged down in the details



# Refocusing Concept Development Based on ISO 11179

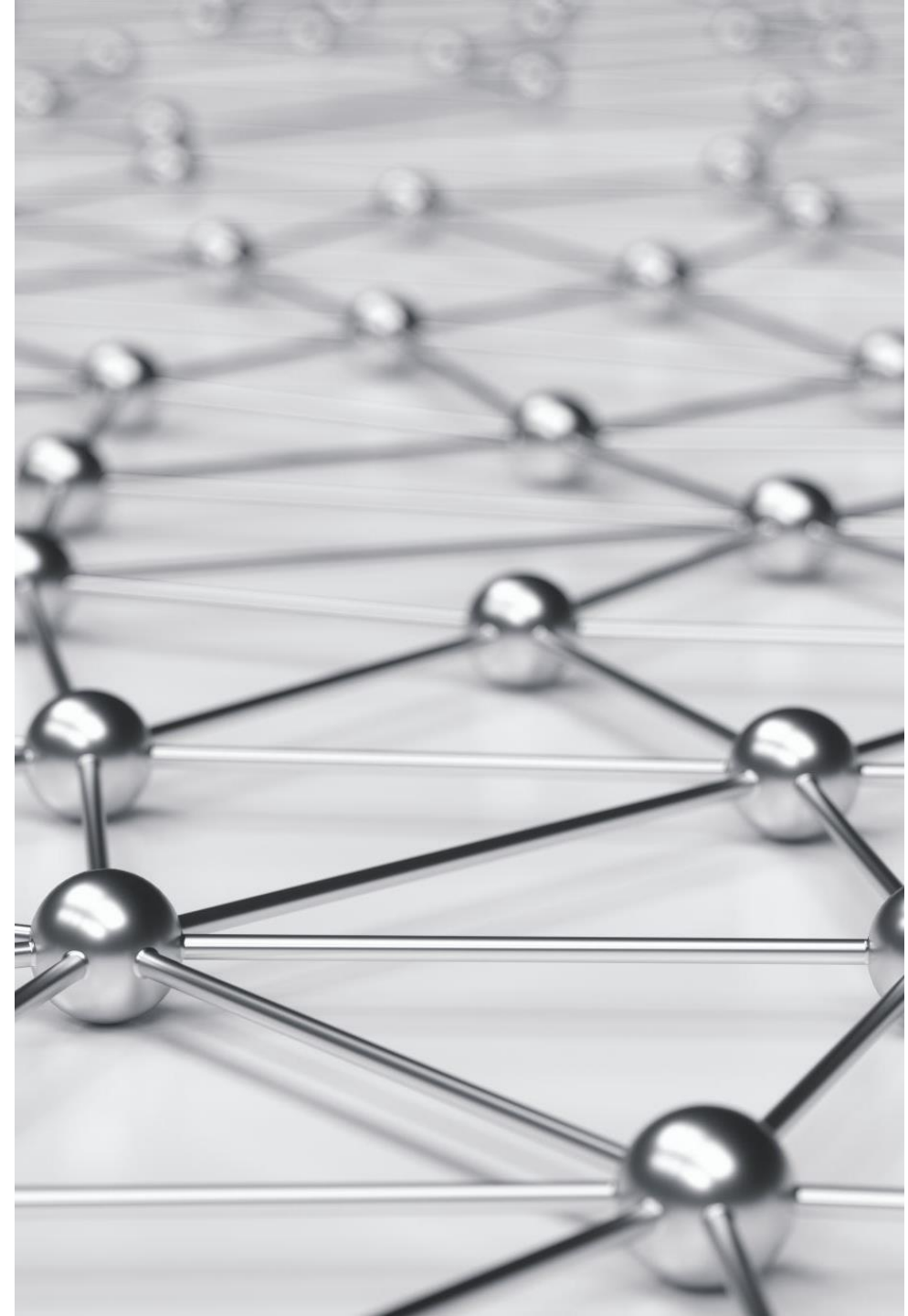
ISO 11179 is an international standard for representation of metadata

- Many metadata repositories are based on the ISO 11179 standard including the CDISC Library

Workstream 1 adopted this model for our approach to biomedical concept development in December 2019

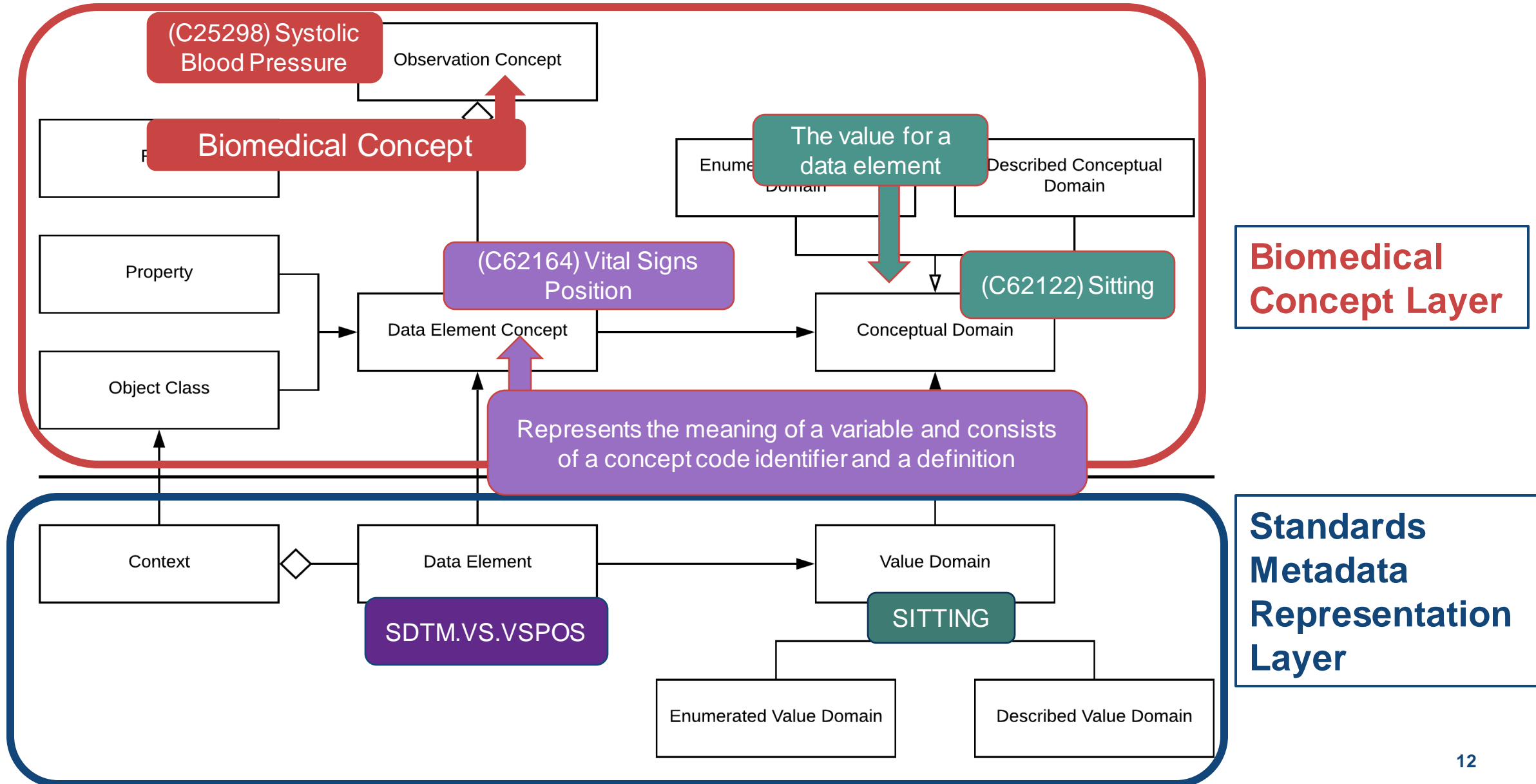
Not a perfect solution; required some adjustments

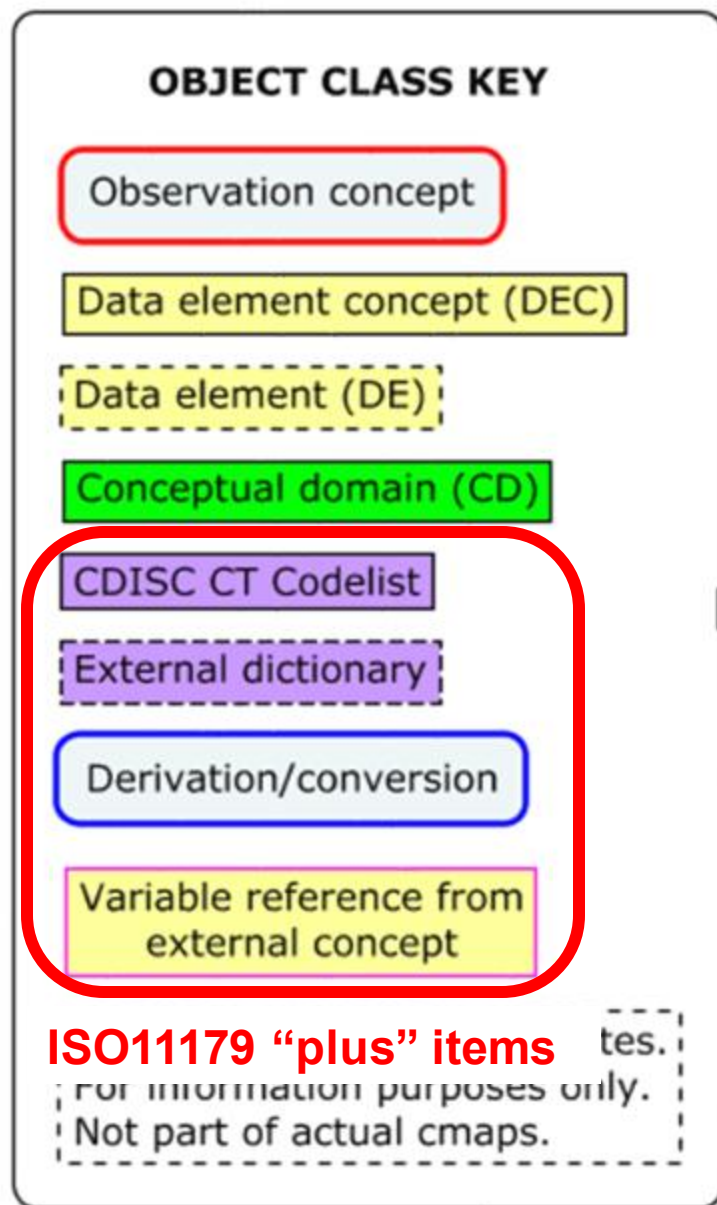
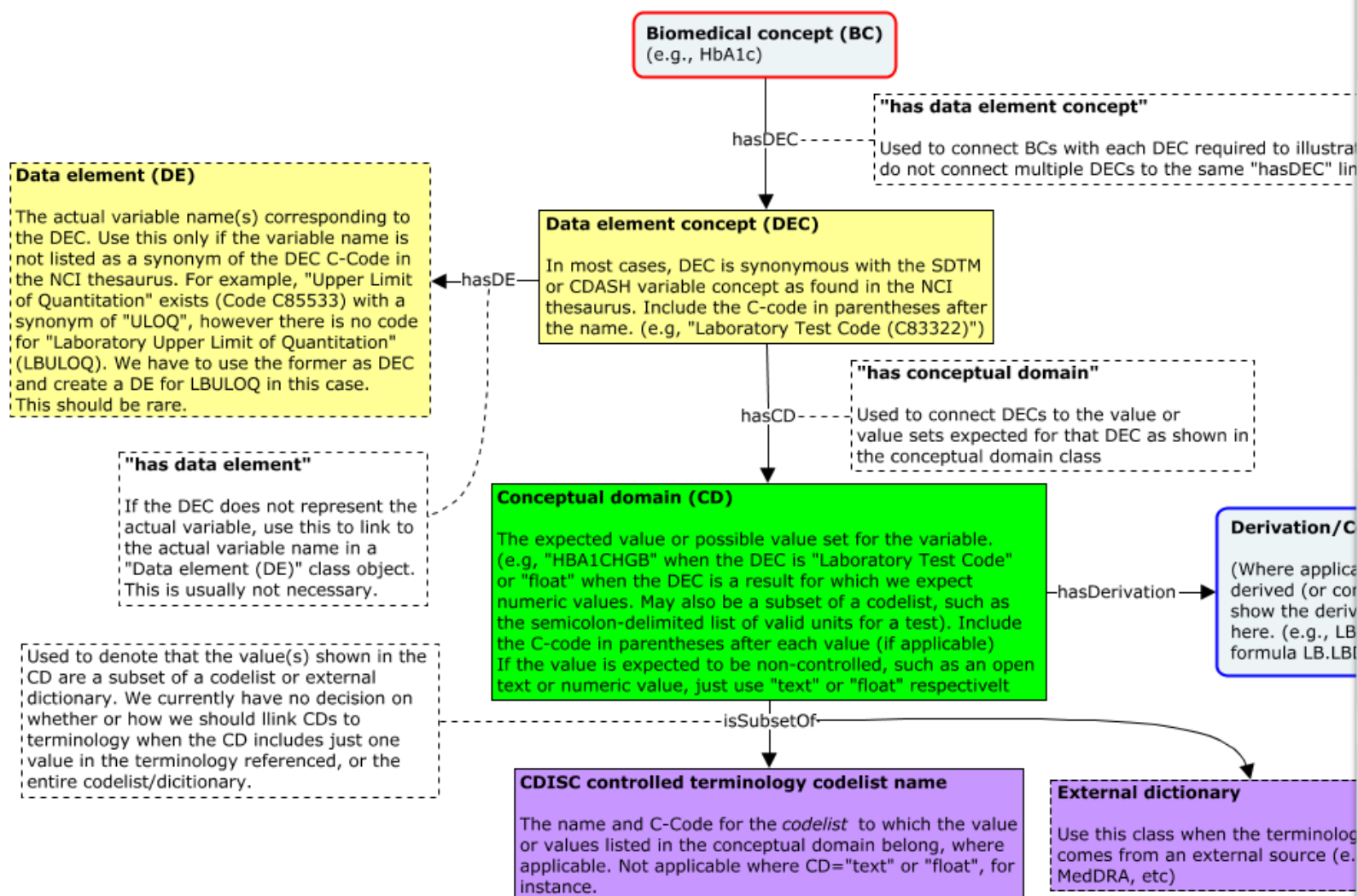
Our approach is “ISO 11179+”



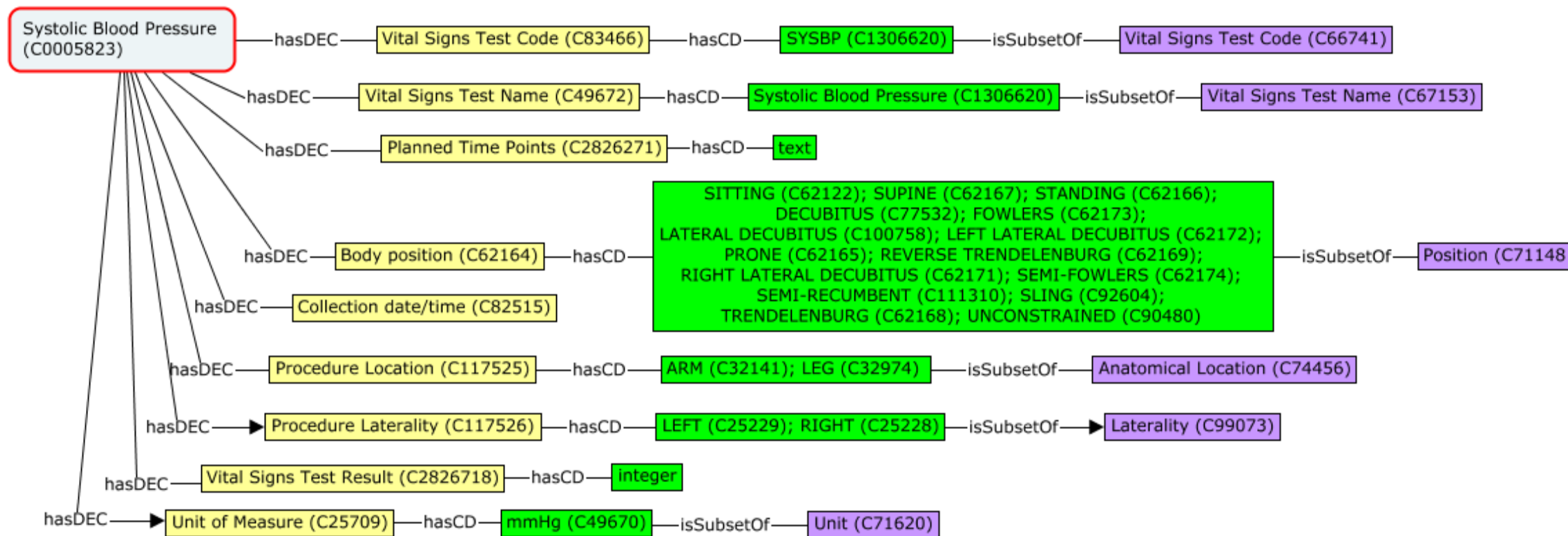


# CDISC 360: ISO 11179 Model

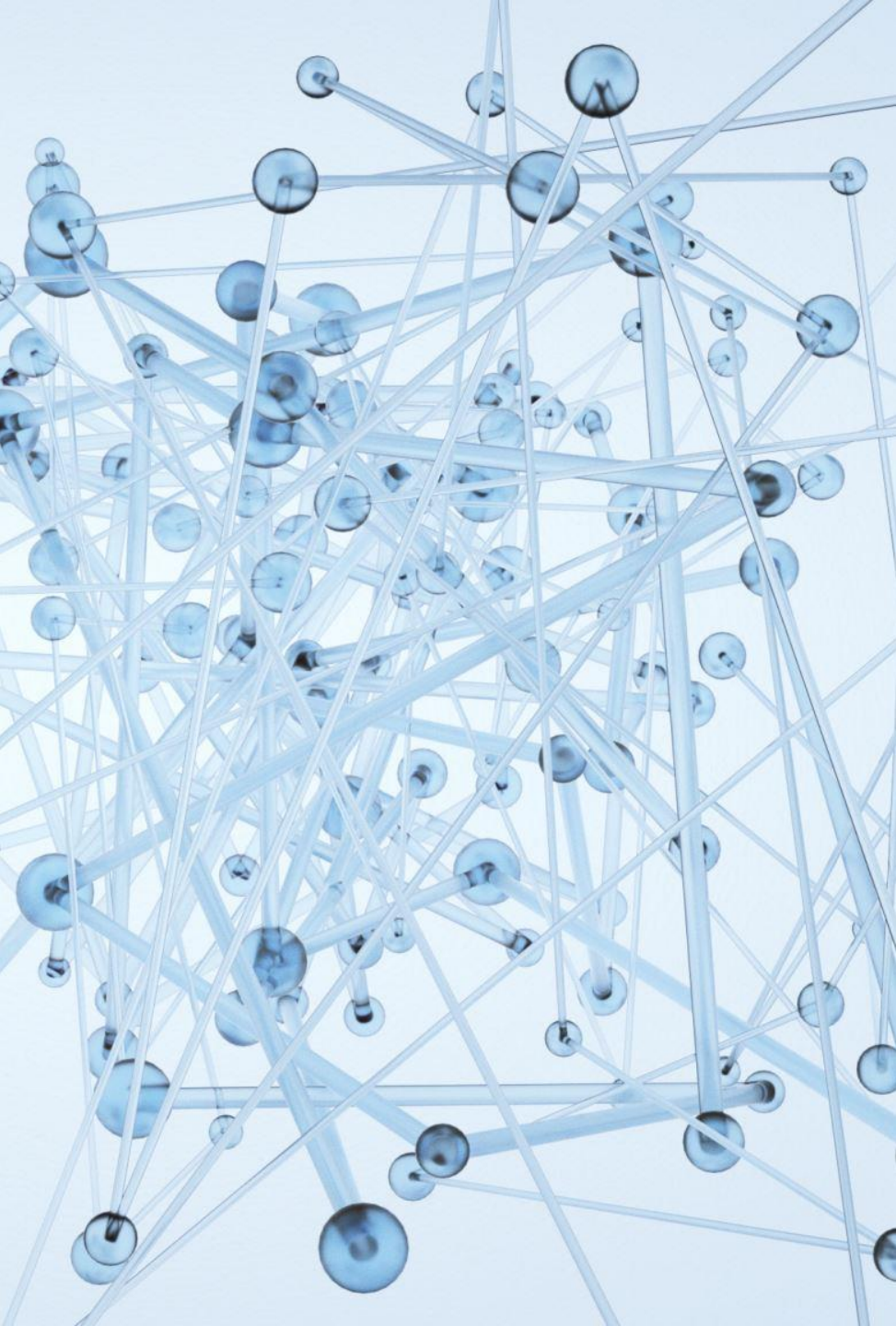




# Biomedical Concept: Systolic Blood Pressure



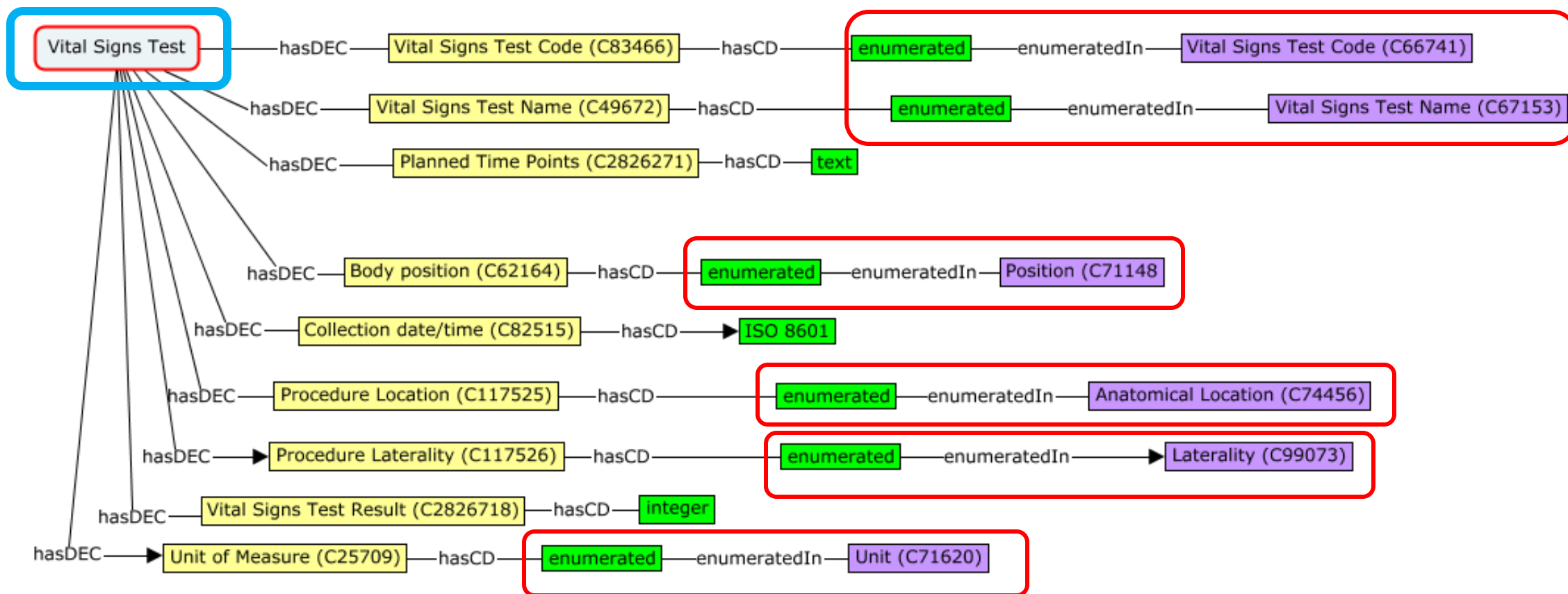




# List of Concepts for 360

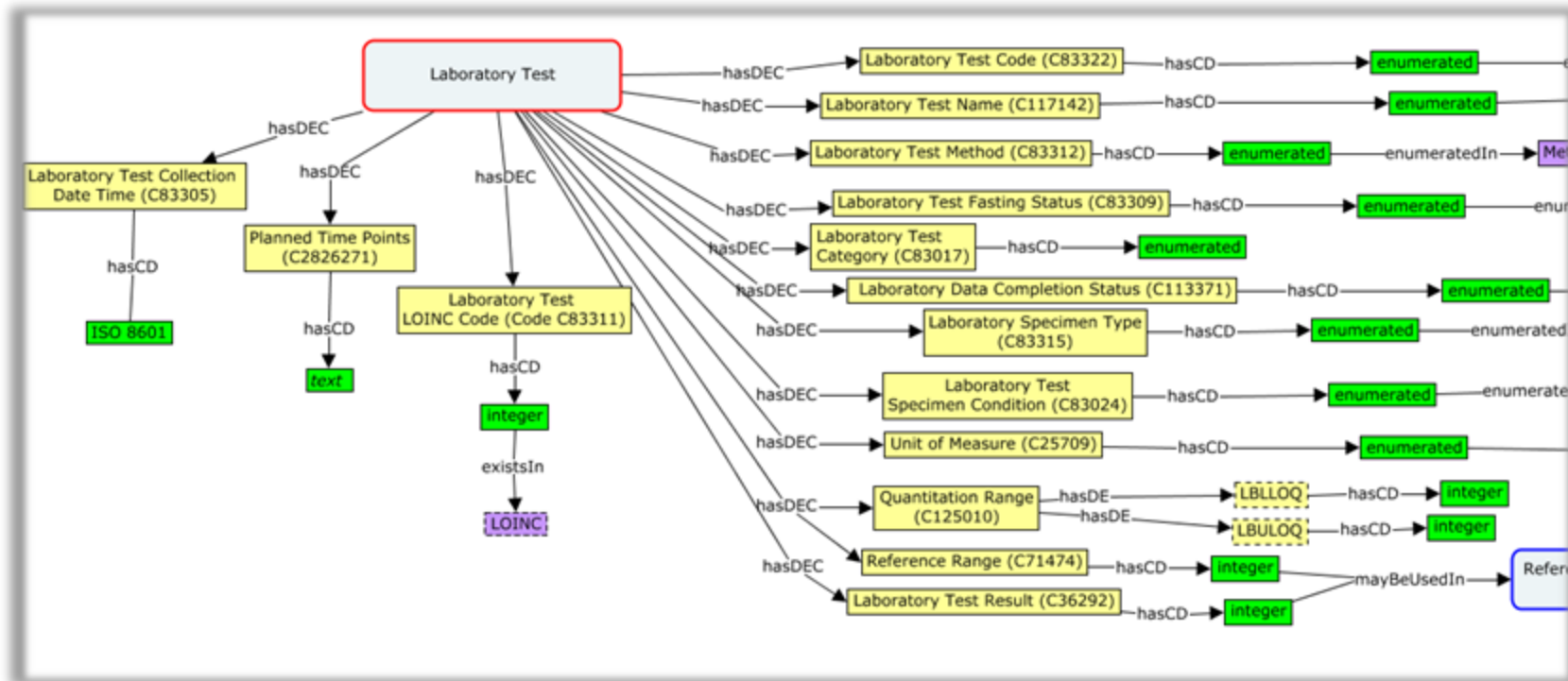
Domain(s)	Biomedical Concept
TA	Arms
TE	Elements
TS	Summary parameters
TV	Trial visits
DM	Subject
DS	Disposition Events/Milestones
VS	Vital Signs
AE	Adverse Events
EX/EC	Insulin administration
LB	HbA1c
	Hemoglobin
	Cholesterol
	LDL Cholesterol

# Biomedical Concept-Specific Maps vs. Template Maps



# Template Maps Enable Scalability

- Broadly applicable to a group of related concepts
- Generalized from BC maps (do not contain BC-specific instantiation details)
- Can be used as basis for instantiation of specific BCs that share the same “backbone”(e.g., most labs)





A vertical strip of a grid with colored dots and lines, showing a sequence of patterns from top to bottom: blue, red, yellow, and light blue.

Value-level templates showing how to instantiate relevant variables for a given BC (Default values, codelists, derivation rules)

BC Label	Test Code	Test name	Body Position	Anatomical Location	Laterality	Units	Derivation
Systolic	SYSBP	Systolic Blood Pressure	SITTING (D++)	ARM (D++)	LEFT; RIGHT	mmHg	
			SITTING; SUPINE; STANDING (alt+)	LEG; CALF; FINGER (alt+)			
			codelist values **				
Diastolic	DIABP	Diastolic Blood Pressure	SITTING (D++)			mmHg	
			SITTING; SUPINE; STANDING (alt+)				
			codelist values **				
Height	HEIGHT	Height	NA+			cm; in	
Weight	WEIGHT	Weight	STANDING (D++)			kg; lb	
			SITTING; SUPINE; STANDING (alt+)				
			codelist values **				
BMI	BMI	Body Mass Index	STANDING (D++)			kg/m2	D04
			codelist values **				



# CDASH to SDTM Mapping Files

Source-to-target mapping pseudocode

Derivations (e.g, USUBJID)

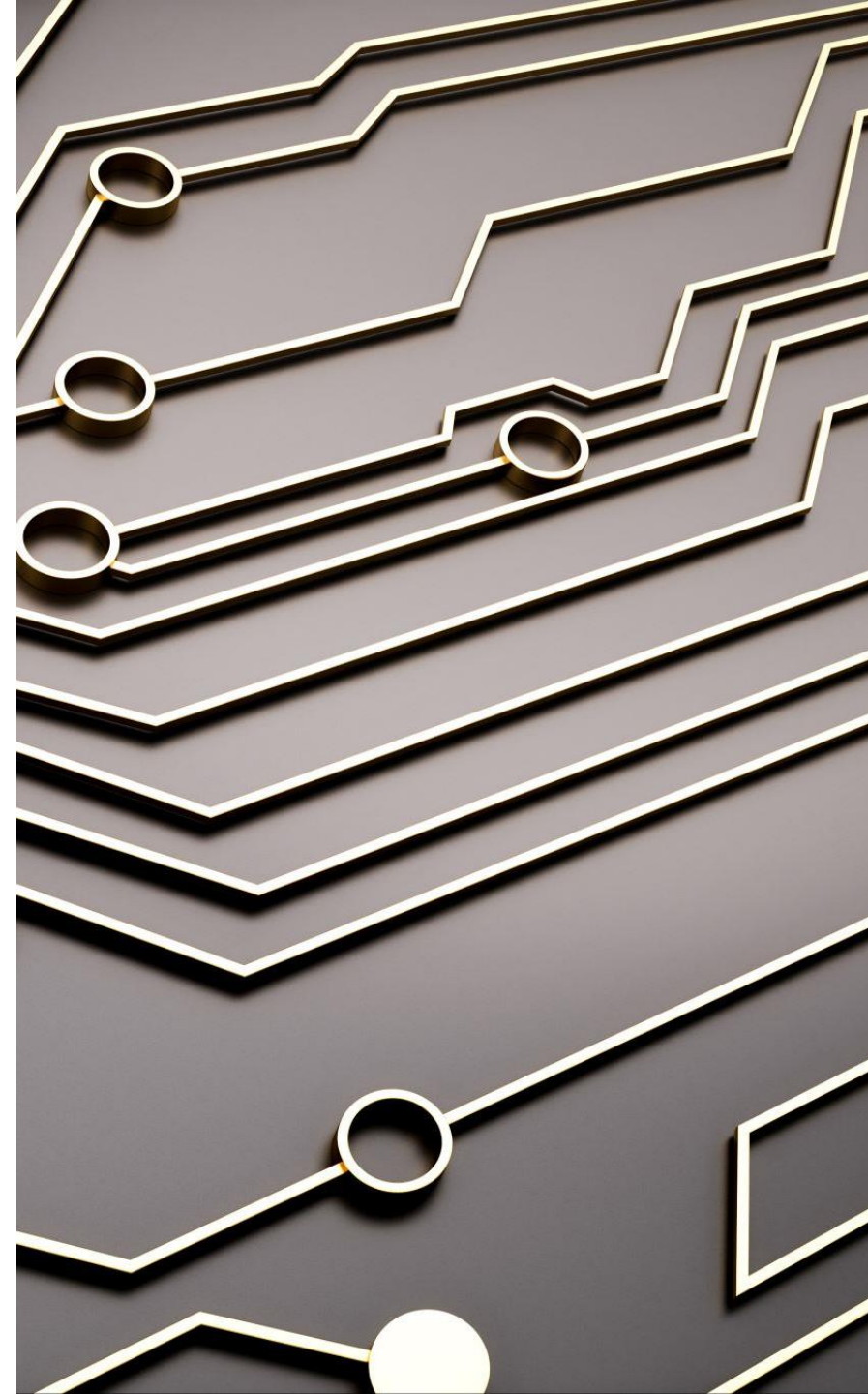
Conversions (e.g., Dates)

Assignments (e.g., Domain, STUDYID)

Source Variable	Mapping - Pseudocode	Mapping - Constant	CODELIST
		DS	DOMAIN
SUBJID	Concatenation of STUDYID, SITEID and SUBJID		
DSSTDAT	Concatenate CDASH DSSTDAT and DSSTTIM and populate SDTM_DSSTDTC in ISO 8601 format.		
DSSTTIM	Concatenate CDASH DSSTDAT and DSSTTIM and populate SDTM_DSSTDTC in ISO 8601 format.		
PROTOCOL MILESTONE_DSCAT	Predecessor	Predecessor	DSCAT
DISPOSITION EVENT_DSCAT	Predecessor	Predecessor	DSCAT
INFORMED CONSENT OBTAINED_DSTERM	Predecessor		
INFORMED CONSENT OBTAINED_DSDECOD	Predecessor	Predecessor	PROTMLST
RANDOMIZED_DSTERM	Predecessor		
RANDOMIZED_DSDECOD	Predecessor		PROTMLST
COMPLETED_DSTERM	Predecessor	Predecessor	
COMPLETED_DSDECOD	Predecessor	Predecessor	NCOMPLT

# CDISC Library Provides Additional Standards Implementation Details

- Domains/Datasets (CDASH, SDTM, ADaM)
- Variable cores (Req / Exp / Perm)
- Controlled terminology
- Data types



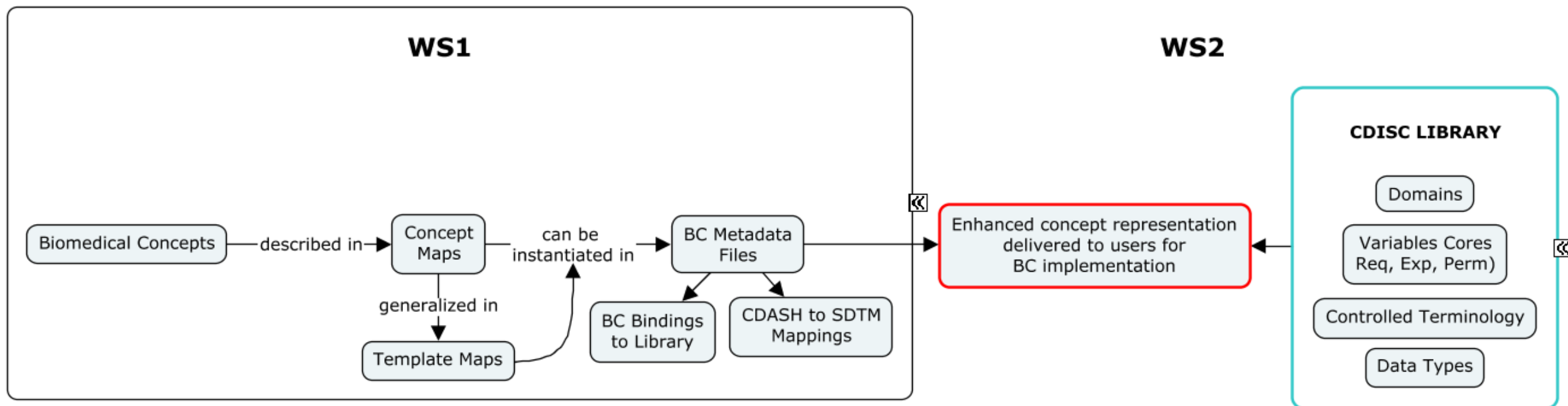




# Enhanced Concept Representation Delivered to Users

- The WS1 Deliverables + existing library content are combined to create enhanced concept representation in CDISC library, for delivery to implementers
  - SDTM define.xml
  - CDASH odm.xml
  - ADSL.xml

# Recap of Workstream 1 Activities

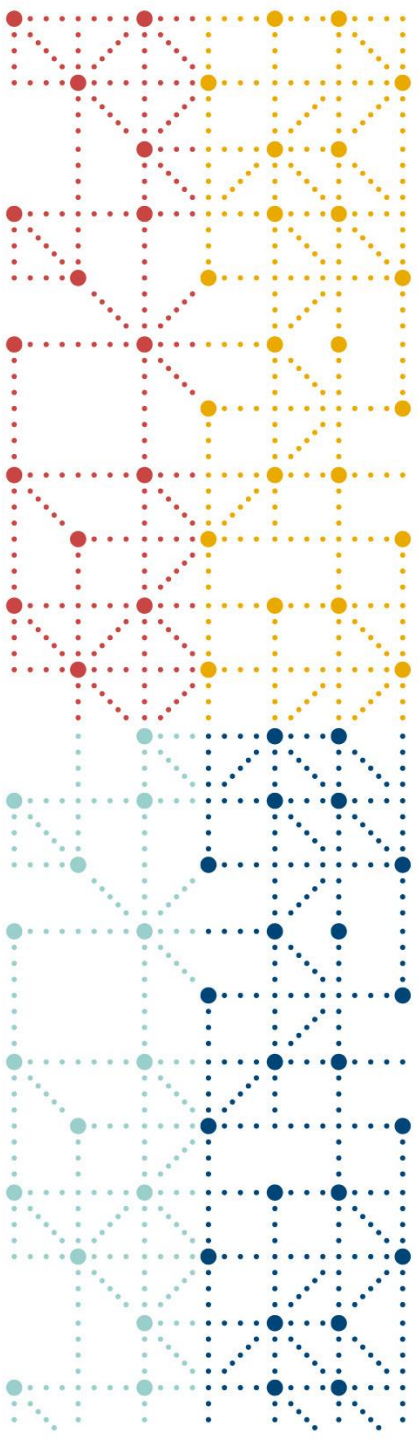




# Conclusions/ Next Steps

- Concept development is an iterative process
- Our processes take into account scalability for development beyond the proof-of-concept
- Next steps
  - Analysis Concepts started but need more robust testing
  - Future of concept-based development will continue to evolve as we apply lessons learned
  - Eventually we'll be able to develop tools and training





**Thank You!**

