

Unified Study Definitions Model Implementation Guide (USDM-IG)

Version 4.0 ((Final))

Prepared by the
DDF Team

Notes to Readers

This is the final Version 4.0 of the Unified Study Definitions Model Implementation Guide (USDM-IG v4.0)

Revision History

Date	Version
2025-05-03	4.0 (Final)

Contents

UNIFIED STUDY DEFINITIONS MODEL IMPLEMENTATION GUIDE (USDM-IG)...	1
VERSION 4.0 ((FINAL)).....	1
1 INTRODUCTION	5
1.1 PURPOSE.....	5
1.2 ORGANIZATION OF THIS DOCUMENT	5
1.3 HOW TO READ THIS DOCUMENT.....	5
2 FUNDAMENTALS OF THE USDM.....	7
2.1 USDM v1.0	7
2.2 USDM v2.0	7
2.2.1 Support for More Complex Trials	7
2.2.2 Enabling EDC Automation.....	7
2.2.3 Populating protocol standards	7
2.3 USDM v3.0	8
2.3.1 Representation of ICH M11 CeSHarP in USDM	8
2.3.2 SDTM Trial Design Population.....	8
2.3.3 Clinical Trial Registry Population.....	8
2.3.4 Support for More Complex Trials	8
2.3.5 Model Enhancements	8
2.4 USDM v4.0	8
2.4.1 Representation of ICH M11 CeSHarP in USDM	9
2.4.2 Utilizing the Digital Protocol (UDP).....	9
2.4.3 USDM Conformance Rule Specifications.....	9
2.4.4 Test Data and Test Tools.....	9
2.4.5 Training and Education Materials	9
2.4.6 Model Enhancements	9
3 RELATIONSHIP TO OTHER STANDARDS AND FORMATS	10
3.1 RELATIONSHIP TO OTHER CDISC STANDARDS	10
3.1.1 BRIDG	10
3.1.2 PRM	10
3.1.3 SDTM and SDTMIG	10
3.1.4 Controlled Terminology	11
3.1.5 CTR	11
3.1.6 ODM	11
3.1.7 SDM	12
3.2 RELATIONSHIP TO OTHER STANDARDS	12
3.2.1 ICH M11 Guideline, Clinical Study Protocol Template, and Technical Specifications.....	12
3.2.2 HL7 FHIR SOA	12
3.2.3 IDMP	12
4 USDM FEATURES	13
4.1 OVERVIEW	13
4.2 PRINCIPLES.....	14
4.3 NAMING CONVENTIONS	14
4.3.1 General	14
4.3.2 Class and Attribute Naming	14
4.3.3 Data Types.....	14
4.3.4 Relationships	15
4.4 INTERNAL IDENTIFIERS WITHIN THE MODEL.....	15

4.5	CONTROLLED TERMINOLOGY	15
4.6	STUDY, PROTOCOLS, AND AMENDMENTS.....	15
4.7	STUDY IDENTIFIERS AND TITLES	17
4.8	STUDY DESIGN	19
4.9	STUDY ROLES AND ORGANIZATIONS.....	21
4.10	ARMS AND EPOCHS	24
4.11	ACTIVITIES	24
4.12	PROCEDURES	26
4.13	BIOMEDICAL CONCEPTS	26
4.14	STUDY TIMING	27
4.14.1	Timelines.....	28
4.14.2	Timing	29
4.14.3	Decisions and Branching.....	30
4.14.4	Profiles	31
4.14.5	Unscheduled Visits.....	32
4.14.6	Timeline Exit.....	33
4.15	STUDY INTERVENTIONS.....	33
4.16	STUDY OBJECTIVES AND ENDPOINTS	35
4.17	STUDY ESTIMANDS.....	36
4.18	POPULATIONS, COHORTS, AND ELIGIBILITY CRITERIA	36
4.19	ABBREVIATIONS.....	39
4.19.1	General	39
4.19.2	Referencing From Unstructured Text.....	40
4.19.3	Referencing From Syntax Templates	40
4.20	UNSTRUCTURED CONTENT.....	41
4.21	SYNTAX TEMPLATES	43
4.22	XHTML ATTRIBUTES	45
4.23	ADDRESSING FOOTNOTES.....	45
4.23.1	Footnotes Representing Sub-timelines	45
4.23.2	Footnotes Representing Timing and/or Order of Activities	46
4.23.3	Footnotes Representing Alternative Visit Schedules	47
4.23.4	Footnotes Representing Conditional Activities, Assessments, and Procedures	48
4.23.5	Additional timepoints Not Presented in the SOA.....	48
4.23.6	Footnotes Representing Optional Alternative Encounter Methods	48
4.23.7	Footnotes Representing Measurements to Be Done for a Specified Activity.....	49
4.23.8	Footnotes Representing Optional Alternative Measurement Methods	49
4.23.9	Additional Instructions for Procedures and/or Performing Assessments	49
4.23.10	Visit and Timing Window Information	50
4.23.11	Eligibility Requirements.....	50
4.23.12	Complex Combinations	50
4.24	COMPLEX STUDY DESIGNS.....	51
4.24.1	External control arms	51
4.24.2	Multiple Cohorts	52
4.24.3	Multistep Intervention Schedules	54
4.24.4	Basket, Umbrella, and Multiphased studies	55
4.24.5	Decentralized Trials	56
4.25	SCHEDULE OF ACTIVITY VIEWS	56
5	USDM DATA DICTIONARY.....	61
6	USDM API.....	90
6.1	GENERAL.....	90
6.2	SERIALIZATION.....	90
6.3	ADDITIONAL ATTRIBUTES AND REQUIRED CONTENT.....	90
6.3.1	API Additional Attributes	90

6.3.2	API Required Content	91
6.4	EXTENSION MECHANISM	91
7	MAPPING TO OTHER STANDARDS AND FORMATS.....	92
7.1	CREATION OF SDTM TRIAL DESIGN DOMAINS	92
7.2	INFORMING CLINICALTRIALS.GOV REGISTRY	92
7.3	INFORMING CTIS REGISTRY.....	93
7.4	CREATION OF M11 DOCUMENTS.....	93
7.5	USE OF USDM FOR POPULATING PROTOCOL CONTENT	93
8	APPENDICES.....	94
8.1	USDM TEAM	94
8.2	GLOSSARY AND ABBREVIATIONS	94
8.3	REFERENCES.....	97
8.4	REVISION HISTORY.....	97
8.4.1	USDM Implementation Guide	97
8.5	REPRESENTATIONS AND WARRANTIES, LIMITATIONS OF LIABILITY, AND DISCLAIMERS	103

1 Introduction

CDISC is collaborating with TransCelerate through [TransCelerate's Digital Data Flow \(DDF\) initiative](#) to develop a Study Definition Reference Architecture called the Unified Study Definitions Model (USDM). The USDM will serve as a standard model for the development of conformant study definition technologies.

The DDF will help modernize clinical trials by enabling a digital workflow with protocol digitization. This initiative establishes a foundation for a future state of automated and dynamic readiness that can transform the drug development process. Additional information can be found on the [TransCelerate Digital Data Flow Solutions](#) and the [CDISC DDF](#) web pages.

The collaborative effort between TransCelerate and CDISC has enabled the development of the USDM reference architecture in conjunction with development of a Study Definitions Repository (a reference implementation of the USDM architecture). For more information on the SDR, visit the [TransCelerate DDF GitHub site](#) and the [SDR Github site](#).

1.1 Purpose

The USDM Implementation Guide (USDM-IG) is intended for companies and individuals involved in the set-up of clinical studies—sponsors or stakeholders involved in upstream (protocol and content authoring tools)—and downstream consumers of system (e.g., electronic data capture (EDC), clinical trial management, trial master file) and document (e.g., protocol, clinical study reports, statistical analysis plans) standardized digitized study definitions.

This document provides users with sufficient information to understand the USDM and also its potential implementations with the study design process by showing examples of the types of study definition information that can be represented in the USDM.

1.2 Organization of this Document

This document is divided into the following sections:

- Section 1, [Introduction](#), provides an overall introduction to the purpose and goals of the USDM-IG.
- Section 2, [Fundamentals of the USDM](#), provides a boundary of the scope of this version of the USDM and what use cases this version is intended to support.
- Section 3, [Relationship to Other Standards and Formats](#), describes at a high level how the USDM relates to other standards (both CDISC and non-CDISC) and to the TransCelerate Common Protocol Template.
- Section 4, [USDM Features](#), provides an overview of enhancements that support increased trial complexity.
- Section 5, [USDM Data Dictionary](#), illustrates the types of information that can be represented using the USDM, and includes various study designs ranging in complexity.
- Section 6, [USDM API](#), provides information on the USDM application programming interface.
- Section 7, [Mapping to Other Standards and Formats](#), describes the alignment between the USDM and Study Data Tabulation Model (SDTM) Trial Design domains and controlled terminology elements, and provides definitions for protocol registration data elements submitted to ClinicalTrials.gov.
- [Appendices](#) provide additional background material and describe other supplemental material relevant to the USDM.

Examples of use of the model in JSON, .PNG, and .XLS format as well as other information can be found [here](#).

1.3 How to Read this Document

1. First, become familiar with the DDF project; see the [TransCelerate DDF Project web page](#) and [CDISC DDF resources](#). If you are new to DDF, visit the [TransCelerate DDF Initiative Solutions](#) site which includes a video describing DDF.

2. Read this guide all the way through (without skipping any sections) at least once.
3. Finally, revisit any sections of particular interest.

2 Fundamentals of the USDM

The USDM comprises 5 parts, which are official CDISC standards:

1. Unified Study Definitions Model (USDM) class diagram represented as a unified modeling language (UML) class diagram
2. Application programming interface (API) specification
3. CDISC Controlled Terminology
4. Unified Study Definitions Model Implementation Guide (USDM-IG)
5. CDISC USDM Conformance Rule Specifications

2.1 USDM v1.0

USDM v1.0 (released August 2022) provided a base model of structured study design.

Please note that USDM v1.0 did not have a corresponding implementation guide. The USDM-IG was initially developed for USDM v2.0 and further updated for USDM v3.0.

2.2 USDM v2.0

Building on the USDM v1.0 foundation, USDM v2.0 (released June 2023) was developed to satisfy an agreed set of use cases based around

- updates to the USDM that enable greater population of study startup (SSU) elements and represent structured study design information for more complex trials,
- updates to the USDM that support EDC automation, and
- updates to the USDM that demonstrate population of the TransCelerate Common Protocol Template (CPT).

2.2.1 Support for More Complex Trials

The first version of the USDM provided a model for simple study designs. Version 2.0 implemented additional elements that allow for representation of more complex study designs in USDM. Section 4, [USDM Features](#), provides an overview of enhancements that support increased trial complexity. One main area of development has been the implementation of study timing (see [Section 4.14](#)) within the model, allowing for complex timing and visit structures to be represented.

2.2.2 Enabling EDC Automation

In order to support EDC automation, the CDISC [Biomedical Concepts](#) model was adapted and included as a submodel in the USDM. The addition of biomedical concepts to the model adds a machine-readable "data" layer to the study design. This data layer can be used in a variety of ways to inform about what data relates to particular assessments within a study design. This biomedical concepts model not only assists in informing an EDC system as to the individual data items required for an assessment (e.g., automating identification of a form in an EDC library with the same/similar set of biomedical concepts) but also provide basic information required to build a new form should there be no EDC library, or no form that matches.

Implementation of the biomedical concepts model in the USDM provides a machine-readable data specification that can support other data-source use cases such as digital health technologies, electronic patient-reported outcomes (ePROs), and electronically supplied data (e.g., central lab, central ECG data).

2.2.3 Populating protocol standards

In Version 2.0, additional elements were added to the model as a proof-of-viability (POV) exercise, demonstrating that structured study design information could be moved from an upstream study design application into USDM format and then used to populate the TransCelerate CPT. Additional information on the USDM elements used for this POV can be found in Section 7.3, [Use of USDM for Populating Protocol Content](#). Note that only a selected set of CPT elements is included for the POV.

2.3 USDM v3.0

USDM v3.0 development topics included:

- Ability to represent the draft ICH Clinical electronic Structured Harmonised Protocol (CeSHarP) developed by the ICH M11 group in USDM
- Add elements to expand population of SDTM trial design datasets
- Identify elements within USDM that can assist in population of trial planning elements for clinical trial registration in trial registries
- Addition of elements and model amendments required to represent structured study design information for more complex studies, including complex cohort trial designs
- Model enhancements to support use of the USDM and ensure consistency within the model

2.3.1 Representation of ICH M11 CeSHarP in USDM

Working closely with ICH, USDM v3.0 was aligned to cover the breadth of sections found in the ICH M11 CeSHarP template. This allows a USDM study design to be represented in the ICH CeSHarP template. **Note:** At the time of publication of USDM v3.0, ICH CeSHarP was still in the development phase. In future phases of USDM development, CDISC will continue to collaborate with the ICH team in order to ensure that USDM remains aligned with the ICH M11 CeSHarP template.

2.3.2 SDTM Trial Design Population

During development of USDM v2.0, elements within the USDM were identified that would allow data from a USDM compliant system to be used to populate SDTM Trial Design datasets related to trial planning. This was expanded during USDM v3.0 development to include additional elements that could be used for SDTM Trial Design population. Additional information can be found in Section 7.1, [Creation of SDTM Trial Design Domains](#).

2.3.3 Clinical Trial Registry Population

Working alongside clinical trial registry subject-matter experts (SMEs), an evaluation was performed to determine how USDM could be used to assist in the population of elements required for clinical trial registries. In Version 3.0, this was restricted to ClinicalTrials.gov. Additional information can be found in Section 7.2, [Informing ClinicalTrials.gov Registry](#)

2.3.4 Support for More Complex Trials

An evaluation was performed to determine model changes that could support more complex cohort trials designs. This resulted in new USDM classes being developed (i.e., Population Definitions, Study Cohort, Characteristic) to support these types of studies. Additional information can be found in Section 4.19, [Populations, Cohorts, and Eligibility Criteria](#).

2.3.5 Model Enhancements

Version 3.0 included model enhancements to support use of the USDM and ensure consistency within the model, such as updating the unified modeling language (UML) to make it a more logical model, removing the API implementation elements and links, and making naming more consistent between classes. Additional information can be found in Section 4.2, [Principles](#); Section 4.3, [Naming Conventions](#); Section 4.4, [Internal Identifiers Within the Model](#); and Section 4.5, [Controlled Terminology](#).

2.4 USDM v4.0

USDM v4.0 development topics included:

- Continued representation of CeSHarP in USDM
- Participation in Utilizing the Digital Protocol (UDP) project with TransCelerate, ICH, and HL7 Vulcan
- Development of USDM Conformance Rule specifications to support USDM v3.0 and v4.0
- Continue support and development of test data and test tools

- Development of training and education materials in conjunction with TransCelerate's Change and Engagement team to foster adoption of DDF
- Model enhancements to support use of the USDM and ensure consistency within the model

2.4.1 Representation of ICH M11 CeSHarP in USDM

Working closely with ICH, USDM v4.0 has been aligned to cover the breadth of sections found in the latest versions of the ICH M11 CeSHarP template and Technical Specification. This will allow a USDM study design to continue to be represented in the ICH CeSHarP template. **Note:** At the time of publication of USDM v4.0, ICH CeSHarP was still in the development phase. In future phases of USDM development, CDISC will continue to collaborate with the ICH team in order to ensure that USDM remains aligned with the ICH M11 CeSHarP template and Technical Specification

2.4.2 Utilizing the Digital Protocol (UDP)

The Vulcan accelerator [UDP project](#) is a collaborative effort between TransCelerate, CDSIC USDM, and HL7 Vulcan to ensure alignment and interoperability between the ICH M11 CeSHarP template and Technical Specification, the UDP FHIR Implementation Guide, and the CDISC USDM deliverables.

2.4.3 USDM Conformance Rule Specifications

CDISC Conformance Rules are an integral part of any CDISC foundational standard and serve as the specific guidance to Industry for the correct implementation of the standards. During this phase CDISC has developed a set of conformance rule specifications to support USDM v3.0 and v4.0 that will aid implementers to ensure solutions conform with the USDM reference architecture (RA), purchasers to ensure products being acquired meet the requirements, and collaborating organizations to ensure that their study builds are interoperable at least in terms of the scope of the RA.

2.4.4 Test Data and Test Tools

Test data and tooling, although not an official standard deliverable for USDM, provide examples of how study design information can be represented in USDM and provide implementers with guidance on mapping study design elements to USDM. A series of publicly available protocols have been mapped to USDM (see the [USDM GitHub Examples](#)).

2.4.5 Training and Education Materials

CDISC is developing an official CDISC education course which when developed will offer both in-person and on-demand USDM training opportunities.

2.4.6 Model Enhancements

Version 4.0 includes model enhancements to support use of the USDM. Details of model changes can be found in Appendix D, [Revision History](#). Enhancements developed for USDM v4.0 include enhanced support for:

- Notes and criteria
- Activity groups
- Multiple template support (M11 alignment)
- Abbreviations
- Interventions, identifiers, and roles (M11 alignment)
- Amendments (M11 alignment)
- Estimands (M11 alignment)
- Observational and device studies

3 Relationship to Other Standards and Formats

The USDM covers a wide range of concepts related to study design that also appear in other published standards such as trial registry standards ([EudraCT](#), [ClinicalTrials.gov](#)), [HL7 FHIR](#) standards, and [ICH](#) guidance documents. As part of the development process, these standards were used as input in order to try to ensure harmonization with these standards, where possible.

3.1 Relationship to Other CDISC Standards

The USDM development process relies on published CDISC standards and other products that serve as references for modeling and naming conventions. To the extent possible, an effort has been made to align or be compatible with these sources where the content was determined to be conceptually identical or closely related to those being developed for the USDM.

3.1.1 BRIDG

The Biomedical Research Integrated Domain Group (BRIDG) is a CDISC, [HL7](#), and [ISO](#) information model "used to support development of data interchange standards and technology solutions that will enable semantic (meaning-based) interoperability within the biomedical/clinical research arena."^[1] BRIDG can be used for various purposes: as a reference model, a data integration/mapping solution, an exchange format, an ontology, or to create a BRIDG-based database. The use of BRIDG helps support the meaningful exchange of data between software systems and databases.

When BRIDG is used as a reference model to create or add new content to a standard, it can help ensure that relationships between and among biomedical research concepts represented using the standard are consistently modeled.

3.1.2 PRM

The [Protocol Representation Model](#) (PRM) provides a standard for planning and designing a research protocol with focus on study characteristics such as study design; eligibility criteria; and requirements from [ClinicalTrials.gov](#), [World Health Organization](#) (WHO) registries, and [EudraCT](#) registries. The PRM assists in automating CRF creation and EHR configuration to support clinical research and data sharing.

Note: The PRM was released in 2012 and includes some overlap with the USDM. It is anticipated that the USDM will develop to be more content rich and implementable as a model and will therefore supersede the PRM.

3.1.3 SDTM and SDTMIG

The [SDTM](#) provides a standard for organizing and formatting data to streamline processes in collection, management, analysis, and reporting. Implementing SDTM supports data aggregation and warehousing, fosters mining and reuse, facilitates sharing, helps perform due diligence and other important data review activities, and improves the regulatory review and approval process. The SDTM provides a standard for organizing and formatting data for human and animal studies; the [SDTM Implementation Guide](#) (SDTMIG) is intended to guide the organization, structure, and format of standard clinical trial tabulation datasets. The SDTMIG was developed to support data submitted to a regulatory authority, such as the US Food and Drug Administration (FDA), but is not restricted to use in regulated submissions. The SDTM is 1 of the required standards that sponsors must use, as specified in the FDA's Data Standards Catalog,^[2] for New Drug Applications (NDAs), Abbreviated New Drug Applications (ANDAs), and certain Biologics License Applications (BLANDAs).

The SDTMIG includes a section related to Trial Design Model datasets. Section 9.1 (Annex IIIa and Annex IIIb) of the ICH *Guideline for Industry: Structure and Content of Clinical Study Reports*^[3] calls for a brief, clear description of the overall plan and design of the study, and supplies examples of charts and diagrams for this purpose. Each annex corresponds to an example trial and provides a diagram describing the study design and a table showing the schedule of assessments. The Trial Design Model provides a standardized way to describe aspects of the planned conduct of a clinical trial shown in the study design diagrams of these examples. Standard Trial Design datasets allow reviewers to

- clearly and quickly grasp the design of a clinical trial,
- compare the designs of different trials,
- search a data warehouse for clinical trials with certain features, and
- compare planned and actual treatments and visits for subjects in a clinical trial.

Modeling a clinical trial in this standardized way requires the explicit statement of certain decision rules that may not be addressed or may be vague or ambiguous in the usual prose protocol document. Prospective modeling of the design of a clinical trial should lead to a clearer, better protocol. Retrospective modeling of the design of a clinical trial should ensure a clear description of how the trial protocol was interpreted by the sponsor.

Automated creation of SDTM Trial Design datasets is possible using data structured in USDM v3.0 format as detailed in Section 7.1, [Creation of SDTM Trial Design Domains](#).

3.1.4 Controlled Terminology

CDISC, in collaboration with the [National Cancer Institute's \(NCI\) Enterprise Vocabulary Services \(EVS\)](#), supports the controlled terminology (CT) needs of the CDISC standards. *Controlled terminology* is the set of codelists, definitions, and valid values used with CDISC model elements. Within CDISC there are many volunteer teams that evaluate and manage CDISC CT. For example, the Protocol Entities Terminology Team develops and publishes the semantics for concepts found in clinical research protocols; the CDISC Glossary Team harmonizes the semantics and definitions for concepts commonly found in CDISC standards documents. The DDF terminology subset of CDISC CT is one of the main deliverables supporting the USDM, and development of CDISC CT for the USDM has been harmonized with existing, published CDISC CT (including SDTM, Protocol, and CDISC Glossary) in order to ensure maximum reuse of terms and definitions. Any new CT that has been developed for the USDM has undergone review from the Protocol Entities and CDISC Glossary Teams. USDM-related CT is developed and published using the same process as all other CDISC CT, in order to ensure a consensus-based, fit-for-use, and harmonized set of terms.

3.1.5 CTR

[Clinical Trial Registry \(CTR\)-XML](#) lets technology vendors implement tools that support a “write once, use many times” solution based on a single XML file that holds the information needed to generate submissions for multiple clinical trials for clinical trial registry submissions, primarily to the WHO, the European Medicines Agency (EMA), the EudraCT registry, and [ClinicalTrials.gov](#) (US).

Working alongside clinical trial registry SMEs, an evaluation was performed to determine how USDM could be used to assist in the population of elements required for clinical trial registries. In Version 3.0, this was restricted to [ClinicalTrials.gov](#). Additional information can be found in Section 7.2, [Informing ClinicalTrials.gov Registry](#).

3.1.6 ODM

[Operational Data Model \(ODM\)-XML](#) is a vendor-neutral, platform-independent format for exchanging and archiving clinical and translational research data, along with their associated metadata, administrative data, reference data, and audit information. The ODM-XML facilitates the regulatory-compliant acquisition, archival, and exchange of metadata and data. It has become the language of choice for representing CRF content in many EDC tools.

ODM-XML v2.0 (released August 2023) added significant functionality to the ODM standard, including:

- Multilingual support
- Data query support
- Traceability (Trace-XML features) support
- HL7 FHIR interoperability
- Study/Trial Design Model in XML (SDM-XML) integration and enhancement
- CDISC 360 support
- Data capture

Although the USDM is a reference model and the ODM is a transport model, there is overlap between the standards in terms of elements related to study design (e.g., biomedical concepts) and elements related to EDC build (e.g., visits, forms, variables). Therefore, during the development of the USDM, areas of development for ODM-XML v2.0 were investigated and, where possible, aligned with USDM.

3.1.7 SDM

Study/Trial Design Model in XML (SDM-XML) is an extension of the ODM-XML and allows organizations to provide rigorous, machine-readable, interchangeable descriptions of the designs of their clinical studies, including treatment plans, eligibility, and times and events. SDM-XML defines 3 key submodules (i.e., structure, workflow, timing), permitting various levels of detail in any representation of a clinical study's design.

Note: SDM v1.0, released in 2011, was incorporated into ODM-XML v2.0. The SDM was used as an input reference model during the development of the USDM.

3.2 Relationship to Other Standards

3.2.1 ICH M11 Guideline, Clinical Study Protocol Template, and Technical Specifications

The ICH M11 guideline[4] introduced CeSHarP; the technical specification ensures that protocols are prepared in a consistent fashion and provided in a harmonized data-exchange format acceptable to regulatory authorities. The guideline, clinical study protocol template, and technical specifications were released in October 2022 for public review; where possible, these were used as reference input during USDM v4.0 development. Working closely with ICH, USDM v4.0 has been aligned to cover the breadth of sections found in the ICH M11 CeSHarP template. This allows a USDM study design to be represented in the ICH CeSHarP template. **Note:** At the time of publication of USDM v4.0, the ICH CeSHarP was still in the development phase. In future phases of USDM development, CDISC will continue to collaborate with the ICH team in order to ensure that USDM remains aligned with the ICH M11 CeSHarP template.

3.2.2 HL7 FHIR SOA

The Vulcan Schedule of Activities (SoA) Project defines a pattern for a clinical trial SOA structure using FHIR resources and processes that enables sharing, interpretation, and implementation in healthcare (EHR, PHR) systems. When a subject is enrolled in a study, research personnel will be able to attach them to the ResearchSubject and ResearchStudy, connecting the CarePlan with the schedule of activities (the research visits and corresponding tests/activities).

3.2.3 IDMP

The ISO IDMP standards specify the use of standardized definitions for the identification and description of medicinal products for human use. The EMA is implementing the standards in a phased program while the FDA evaluated compatibility with currently used standards and is taking next steps for further alignment. USDM v4.0 includes a new extended intervention part that aligns with administrable product, ingredient, substance, and medical device parts of IDMP. However, not all required elements for IDMP could be included in USDM since some of these elements are the outcome of the clinical trials that are designed (e.g., drug indication, effective dose).

4 USDM Features

- [Overview](#)
- [Principles](#)
- [Naming Conventions](#)
- [Internal Identifiers Within the Model](#)
- [Controlled Terminology](#)
- [Study, Protocols, and Amendments](#)
- [Study Identifiers and Titles](#)
- [Study Design](#)
- [Study Roles and Organizations](#)
- [Arms and Epochs](#)
- [Activities](#)
- [Procedures](#)
- [Biomedical Concepts](#)
- [Study Timing](#)
- [Study Interventions](#)
- [Study Objectives and Endpoints](#)
- [Study Estimands](#)
- [Populations, Cohorts, and Eligibility Criteria](#)
- [Abbreviations](#)
- [Unstructured Content](#)
- [Syntax Templates](#)
- [XHTML Attributes](#)
- [Addressing Footnotes](#)
- [Complex Study Designs](#)
- [Schedule of Activity Views](#)

4.1 Overview

The USDM normative form is a UML model. The USDM provides the ability to define a version of a clinical study that includes:

1. The main study details, such as:
 - a. Versions and content of study definition documents (e.g., a protocol that the study relates to)
 - b. Various identifiers allocated to the study
 - c. Study roles and organizations
 - d. Study amendment details
2. One or more study designs within the study, with each study design detailing:
 - a. Arms and epochs within the design and the relationships between them
 - b. Encounters planned for the study and the relationship with the epochs of the study
 - c. Timing of collection of data and the performance of procedures
 - d. A detailed data specification for the data to be captured as part of the study
 - e. Procedures to be performed as part of the study design
 - f. Subject populations defined within the study design
 - g. Objectives, endpoints, and estimands defined within the study design
 - h. Interventions defined as part of the study design
 - i. The relevant indications
 - j. Biospecimen retention information

Although the USDM is designed to hold and exchange a single version of a study, the model can be used to implement systems that hold multiple versions of multiple studies.

Note: The use of the terms above and their respective definitions are defined within the USDM class definitions and the related controlled terms.

4.2 Principles

The main principles applied to the development of the USDM include:

- Try not to reinvent the wheel. At the same time, improve. Use and learn from existing models.
- Align with existing CDISC models as much as possible but do not be constrained by them.
- Where sensible, provide standardized codes from CDISC CT. Allow for aliases.
- Allow for references to any CT where sensible.
- Do not recreate the paper world.
- Be aware of model versus presentation.
- The model should represent a complete protocol, not a partially completed one. Implementors should be able to relax constraints if they are building protocols.
- The model should not prevent implementors from extending the model.
- Keep the approach simple at the start; iterate, learn, and add complexity as it is understood.
- Support the planned design, not subsequent execution.
- Support the whole protocol document.

With respect to terminology, principles include:

- Standardize on a codelist/value set; be prescriptive.
- Where there is misalignment, standardize on the best global standard.
- Allow for regional differences (e.g., FDA in the US).

4.3 Naming Conventions

4.3.1 General

The USDM defines standard naming conventions. This includes improving the names of classes and, in particular, attributes to make the model more implementation friendly.

This section details the conventions used for naming and the use of attribute data types.

4.3.2 Class and Attribute Naming

The naming convention as currently used is:

- Nouns are used for class names.
- Every class has an attribute named "id" such that a unique identifier, within the scope of a study, can be allocated to instances of the class.
- A class can have a number of standard attributes. The attribute names should not be used for any other purpose than:
 - name: the literal identifier (i.e., distinctive designation) for an instance of the class
 - description: a narrative representation for an instance of the class
 - label: the short descriptive designation for an instance of the class
 - notes: a USDM relationship between the class and the CommentAnnotation class which provides the set of notes related to the class

Note: a class may employ these attributes if they are required and thus not all classes use them.

- A class can have additional attributes.

4.3.3 Data Types

Attributes have been provided with simple data types or 1 of the following complex data types:

- Code: Including a reference to the corresponding code system, code system version, and decode value
- AliasCode: Allowing to refer to a standard code and 1 or more standard code aliases
- Quantity: Including a value and an optional unit

- Range: Including a minValue and maxValue quantity and an indication whether the range is approximate
- QuantityRange: An abstract class which can be inherited either by a Quantity or a Range
- Duration: Including a text, quantity, indication if duration will vary, and the reason duration will vary.
- PersonName: Aligning to the FHIR HumanName datatype and including person name details like familyName, givenNames, prefixes, and suffixes
- CommentAnnotation: Including free text and optional codes as needed for the purpose

The complex datatypes are further specified via separate classes in the data model.

4.3.4 Relationships

Relationships have, in general, been formed from the names of the class at either end of the relationship with singular names used for one-to-one relationships and plural names used for one-to-many relationships.

4.4 Internal Identifiers Within the Model

Each class defined within the UML has an identification attribute that can be used to provide a unique identifier for an instance of the class. The identifier should be unique and self-consistent within the scope of a version of a study. No attempt is made to define the form, type, or structure of these identifiers apart from that they are expected not to contain spaces; the attributes are defined as strings.

The only exception is the identifier at the head of the model within the Study class. Implementors are free to allocate the value to this field using, for example, a UUID, to ensure uniqueness within the implementation.

4.5 Controlled Terminology

Controlled terminology is referenced in multiple places across the USDM. So as to provide a mechanism to refer to controlled terms in a consistent manner, the USDM employs the Code class. The Code class uses 4 attributes to define the term being used (a code and decode pair), the terminology from which the term is taken, and the version of that terminology. This allows for any controlled term—whether CDISC, SNOMED, LOINC, or other—to be referred to in a consistent manner.

Certain attributes within the USDM Code class have been constrained to using terms from a given codelist from specified terminologies; these are specified in the controlled terminology spreadsheet. Although most of the terms referenced are CDISC CT, some other controlled vocabularies are referenced.

Where a standard code (typically a CDISC code but not always) is demanded by the model but flexibility is desirable/needed, users may include other terms (aliases) using the AliasCode class. Here 1 standard term is required but zero, 1, or more aliases can be provided. One particular instance is geographic references. The standard code should be from [ISO 3166](#); other code aliases (e.g., [GENC](#)) can be provided.

4.6 Study, Protocols, and Amendments

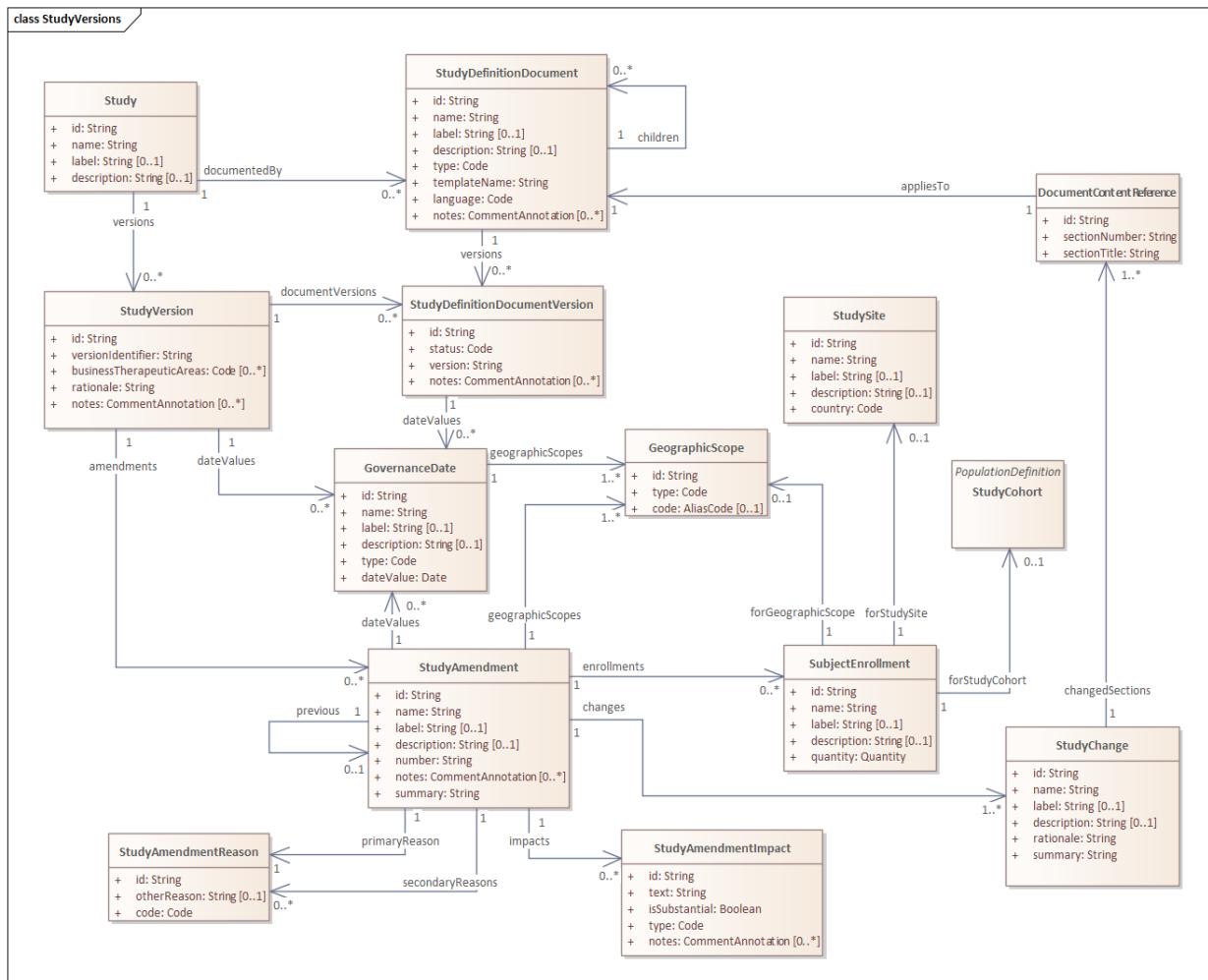
The Study class is the root of the USDM, collecting together the definition of the study and its corresponding versions as a whole. A study is documented by a study definition document, which usually is a protocol but could be of other types. The overarching study and the study definition document each have their versioning with corresponding governance dates. These dates are to be focused to a specific geographic scope (e.g. global, regional, country).

Because the traditional paper/PDF protocol document has been split into 2 parts (i.e., the document and an electronic design using the USDM), there is a need to link which electronic definition is valid with which version of the document. The study version links the study with its constituent parts that include 1 or more study designs (see [Section 4.8](#)), amendments, identifiers, and titles (see Section 4.7, [Study Identifiers and Titles](#)) for the study. The Study Version class or Study Design class refers to the corresponding instance in the StudyDefinitionDocumentVersion class to define to which versions of an external document the study definition

relates. The StudyVersion class allows for stating the business therapeutic area. **Note:** The business therapeutic area is provided for downstream processes and for sponsor organizations to define the business areas within the enterprise handling the study. It should be noted that business therapeutic area is not the same as the therapeutic area defined in the StudyDesign class.

A study version may represent an amendment. Corresponding amendment details—including reasons for the amendment, number or percentage of subjects enrolled at time of amendment, list of amendment changes, and substantial impact per type—are captured in the StudyAmendment class and corresponding subclasses. All amendment details may be reflected in the corresponding study definition document version. The content of this study definition document version is captured in the USDM as unstructured content (see [Section 4.20](#)) and may include direct linkage to the specific study amendment information. Each amendment includes 1 or more changes. Each change can be detailed with a summary, a rationale, and 1 or more references to specific sections of the current study definition document that are changed.

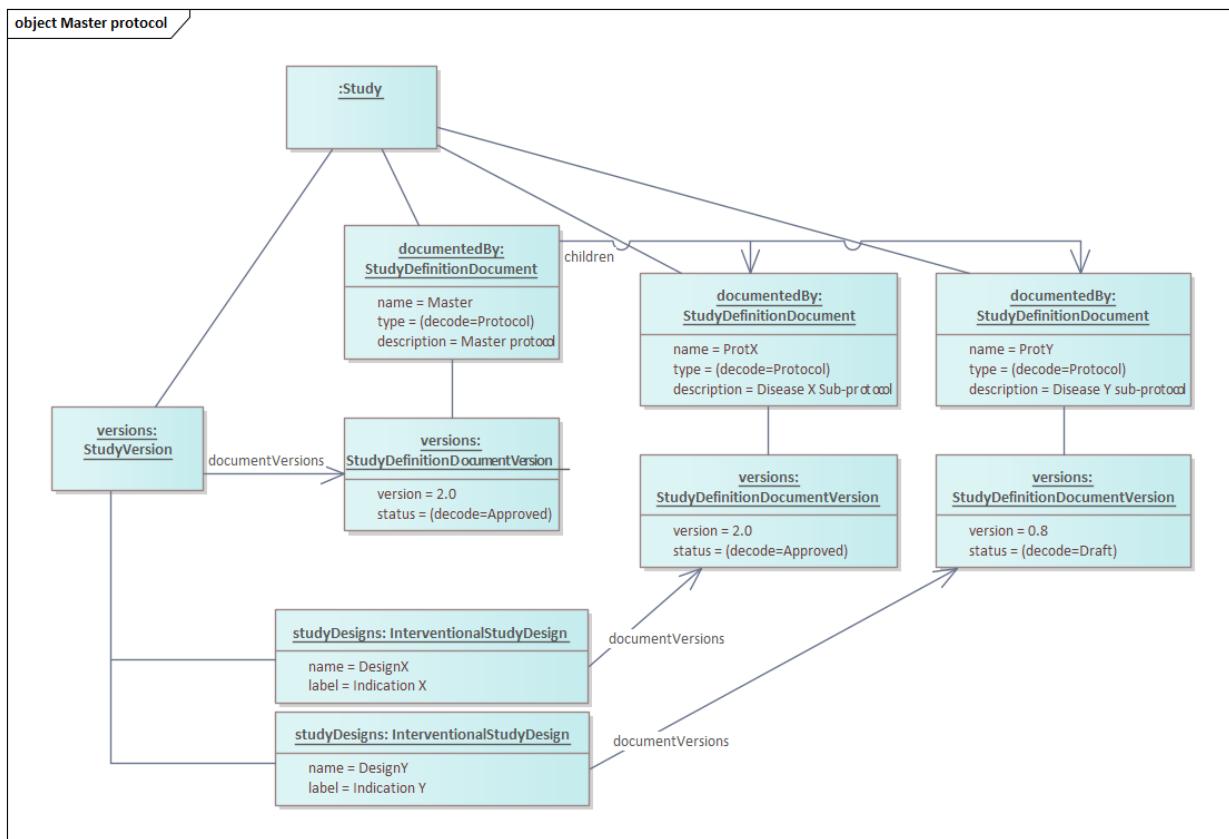
Abbreviations that are used to describe the study design are defined at the study-version level and can be reused (e.g. referenced) both in the syntax template text (e.g., for eligibility criteria or assessment conditions) as well as in unstructured document content. Some examples are presented in [Section 4.19, Abbreviations](#). The full list defined for the study can also be used to automatically create the full list of abbreviations in the study protocol.



Typically, there would be a one-to-one relationship between study version and study design with 1 or more protocol versions related to the study covering the different designs. Multiple study designs are permitted so as to accommodate multiple designs that test, for example, multiple drugs and/or multiple subpopulations in parallel under a single (master) protocol without a need to copy all study details for each sub-trial.

The following instance diagram shows an example of a study with multiple designs involving multiple study definition documents. In this diagram, there is 1 master basket trial protocol referred to from the StudyVersion class.

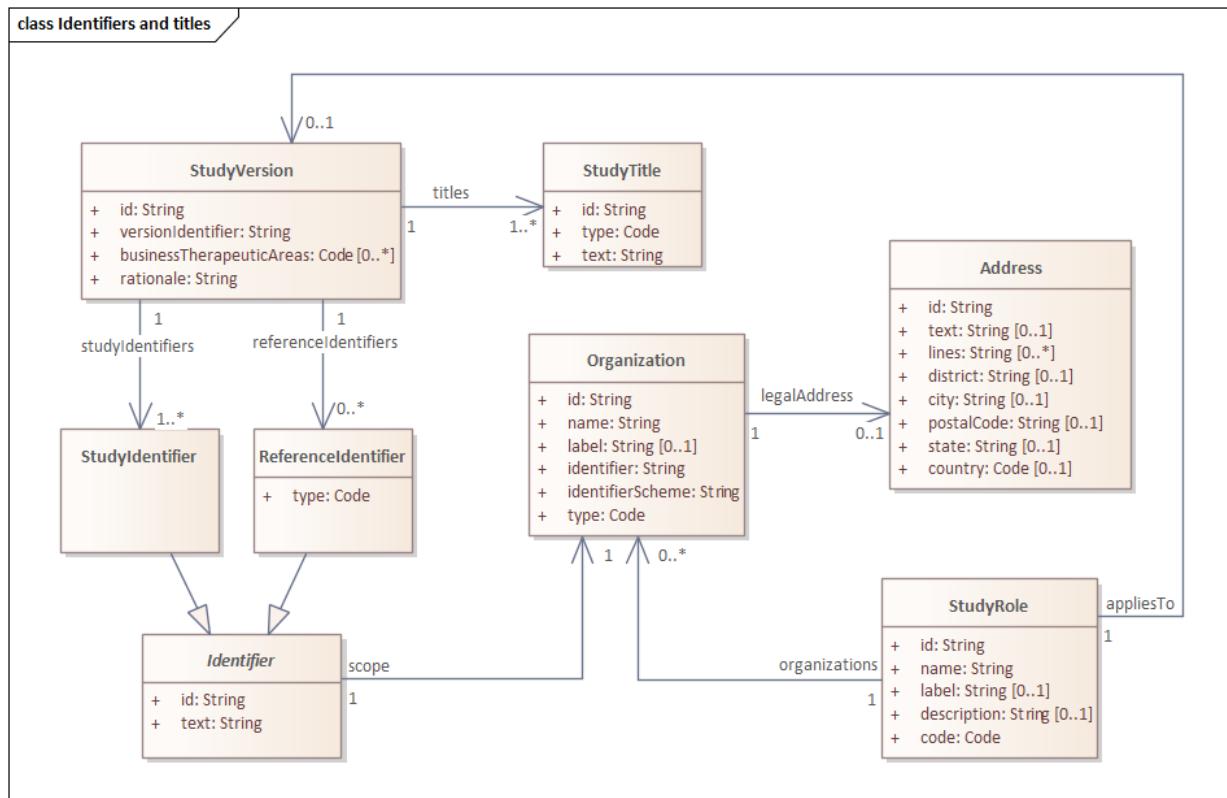
This master protocol has several children which in this case specify the specific details for the different indications that are included for the same experimental intervention. Each study design is in this case specific for an indication and points to the corresponding document versions of the child protocols. Note that for each version the maturity status may differ (e.g., draft, approved), which reflects a staged approach of study designs for multiple indications (basket), multiple drugs (umbrella), or multiple phases.



Note that instance diagrams are created to show a single use case. Not all required attributes and relationships are presented in the instance diagrams.

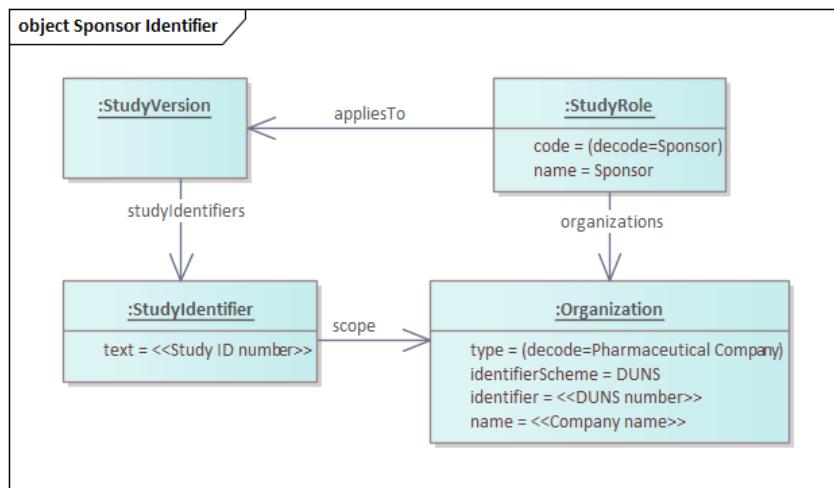
4.7 Study Identifiers and Titles

Study identifiers, reference identifiers, and titles are stored in separate dedicated classes as presented in the UML below and are referred to from out of the **StudyVersion** class. A study identifier specifically identifies the study represented in the data model. A reference identifier is optional and identifies an overarching (e.g., pediatric investigational plan number, clinical development plan number).

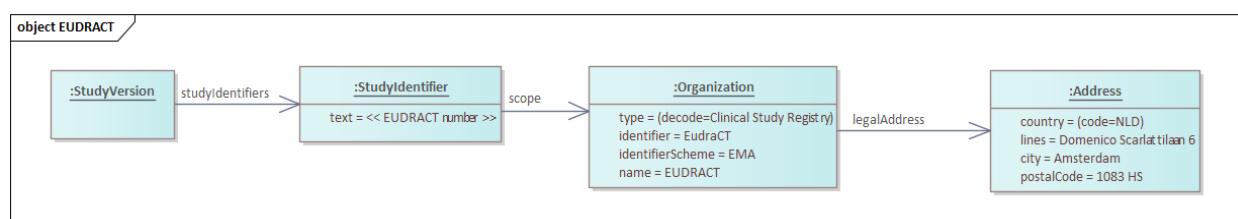
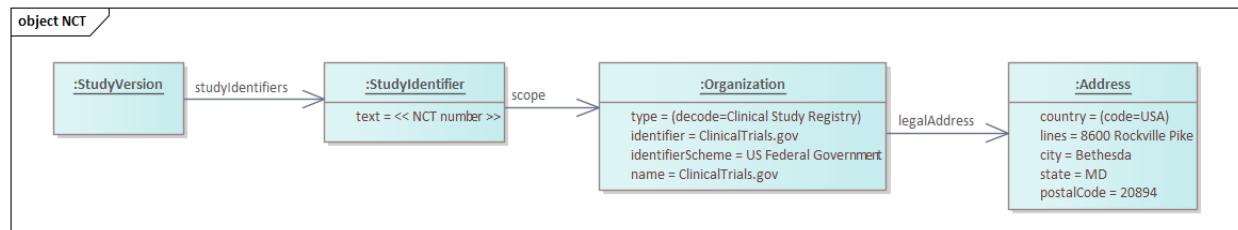


One or more study titles are required for a study. They can be of different types (e.g., official, scientific, short titles). If available, the acronym should be stored as a title as well, specifying the type as acronym.

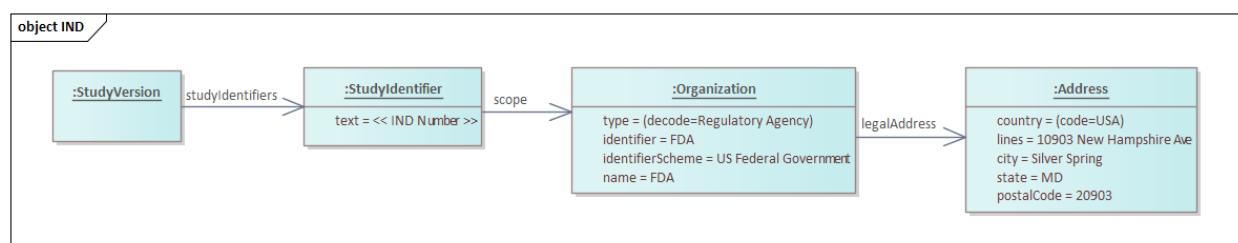
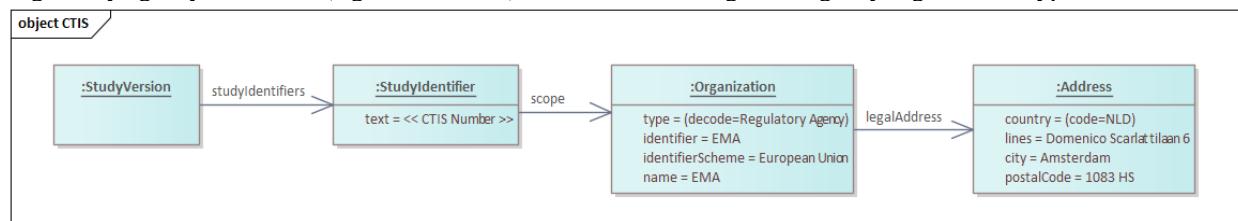
The **StudyVersion** class allows for including 1 or more study identifiers. Although multiple identifiers are permitted, the study definition should have 1, and only 1, sponsor identifier. A sponsor identifier is identified by its scope of an organization that has the Sponsor study role as shown in the following instance diagram. Identifiers of co-sponsors may be linked in a similar fashion to the co-sponsor study role.



Registry identifiers (e.g., NCT and EudraCT numbers) should refer to a clinical study registry organization type as presented in the following diagram.



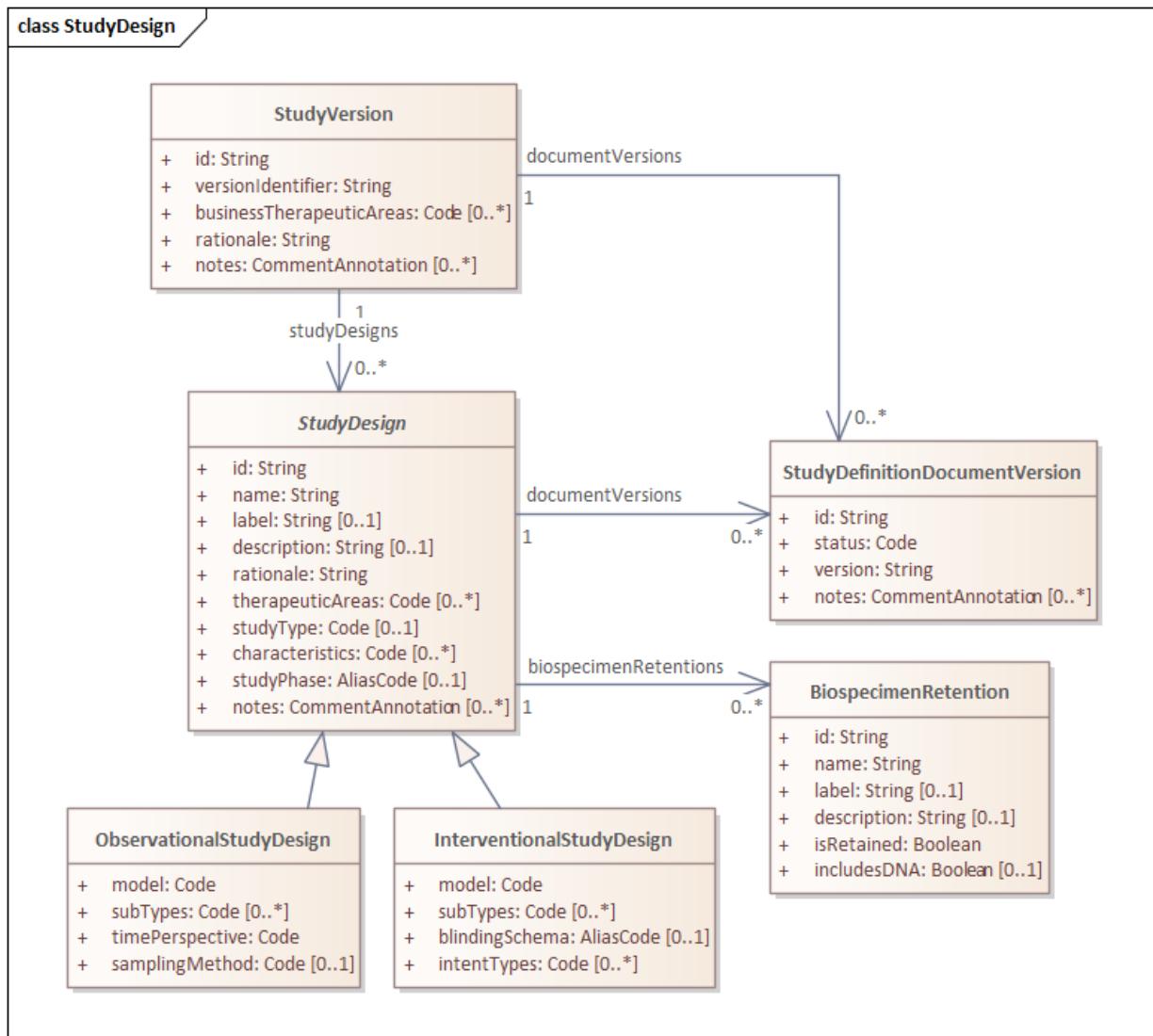
Regulatory agency identifiers (e.g., CTIS, NCT) should refer to a regulator agency organization type:



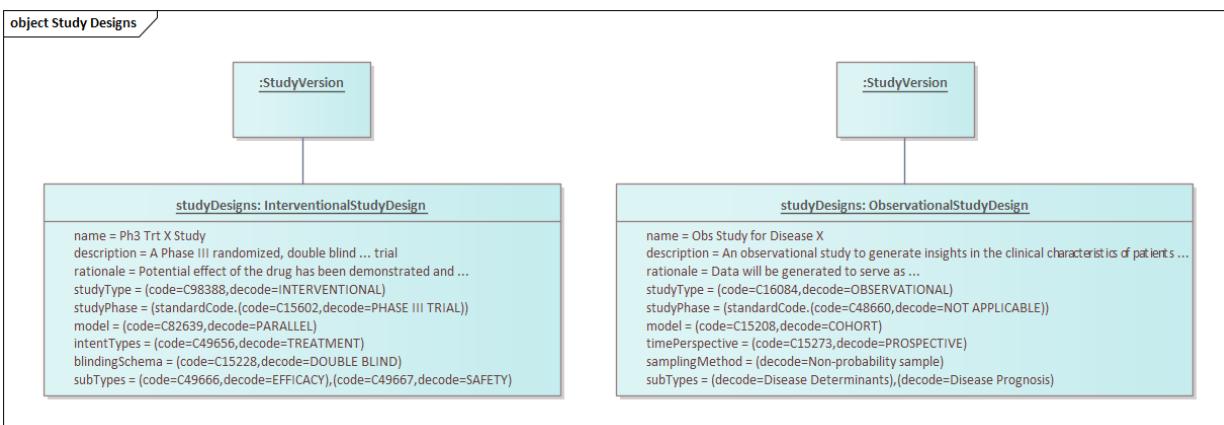
Note that not all attributes (required and optional) and relationships are presented in these instance views. Also note the use of ISO 3166-1 country codes within the address field referenced by the organization class.

4.8 Study Design

The StudyDesign class is the container for a single design within a study definition. It can be populated as either an observational study design (ObservationalStudyDesign class) or interventional study design (InterventionalStudyDesign class). Both classes inherit all the study design features from the StudyDesign class and include references to study timelines (see Section 4.14, [Study Timing](#)); objectives and endpoints (Section 4.16); populations (see [Section 4.18](#)); study interventions (see [Section 4.15](#)); and design elements like arms, epochs, and encounters (see [Section 4.10](#)). It provides the slots for key parameters such as therapeutic area, study phase, and study type. Specific interventional or observational study design parameters referring to their own specific controlled terminology are stored in the corresponding classes. Trial types are stored as subTypes in the InterventionalStudyDesign class as well as intent types, blinding schema, and intervention model. Observational subtypes and model are stored in the ObservationalStudyDesign class together with timePerspective and samplingMethod.



The following instance examples show how study design elements may be populated for interventional and observational studies.



Note that instance diagrams are created to show a single use case. Not all required attributes and relationships are presented in the instance diagram.

The StudyDesign class provides a place to store 1 or more codes defining the therapeutic area to which the study design relates from a regulatory perspective. No controlled terminology is provided for the population of this therapeutic area field; the following table details controlled vocabularies that are available for users to populate 1 or more values into the attribute.

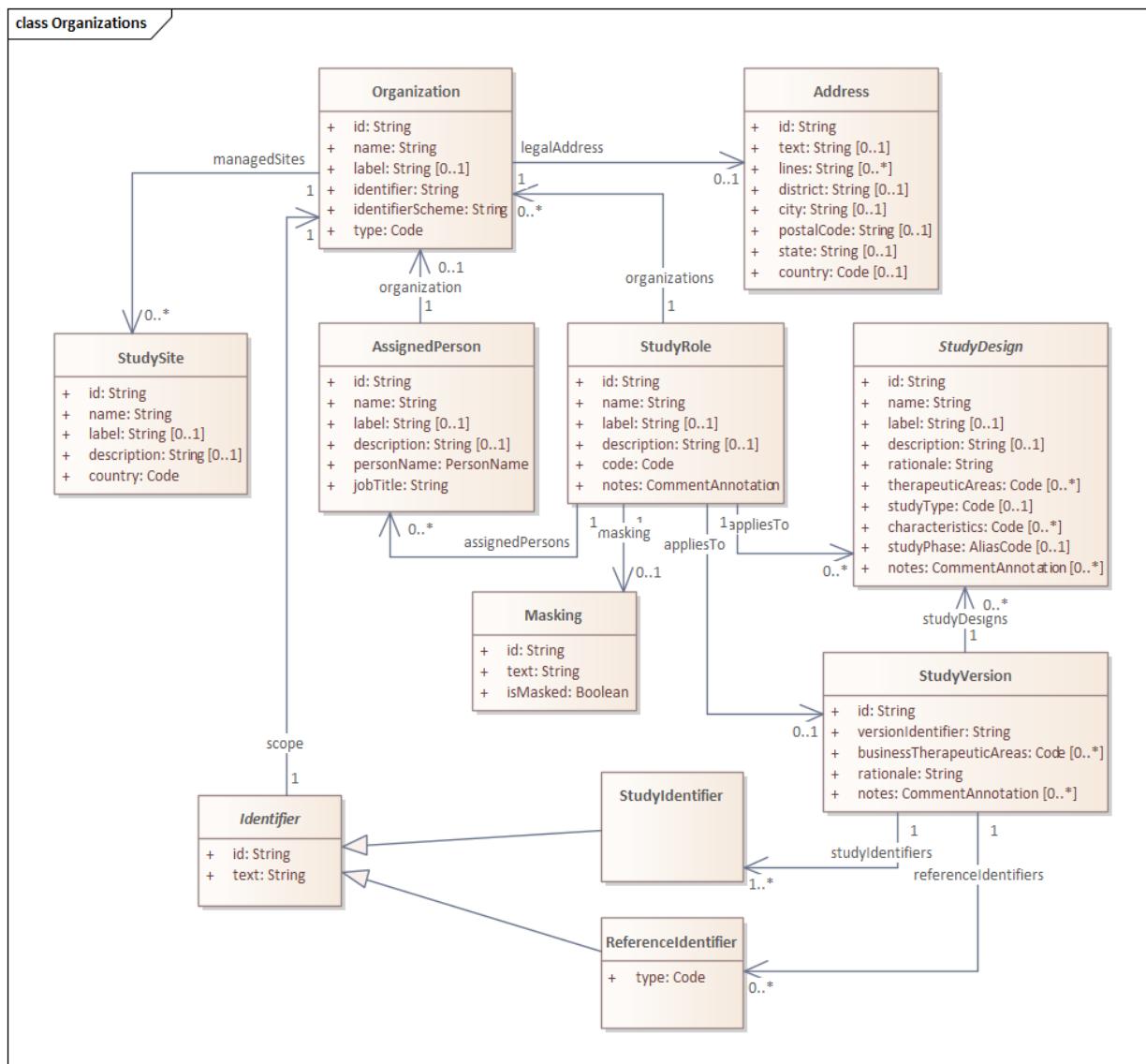
Dictionary/Terminology	URL
EudraCT	https://eudraact.ema.europa.eu/docs/technical/EUDRACT_Eutct_Pick_Lists_and_coded_values_v1_0.xls
ICD-10	https://www.icd10data.com/ICD10CM/Codes
MedDRA	https://www.meddra.org/
MeSH	https://www.ncbi.nlm.nih.gov/mesh/
NCI Thesaurus	https://ncit.nci.nih.gov/ncitbrowser/
SNOMED-CT	https://www.nlm.nih.gov/healthit/snomedct/index.html
US FDA	https://www.fda.gov/drugs/development-resources/spectrum-diseasesconditions

4.9 Study Roles and Organizations

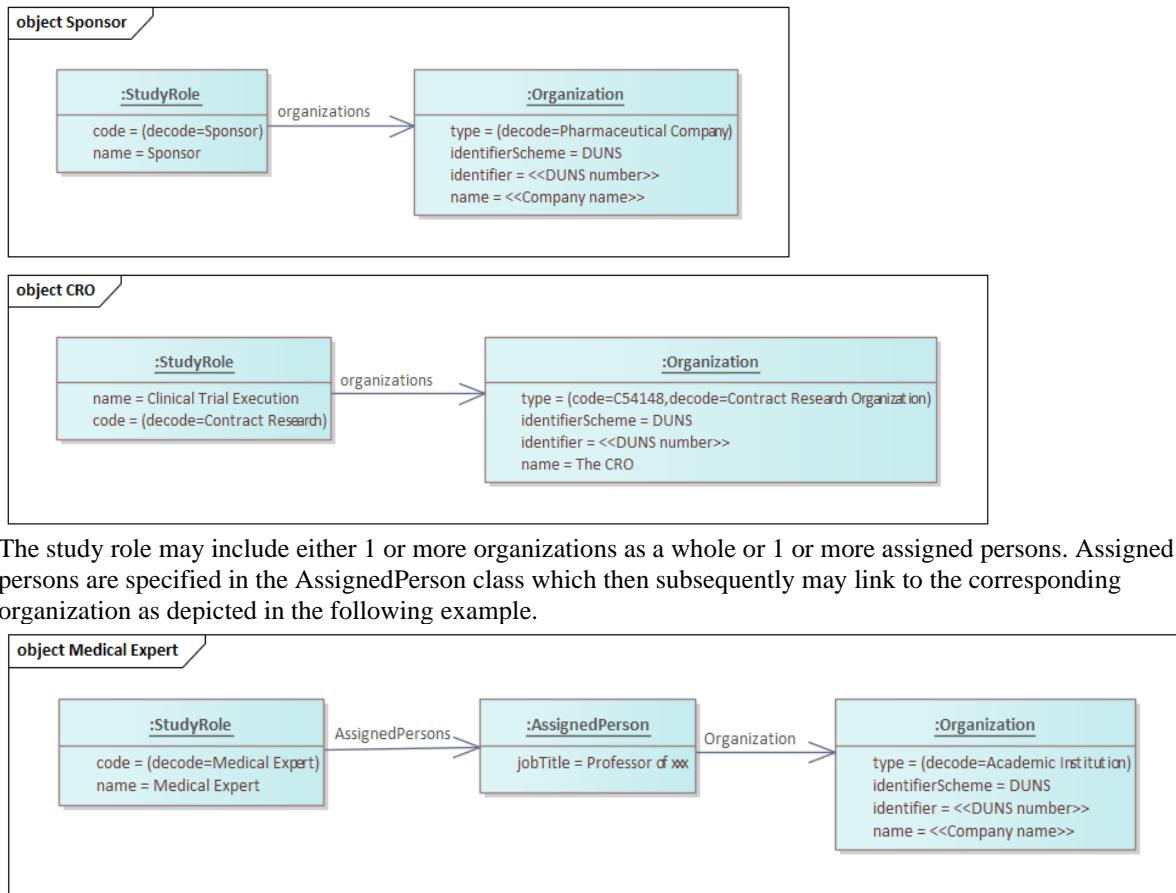
A clinical study may include a number of different roles on different levels (e.g., sponsors, investigators, monitoring committees). These roles are stored in the StudyRole class. A role may apply to the study as a whole or to 1 or more study designs specified within that study.

Names of persons assigned to a study role are specified in the AssignedPerson class. The actual name is to be specified in the personName complex datatype attribute which allows for specification of given names, family names, prefixes and suffixes as well as the complete text of the name. If no specific persons are assigned to the role then the StudyRole may directly link to an organization being responsible for the role as a whole. The organization type identifies what kind of organization is specified (e.g., pharmaceutical company, healthcare facility, contract research organization (CRO), regulatory agency). An identifier should be referring to 1 of the defined organizations as its scope (see [Section 4.7](#)).

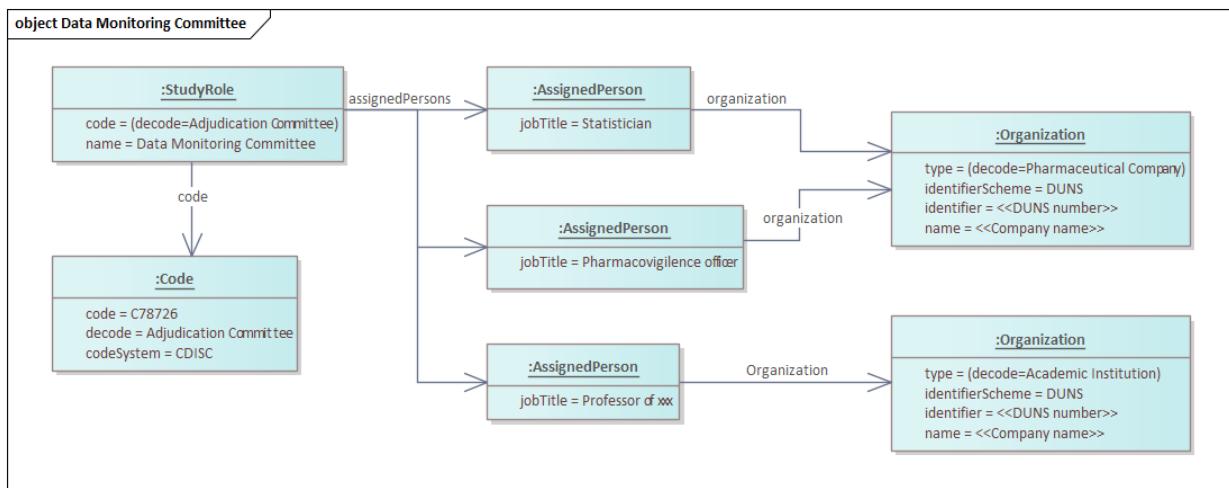
An organization can optionally manage 1 or more study sites. These study sites may be referred to in case a subject enrollment status for an amendment is specific for a site (see Section 4.6, [Study, Protocols, and Amendments](#)). If a role is masked in a study then this can be further specified in the Masking class.



Examples of a sponsor entry and a CRO entry are presented below. In case of a commercial organization, the DUNS number is expected to be specified to uniquely identify the commercial entity.



The following example shows how a data monitoring committee includes more assigned persons referring to their respective organizations.



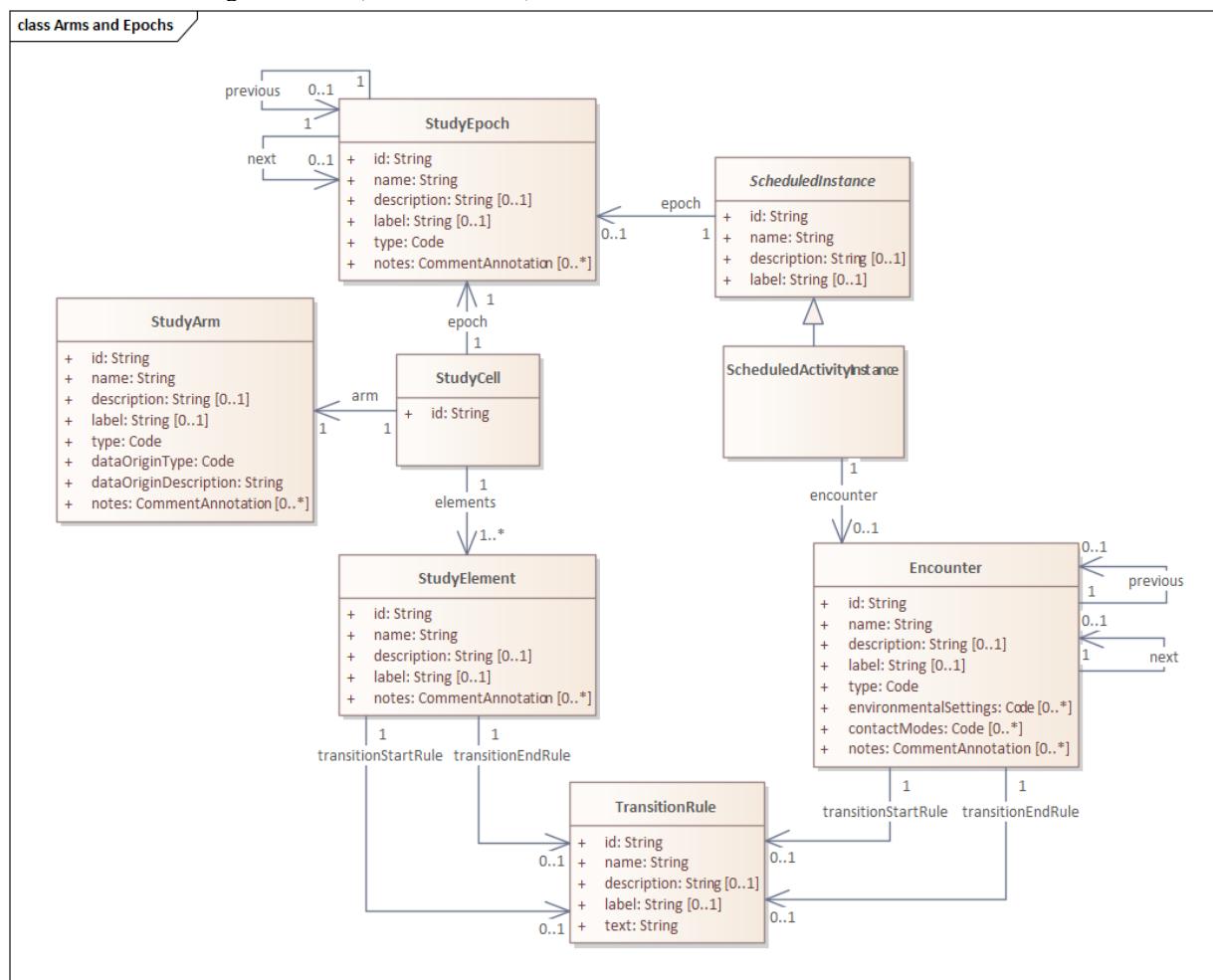
Note that instance diagrams are created to show a single use case. Not all required attributes and relationships are presented in the instance diagrams.

4.10 Arms and Epochs

The high-level study design based on arms and epochs is defined using the StudyArm, StudyEpoch, StudyCell, and StudyElement classes. The manner in which the classes are used follows the CDISC SDTM. Epochs are related to the study encounters (a more generic term for visits) via ScheduledInstances that form a ScheduleTimeline (see Section 4.14, [Study Timing](#)). StudyElements can relate to the corresponding studyInterventions that are planned for the specific StudyArm and in the specific StudyEpoch.

StudyElements and Encounters have entry and exit rules that are defined using the TransitionRule class. It should be noted that although the StudyElements and Encounter classes share the use of the TransitionRule class, it is not expected that the instances within any study design will overlap; they are, most likely, distinct sets.

Given that the use of the classes is based on the SDTM, the information within these classes can be used to populate the SDTM Trial Design domains (see [Section 7.1](#)).



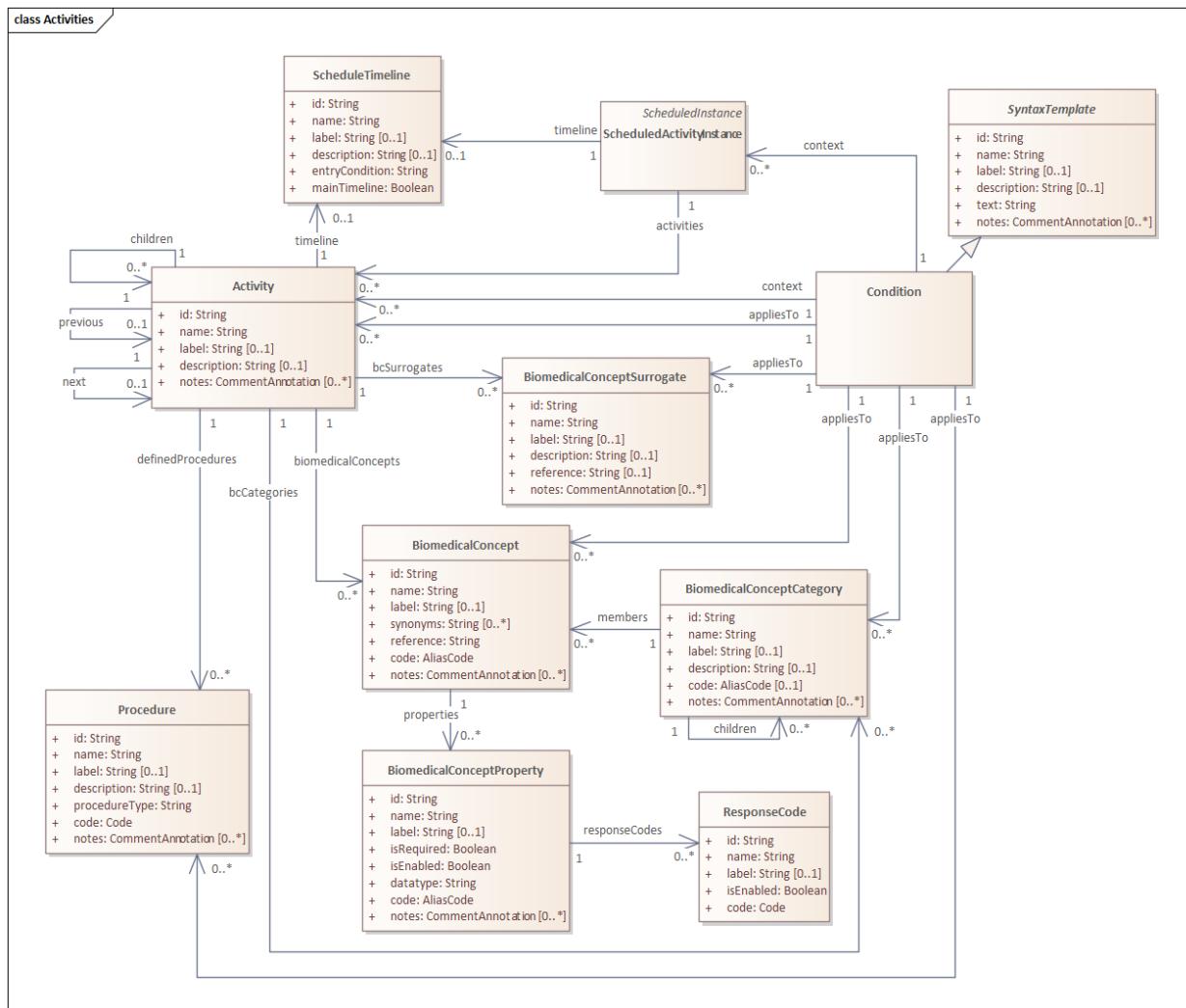
4.11 Activities

Activities are the means by which the procedures to be performed and the data to be captured are specified at a detailed level. The Activity class is used to group together data capture and procedures. The composition of these groupings is left to those designing studies and may align with the activities presented in the schedule of activities. The presentation ordering in the schedule of activities can be handled with the previous and next attributes. Any

presentation groupings can be handled with the children attribute. Activities can be reused across multiple points within a study timeline via the ScheduledActivityInstance class (see Section 4.14, [Study Timing](#)).

The Activity class can be linked to 1 or more procedures (see [Section 4.12](#)), 1 or more biomedical concepts (see [Section 4.13](#)), 1 or more groups of biomedical concepts, 1 or more surrogate biomedical concepts, and/or a subtimeline. A subtimeline referred to from an activity would typically be a sequence of actions covered by the activity description (e.g., blood glucose profiles, sitting/standing vital signs sequences).

Activities or the corresponding assessments and procedures may be conditional. These conditions, specified in the Condition class, apply to at least 1 activity, biomedical concept, group of biomedical concepts, biomedical concept surrogate, or procedure. The context of the condition can be to the activity in general (at every time point it is scheduled) or to a specific time point in the timeline via ScheduledActivityInstance.



The example below shows how the values for activities that are typically present in the first column of the schedule of activities are stored in the USDM activity class and how "grouping" headings can be accommodated. The previous and next attribute is used to identify the order of presentation while the children attribute is used to identify the group members, for example "Efficacy" or "Safety". This grouping activity (e.g., having children) is typically only used for presentation purposes and is not expected to be referred to from a scheduled activity instance or to point to biomedical concepts or procedures. It is recommended that only 2 levels of grouping (i.e, parent and child) are used.

Schedule of activities	Screening	Day 1
Subject related Assessments			
Informed consent	X		
In/Exclusion criteria	X	X	
Demography	X		
Medical history	X		
Randomisation		X	
Efficacy			
Lab efficacy assessments		X	X
PRO questionnaire		X	X
Safety			
Vital signs	X	X	X
ECG	X	X	
Hematology	X	X	
Biochemistry	X	X	
Adverse events	X	X	X
Intervention			
Drug dispensation		X	X
Drug accountability		X	

label	id	previous	next	children
Subject related Assessments	id_01		id_02	id_02, id_03, id_04, id_05, id_06
Informed consent	id_02	id_01	id_03	
In/Exclusion criteria	id_03	id_02	id_04	
Demography	id_04	id_03	id_05	
Medical history	id_05	id_04	id_06	
Randomisation	id_06	id_05	id_07	
Efficacy	id_07	id_06	id_08	id_08, id_09
Lab efficacy assessments	id_08	id_07	id_09	
PRO questionnaire	id_09	id_08	id_10	
Safety	id_10	id_09	id_11	id_11, id_12, id_13, id_14, id_15
Vital signs	id_11	id_10	id_12	
ECG	id_12	id_11	id_13	
Hematology	id_13	id_12	id_14	
Biochemistry	id_14	id_13	id_15	
Adverse events	id_15	id_14	id_16	
Intervention	id_16	id_15	id_17	id_17, id_18
Drug dispensation	id_17	id_16	id_18	
Drug accountability	id_18	id_17		

4.12 Procedures

The procedures linked to the Activity class allow for the procedures required by the activity to be detailed. A procedure consists of a free-text name and description; procedures can be classified using a free-text type attribute and coded using the code attribute. In cases where the procedure includes a study intervention (e.g., drug administration), the corresponding study intervention can be referenced.

4.13 Biomedical Concepts

The CDISC [Biomedical Concepts model](#) defines a clinical concept in a standardized and reusable manner; it is a specification focused on the data, not how the data are captured or processed. As such, biomedical concepts (BCs) are atomic entities and should not be split apart; to do so causes a loss of meaning. A BC is identifiable (has an identifier) and is complete (contains everything needed to use it).

A BC defines an observation but it requires context: the context of a clinical study. This is why, in the USDM, BCs are linked to activities and thus the remainder of a study design.

Within the USDM, the BC model has been represented in a manner consistent with the rest of the USDM. For example, controlled terminology references use the Code object to be compatible with all of the CT references across the USDM. Additional attributes have been added to allow for configuration as part of a study to enable or disable certain qualifiers or to constrain terminology responses to match the needs of a study (e.g., constraining units to metric values).

When a BC is included within a study design the BC can be constrained if the BC definition allows for such. When those constraints are applied or by whom is not dictated by the model; that is an implementation and process concern. For example, a study definition may leave everything in the BCs unconstrained and only when the study design is deployed in capture systems will any constraints be applied. Constraints take the form of disabling optional properties; for example, the method used for an observation does not need to be captured, or the terms for a property can be constrained (e.g., body position is always going to be supine for a particular observation and so standing can be disabled as an option). The constraints are applied via a enabled boolean flag. Some properties, such as a result, are always required. Required properties are indicated by a second boolean flag.

The USDM allows for the inclusion of a single BC (e.g., heart rate), a collection of BCs (e.g., vital signs preconfigured to include height, weight, heart rate, and other tests), or surrogate BCs. Surrogate BCs are a placeholder mechanism for when a BC definition is not available. This allows the name of a test to be specified but no further detail need be provided. Surrogates can contain a name and description pair for the concept required. A reference field is also provided to allow for links to reference materials (e.g., a URL for an external resource).

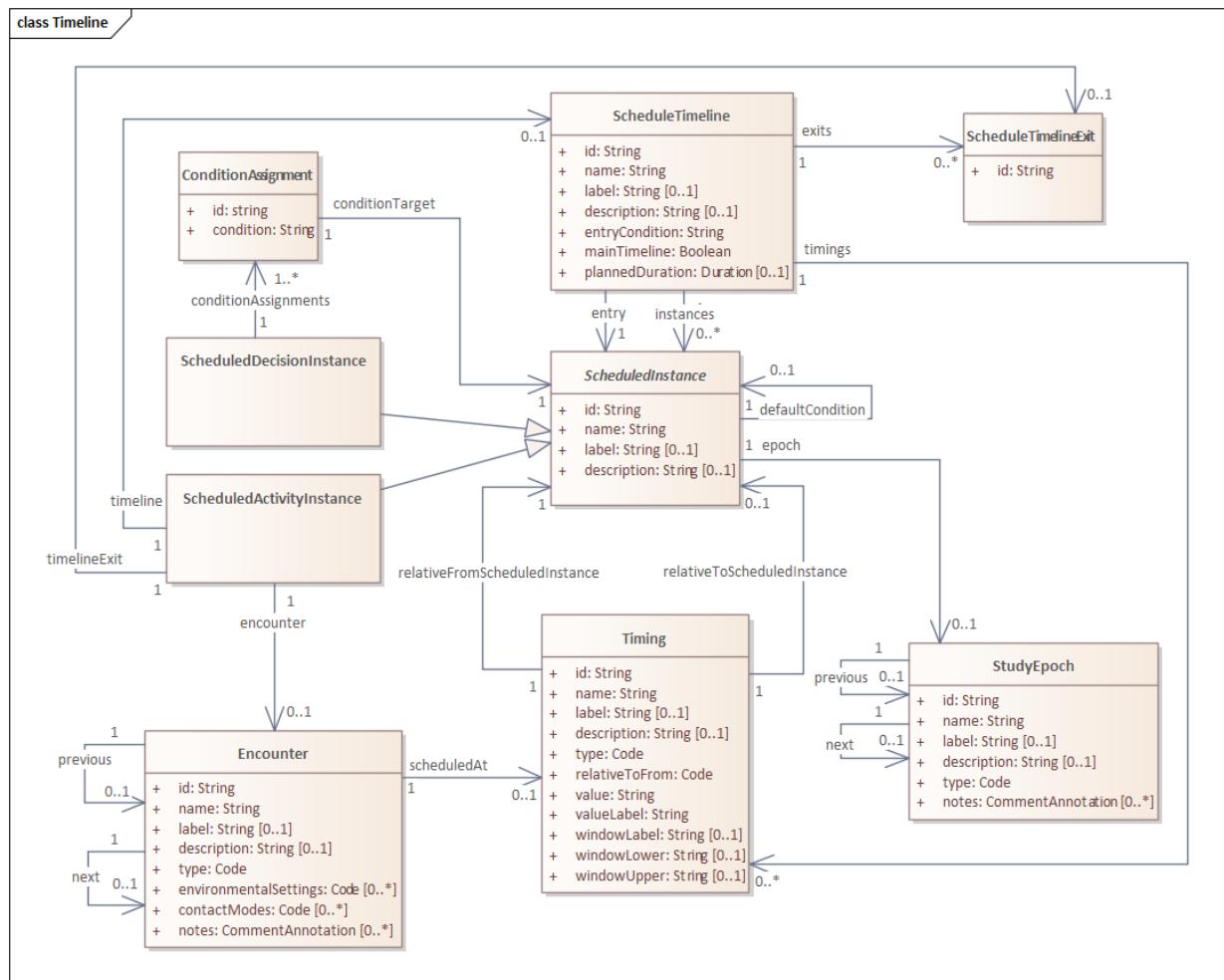
A single BC uses the BiomedicalConcept class as its root instance connected to 1 or more BiomedicalConceptProperty instances to define the various properties of the BC (e.g., result value, units, qualifiers).

Some of the property nodes will require controlled terminology references; these are placed within ResponseCode instances which then onward refer to a Code instance holding the actual term reference.

One or more BCs can be grouped using a BiomedicalConceptCategory. It is assumed that, to be useful, more than a single BC should be added to a grouping (e.g., vital signs). These groupings are expected to be sponsor defined but, in the future, some can be expected to be industry defined.

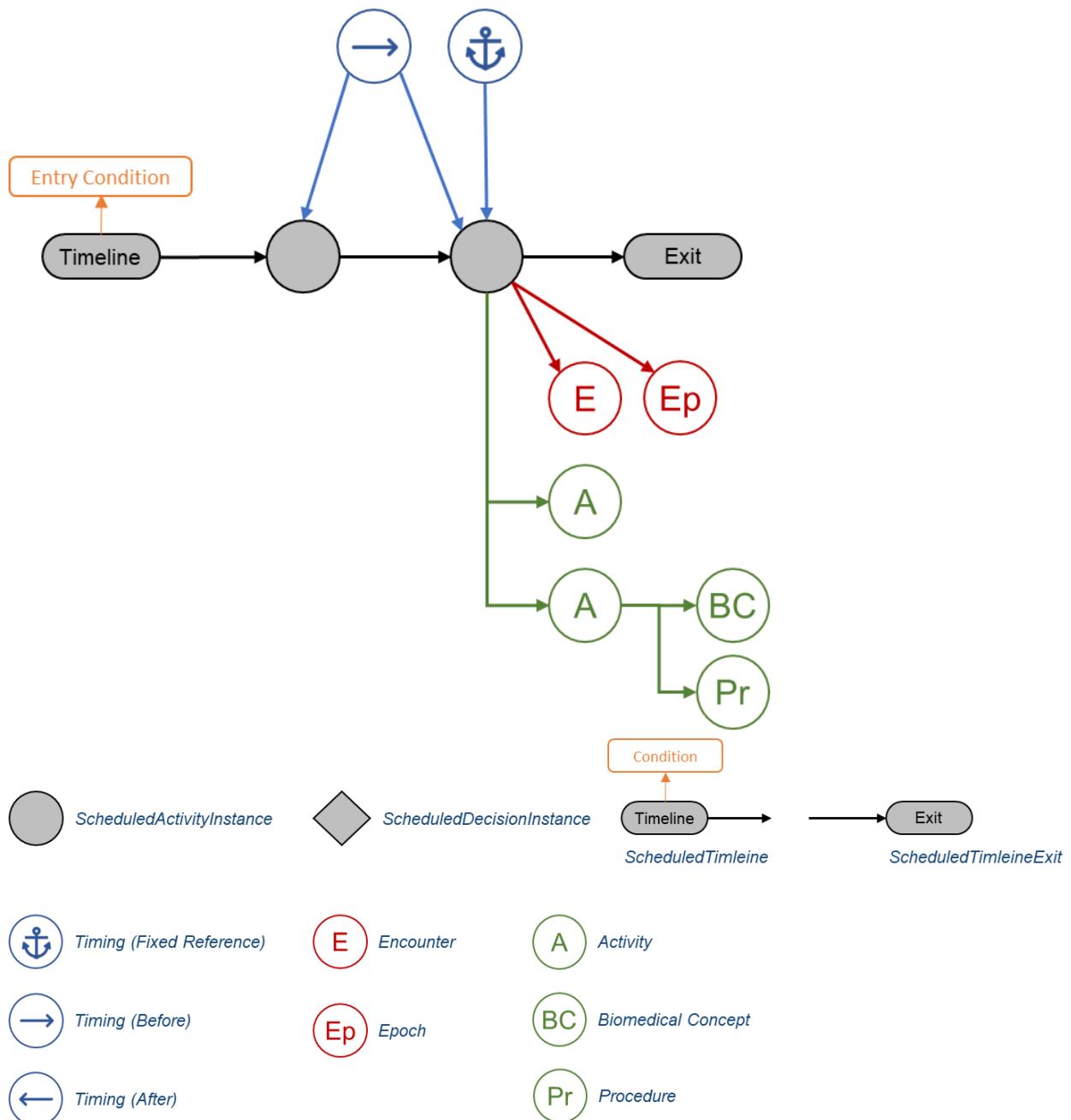
4.14 Study Timing

One of the key aspects of a study design is the timing of encounters (visits) and the activities to be performed within those encounters. The USDM includes a mechanism for building timelines that can be reused within a study and, given external library management, across studies. The corresponding classes and attributes are shown in the following UML diagram. This model allows for multiple planned timings within an encounter as well as for decision points in the study process. The corresponding information is stored in a timeline as scheduled activity instances and scheduled decision instances, respectively. Both inherit all attributes and relationships from the ScheduledInstance class (indicated by the closed arrows in the UML) and can be linked to the corresponding study epoch. The Timing class includes all timing information with details on time between instances and corresponding windowing. One or more scheduled activity instance can be related to a corresponding encounter, which is usually presented as a visit in the schedule of activities.



4.14.1 Timelines

The study timing mechanism depicted in the following figure is based on the notion of a timeline. A *timeline* is composed of an entry point with an associated entry condition (see ScheduleTimeline class), a sequence of steps (the ScheduledActivityInstance class and scheduledDecisionInstance class), timing relating the steps (the Timing class), and 1 or more exits (the ScheduleTimelineExit class) that mark the end of timeline processing. The planned duration of a timeline can optionally be specified, which for the main timeline reflects the planned total study duration. A timeline is named and can be referenced or reused within other timelines. The steps within a timeline link the encounters with the activities required for each step and thus define the timing for the encounters. The ScheduledActivityInstance class is the link between the high-level study design defined by the StudyArms and StudyEpochs classes, the Encounter classes, and the detailed study design defined by the Activity class.



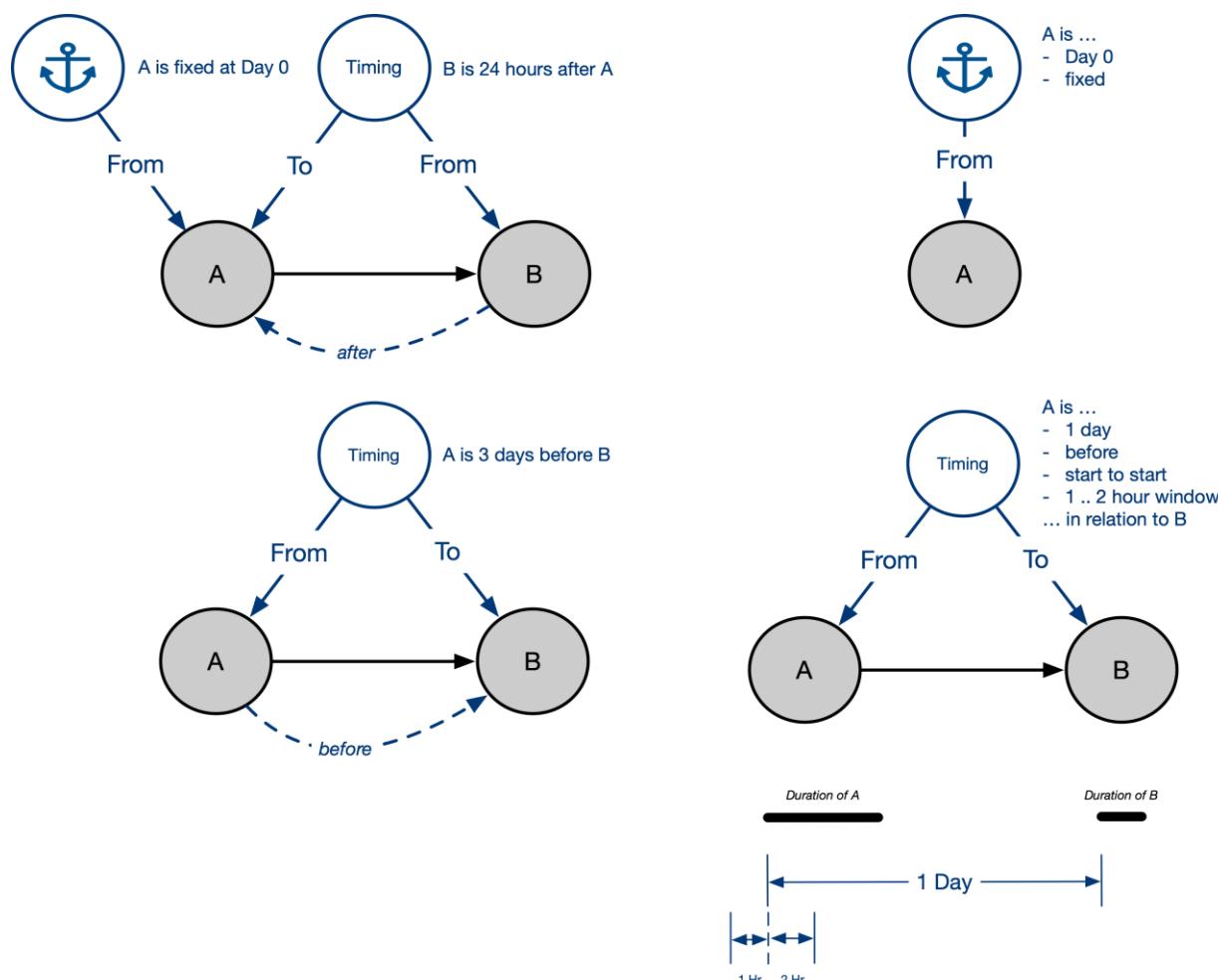
4.14.2 Timing

The timing between steps comprises a relative time of before or after, and an anchor time that is fixed. The following figure illustrates the timing capabilities. The Timing class allows for explicit timing to be built into a timeline using a combination of anchors (fixed timing) and relative timing. The timing definitions should be read as "the <Timing.relativeFromScheduledInstance> node is <Timing.value> <Timing.type of before or after> the <Timing.relativeToScheduledInstance> node". The timing definition allows for further precision in the timing by specifying the relativeToFrom type.

For anchors, the relativeFrom node refers to the scheduled instance that provides the fixed reference. The corresponding relativeTo node should either refer to the same scheduled instance or should be missing.

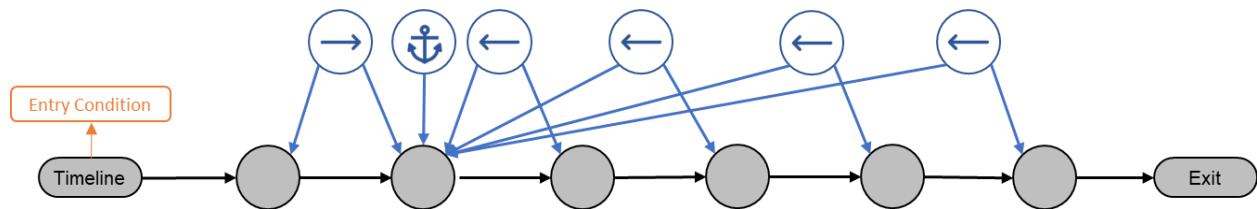
A timing may be referenced from an Encounter using the scheduleAt attribute allowing for a specific encounter timing and corresponding windowing to be defined and presented in a scheduled of activities. An Encounter timing might potentially overarch multiple scheduledInstances representing different blocks of activities within an encounter.

Note that in the timing diagrams the relativeFromScheduledInstance and relativeToScheduledInstance relationships have been shortened ("From" and "To," respectively) so as to make the diagrams readable.



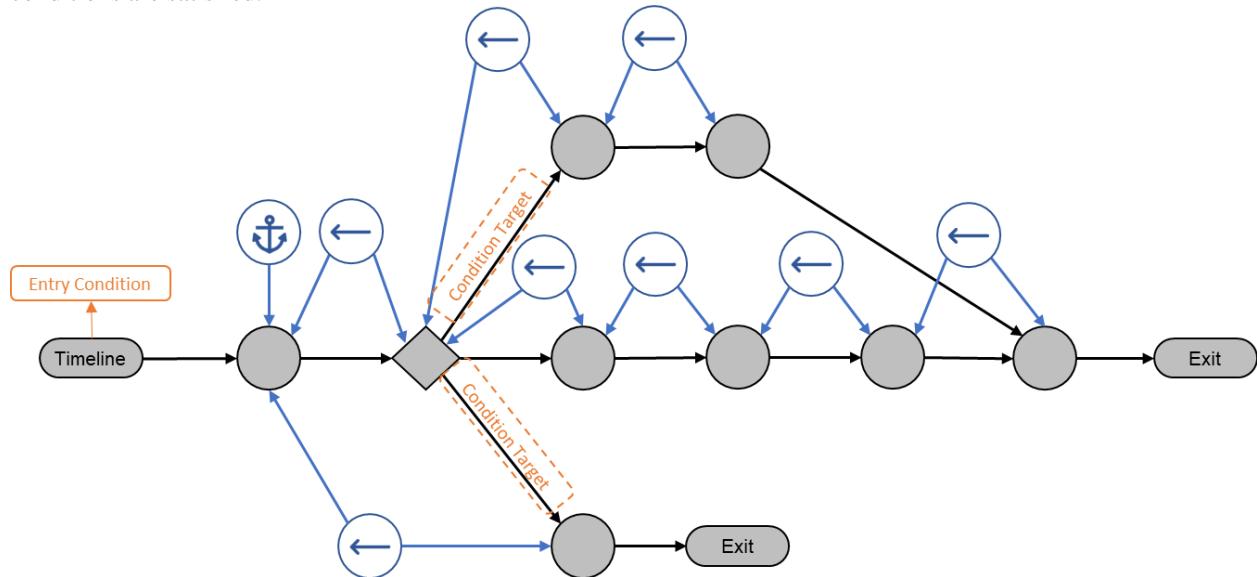
Planned timings are stored in the value attribute of the Timing class and are expected to be formatted according to ISO 8601. A corresponding window can be identified using the window attributes. The windowLower and windowUpper attributes are also expected to be formatted according to ISO 8601. Textual representations of these values can be stored in the valueLabel and windowLabel attributes, respectively.

Note that timings can be defined between each consecutive scheduled instance or all or part of the timings can be related to a fixed (anchor) timepoint:

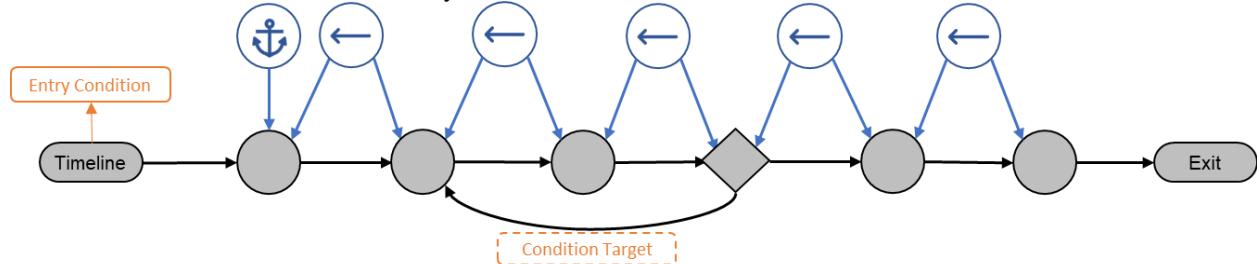


4.14.3 Decisions and Branching

Decisions and branching are handled using instances of the ScheduledDecisionInstance class within a timeline as shown in the following figure. Each decision point can handle multiple conditions; for example, simple yes/no decisions as well as a complex switch with multiple paths. Each possible route is set up with an associated destination. For switches, there should be a "default" condition specified for the case when none of the other conditions are satisfied.



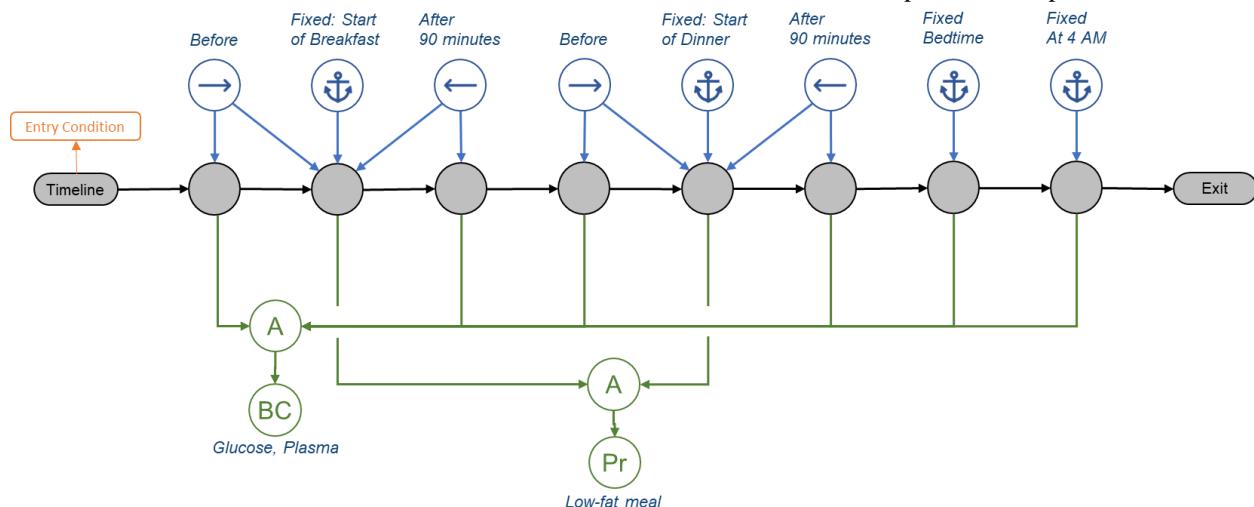
The decision can also be used to create cycles:



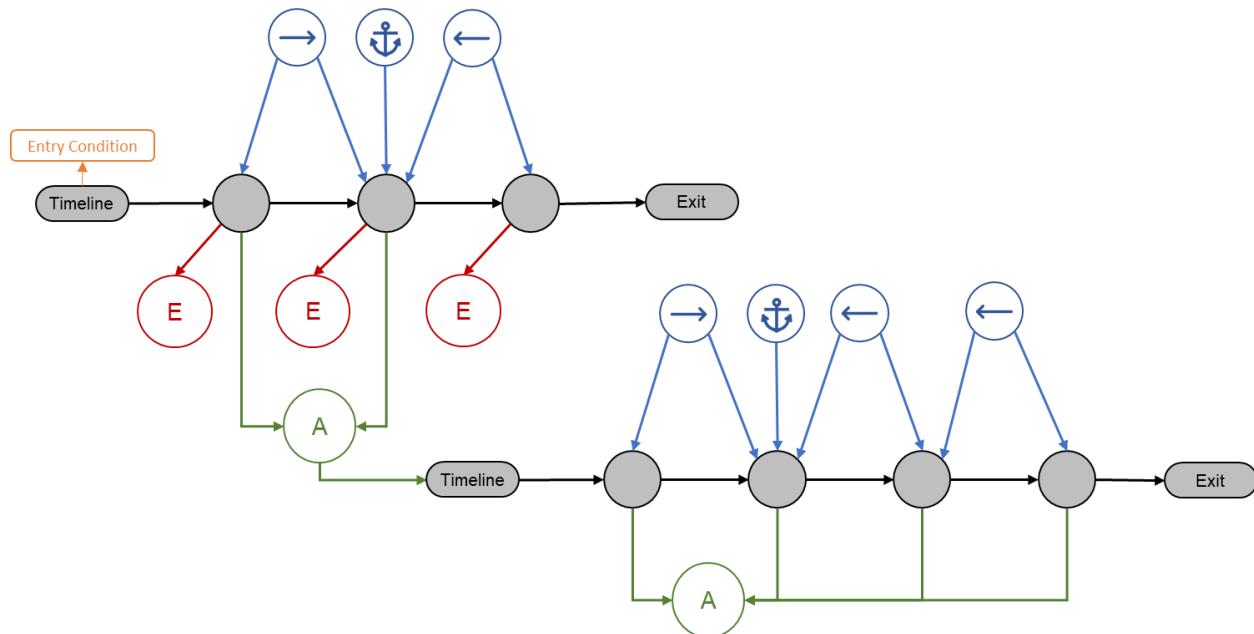
Descriptions of the decision and pointer are defined using the conditionAssignment class. This class includes 2 attributes: a description of a condition and the reference to the target instance of the scheduledActivityInstance class that it points to once this condition is met—for example: "not reached cycle 12 and fulfilling eligibility to enter next cycle","ScheduledActivityInstance_2".

4.14.4 Profiles

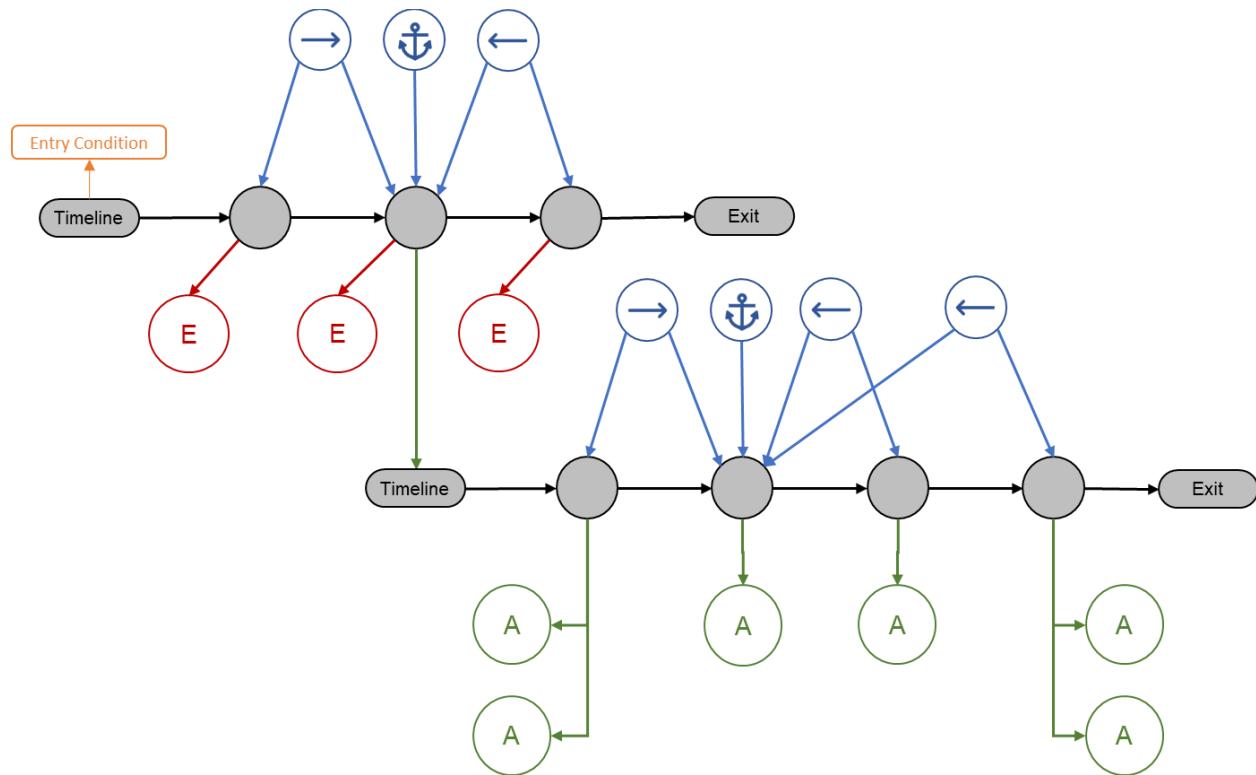
Profiles can be created using the various classes, as depicted in the following figure. A profile is another use of the timeline pattern and may reflect a sub-timeline within an encounter. A condition for entry can be defined but need not be. In this example, anchors are used to fix meal times over a single day and the associated observations scheduled in relation to the fixed meal times. The activities are shared across the steps within the profile.



The profile can be "attached" to an activity using the `ActivityTimeLineId` attribute so that it is executed as part of that activity, as illustrated in the following figure. This is useful for a sequence of repeated measures within the same activity.

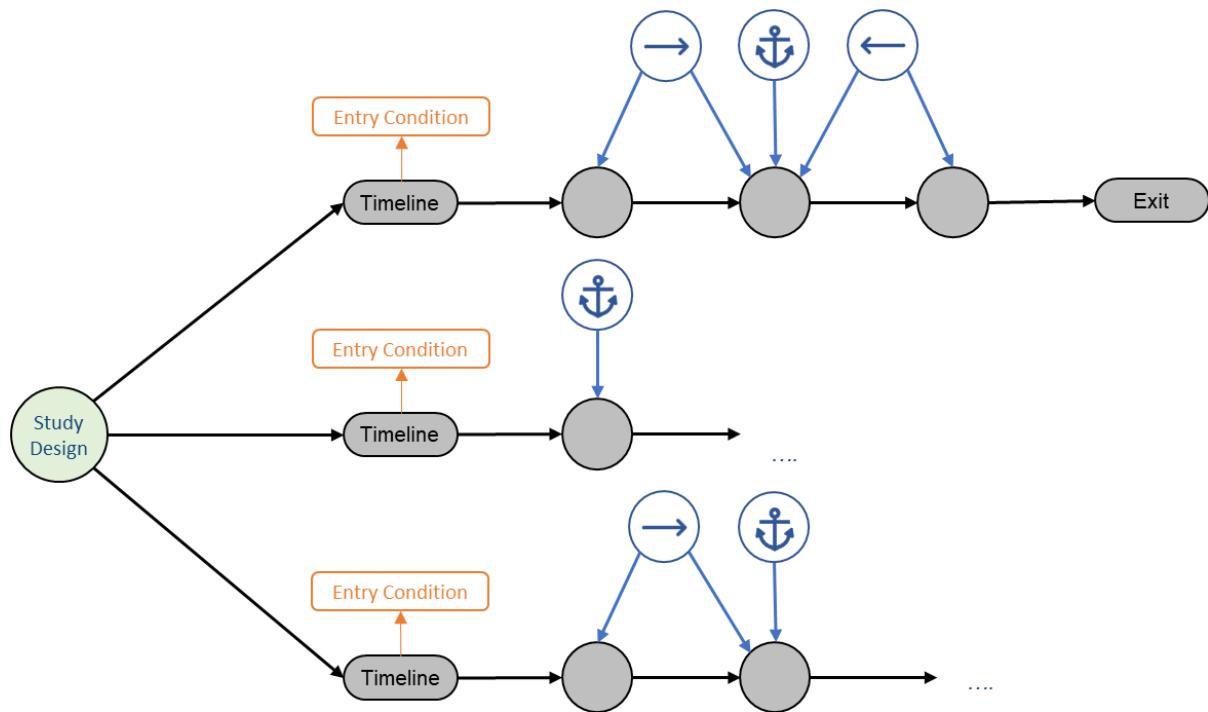


The timeline can also be attached to a `ScheduledActivityInstance` from another timeline using the `timelineReference`, thus allowing timepoints within a visit to be constructed, as shown in the following figure.



4.14.5 Unscheduled Visits

Unscheduled visits within a study are handled by creating separate timelines for each unscheduled "event" that needs to be handled within the study design. A study design would typically have 1 "main" timeline with a condition such as "subject identified". Further timelines can be created and linked to the StudyDesign instance with the timeline having an appropriate condition (e.g., "Adverse event", "Lost contact with subject"). Each timeline is then free to detail the steps taken under the respective circumstances.



4.14.6 Timeline Exit

It should be noted that the ScheduledTimelineExit instance does not perform any role other than marking the end of a timeline. It is linked from the last ScheduledActivityInstance instances in the timeline.

4.15 Study Interventions

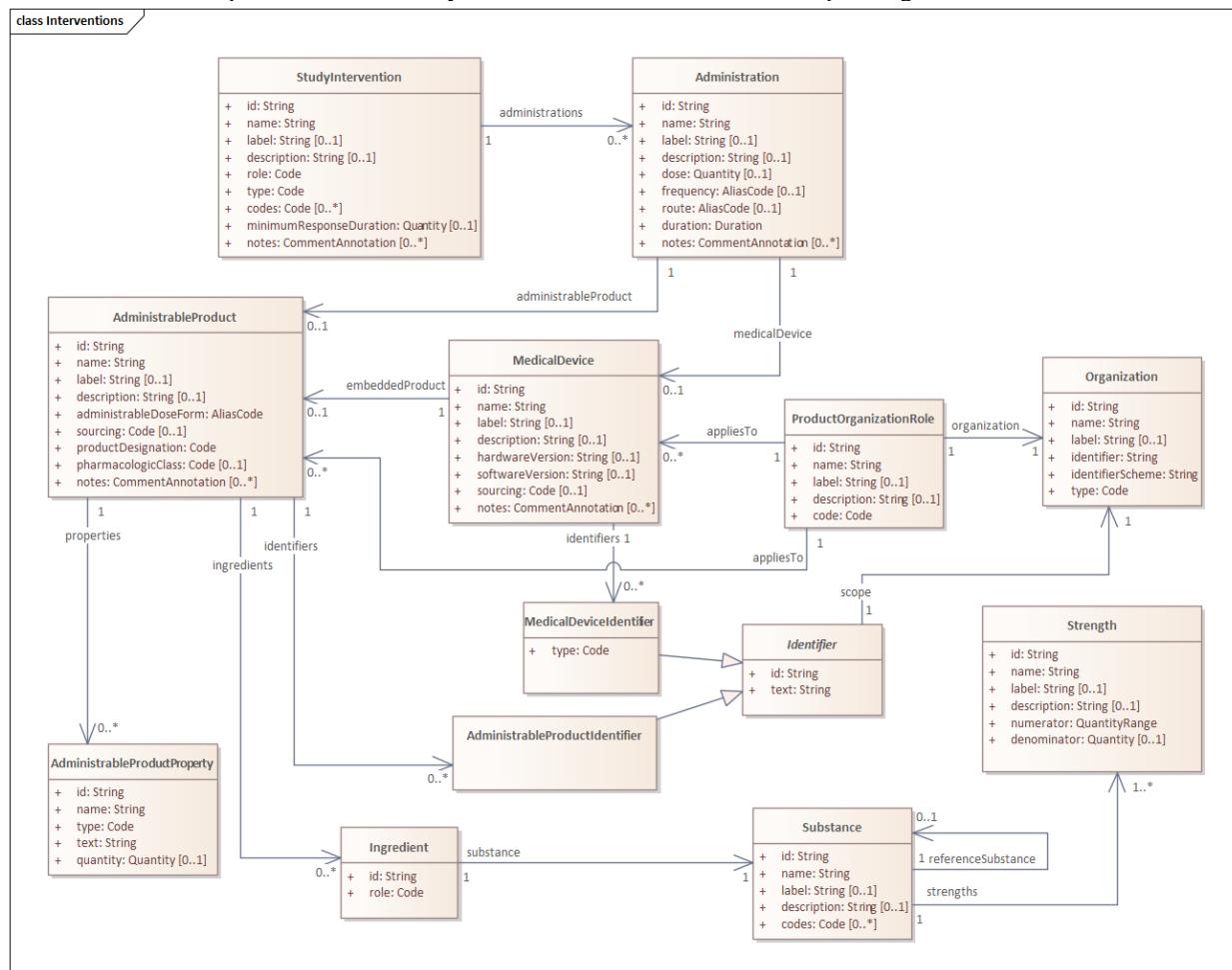
The interventions for a study are stored in the StudyIntervention class. Each intervention needs to be defined by role and type. Optionally, information on 1 or more codes from external coding systems and the expected duration to minimum response can be added. Corresponding administration details are specified in the Administration class. The frequency, dose, route, administrable product, medical device, and duration can be specified for each administration. If the administrable product is embedded (e.g., inseparable) in the medical device then the administrable product are expected to be defined via the medical device as an embedded product and not directly via the administration class.

For each medical device, information on sourcing, embedded products, and medical device identifiers may be specified. For each administrable product, information on the product designation (IMP/NIMP); pharmacological class; sourcing; and 1 or more administrable product identifiers, properties, and ingredients may be specified. Note that the internal sponsor code or compound number for the administrable product can be stored as the administrable product identifier.

Each ingredient specified by its substance may have a reference substance. The corresponding reference strength represents the strength (quantitative composition) of the active moiety of the active substance or of another substance used to express the strength of the product. There are situations when the active substance and active moiety are different resulting in different expression of the strength. The strength of each substance is specified in the strength class using a quantity or range numerator and preferably a denominator. In case the strength is not exact but estimated to be within a range, the numerator can be expressed as a range using minValue and maxValue attributes. For IDMP, the strength value or minValue and corresponding denominator value refers to the IDMP strength lower limit, while, if applicable, the strength maxValue and corresponding denominator value, refers to the strength upper limit.

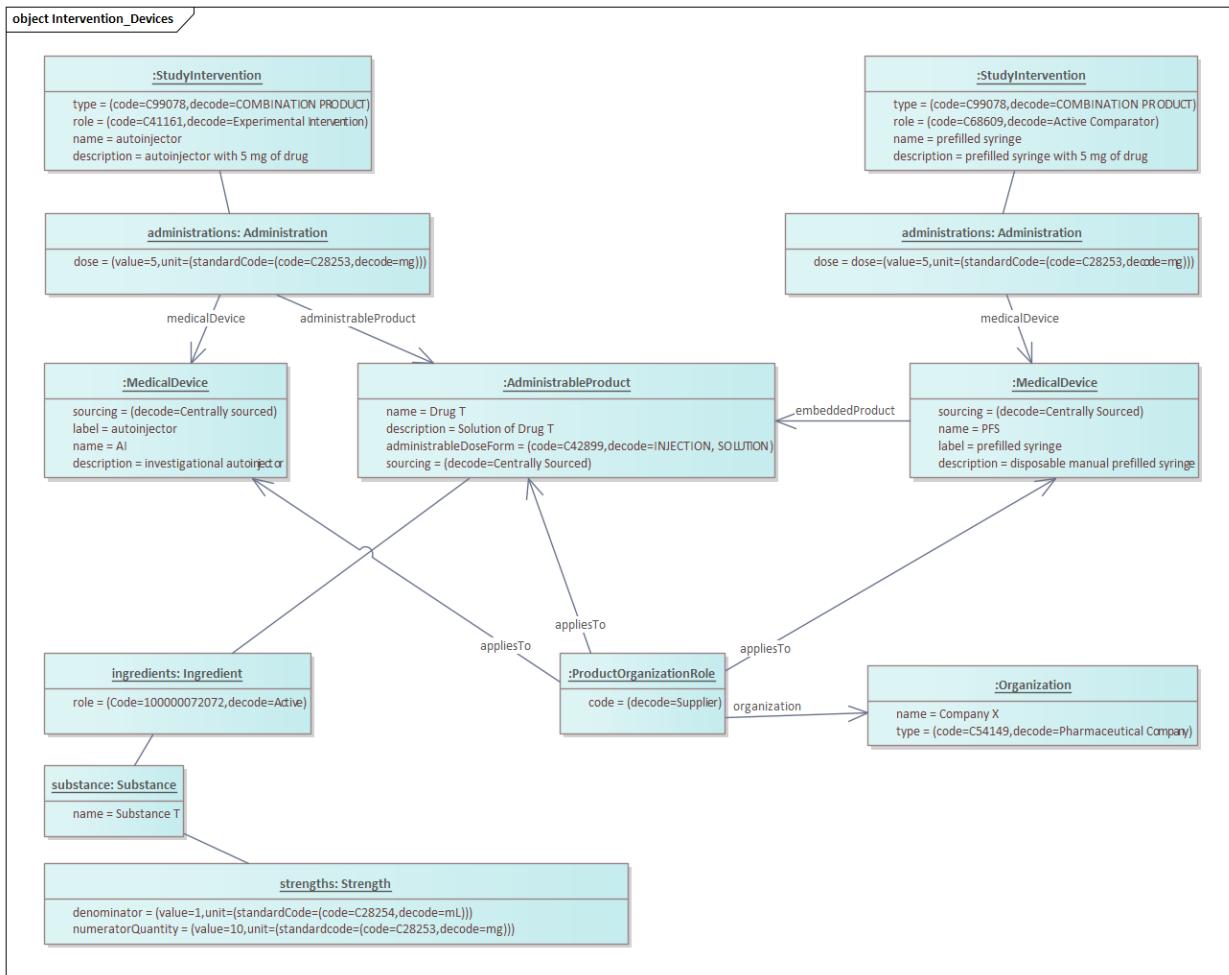
Product related organization roles like manufacturer and supplier may be defined in the ProductOrganizationRole class which refers to the corresponding defined organization and applies to one or more medical devices and/or administrable products.

Study interventions need to be directly referred to from the Study Design class. In addition, they can be directly related to estimands, procedures, and study elements as defined for the corresponding classes.



An example of an bioequivalence study comparing the bioavailability of one drug administered via different devices is shown below. The test (experimental intervention) and reference (active comparator) interventions are stored as two separate instances in the StudyIntervention class both as a combination product type of intervention. The experimental intervention includes a device which can be refilled with the administrable product. Hence the medical device and administrable product are separately linked to the corresponding administration class. Contrary, for the active comparator study intervention, the product is prefilled and therefore specified as an embedded product for the medical device.

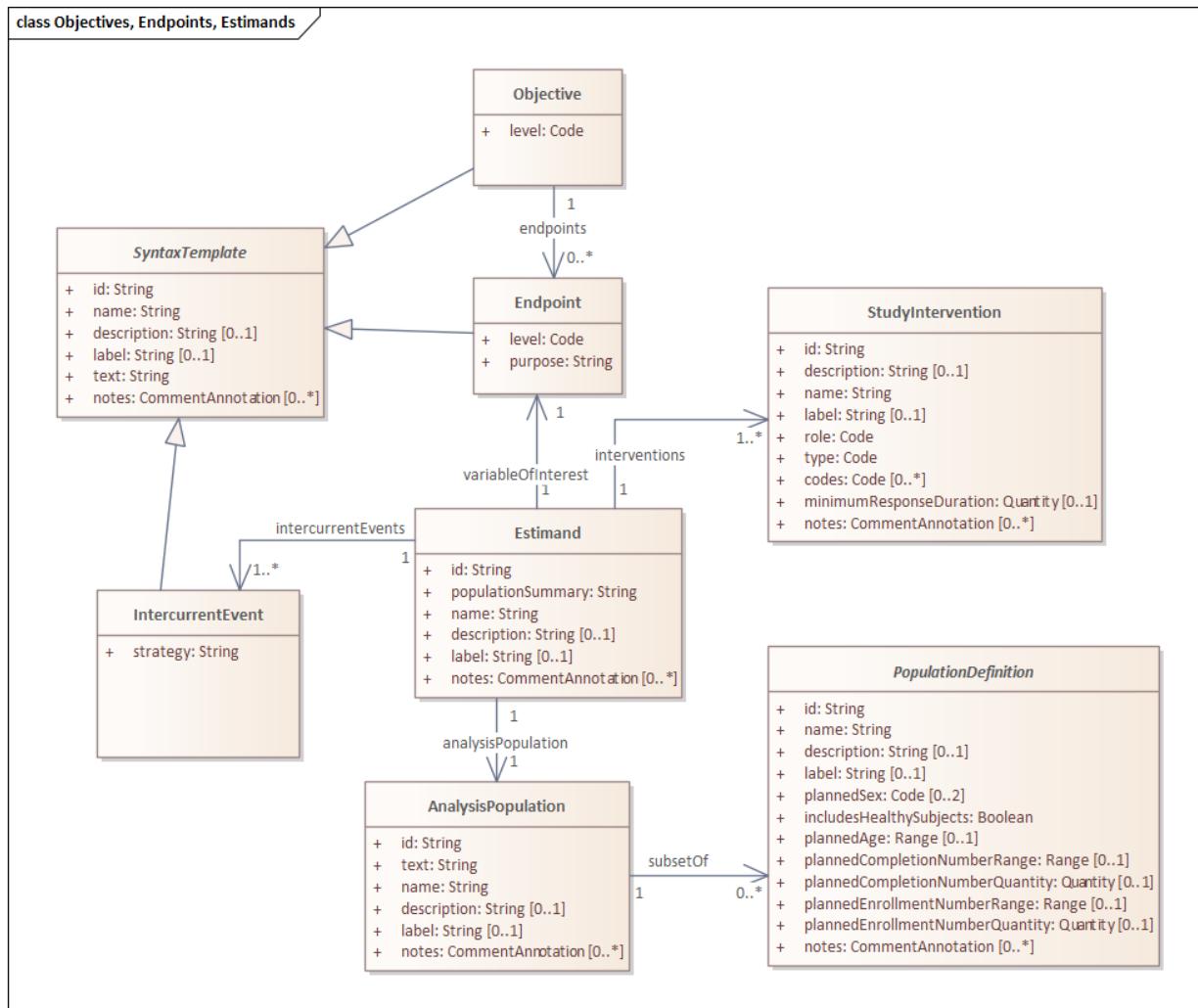
The actual dose given for both administrations is equal and set to 5 mg. Both interventions refer to the same administrable product with a strength specified (via its ingredients/substance and strength nominator and denominator) to be 10 mg/mL. All products are centrally sourced and in this case only one product organization role as supplier was specified which applies to all products. The corresponding organization in this case is a pharmaceutical company with the hypothetical name Company X.



Note that the instance diagrams are created to show single use cases. Not all (required) attributes, relationships and properties are presented in the instance diagrams. Cross-references between instances are presented by arrows while nested instances are represented by straight lines.

4.16 Study Objectives and Endpoints

The study design objectives and endpoints can be defined within the Objective class and the Endpoint class. The Objective class allows for the textual description of the objective and its level (e.g., primary, secondary, exploratory) and a link to 1 or more associated endpoints containing the endpoint definition in textual form. Both the objective and endpoint class inherit from the syntax template (see [Section 4.21](#)), allowing for references to information stored elsewhere in the data model. The endpoint may be a variable of interest for the study estimand (see [Section 4.17](#)).



4.17 Study Estimands

Aligning to the ICH guideline E9 (R1) addendum,[5] study estimands and the definition of the treatments to be investigated, the population, the variable, the population summary, and the handling of intercurrent events (ICEs) are handled within the Estimand, IntercurrentEvent, and AnalysisPopulation classes along with the relationships to the corresponding endpoints (for the variable of interest; see [Section 4.17](#)) and study interventions (e.g., treatment; see [Section 4.15](#)).

The AnalysisPopulation may be defined as a subset of a study design population or study cohort which inherit their features from the population Definition class (see [Section 4.18, Populations, Cohorts, and Eligibility Criteria](#)).

4.18 Populations, Cohorts, and Eligibility Criteria

Populations and cohorts are a (sub-)group of subjects that take part in the study. The parent class PopulationDefinition is used to define a group of subjects in general. This class includes references to the eligibility criteria that are applicable to the population. All the elements of the PopulationDefinition class are inherited by both

the StudyDesignPopulation class, which stores the population details for a specific study design; and the StudyCohort class, which stores the details of subpopulations that, based on their characteristics, may deviate in how they are treated, assessed, or analyzed.

In addition to the inherited attributes from the PopulationDefinition class, the StudyDesignPopulation class may refer to the corresponding subgroups stored as study cohorts. The standard PopulationDefinition attributes criteria, PlannedCompletionNumber and/or plannedEnrollmentNumber, plannedAge, and plannedSex are either defined at the StudyDesignPopulation level or at the StudyCohort level. The allowed coded values for plannedSex are "male" or "female"; either or both can be specified for a study design population or for a study cohort.

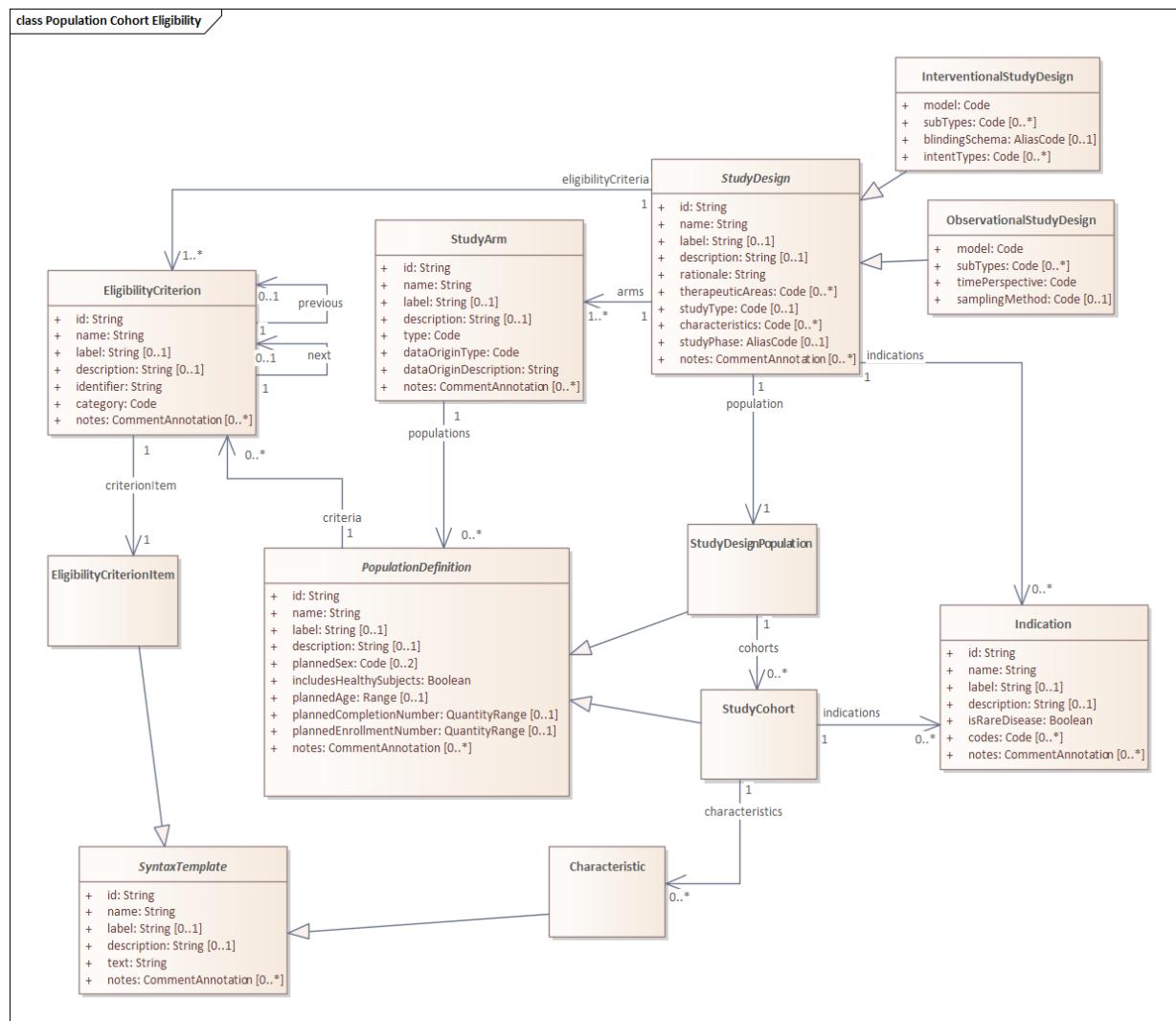
The StudyCohort class may refer to additional characteristics not defined by any other attributes in the PopulationDefinition class. These characteristics are stored in the Characteristic class, which inherits its attributes from the Syntax Template class (see [Section 4.21](#)) and thus can refer to any item stored elsewhere in the USDM.

Eligibility criteria items inherit from the Syntax Template class as well, allowing for referencing any item stored in the USDM (e.g., assessments stored as BCs). The previous and next attributes in the EligibilityCriterion class referring these items define the presentation ordering within an eligibility criterion category or overall for a specific study design. The identifier attribute may be used to store the short name used for mapping to the SDTM Trial Inclusion/Exclusion Criteria domain (see Section 7.1, [Creation of SDTM Trial Design Domains](#)).

The indication for a study design can be placed into the Indication class. Each indication has a textual description plus the ability to define 1 or more codes from external code systems (including a sponsor's own terminology) that define the indication. The corresponding attribute isRareDisease can be used to indicate whether an indication is regarded as a rare disease according to applicable registries (e.g., the NIH [Genetic and Rare Diseases Information Center\(GARD\)](#)). Indications stored in the indication class are applicable to the whole study design population.

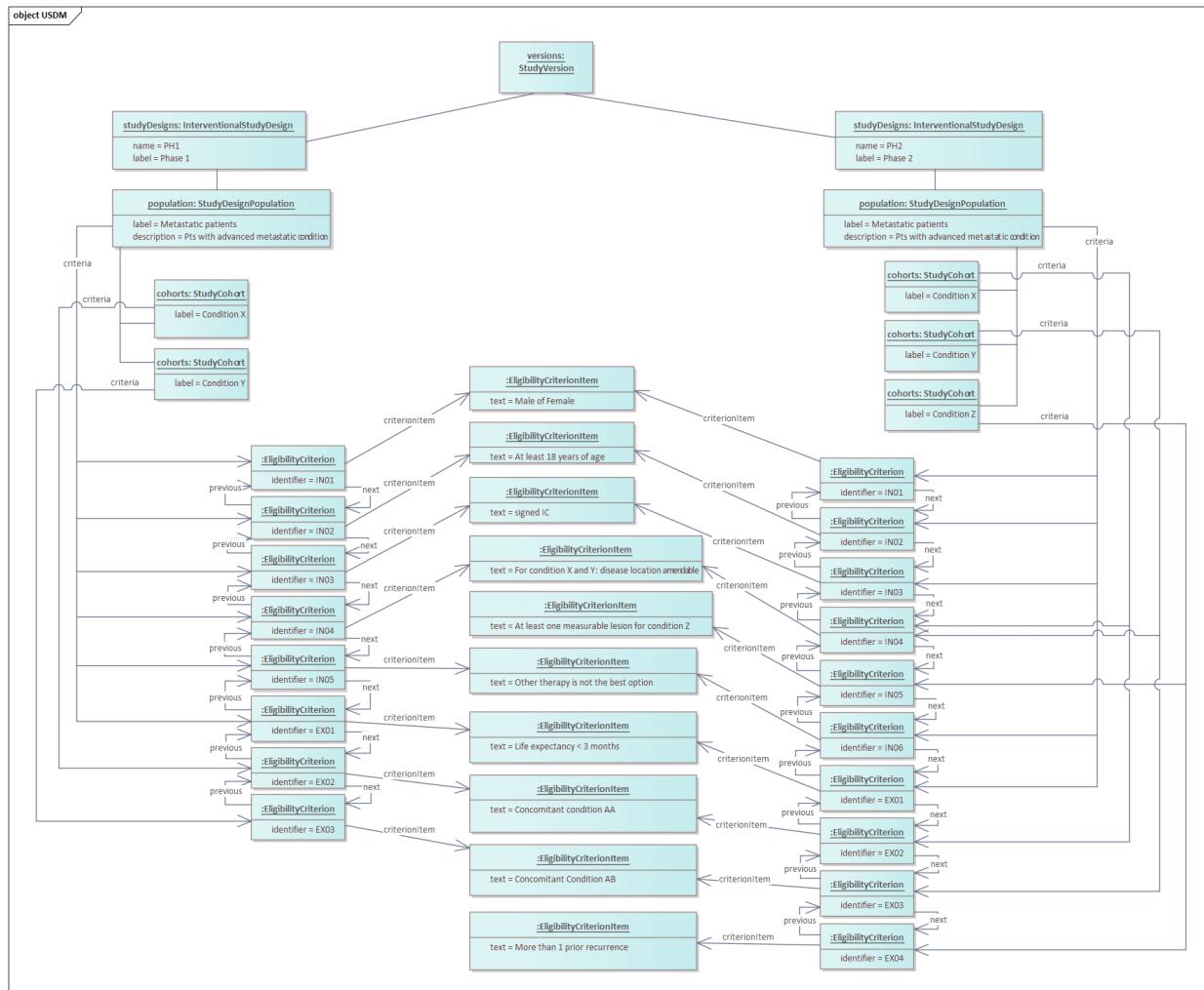
Cohorts may optionally point to 1 or more indications applicable to the specific cohort.

In case needed, specific notes for example for grouping, mapping, or providing additional information can be added to the items in a class. Corresponding codes can be added to these notes aligning with internal or external standards that are applicable to the notes.



The following instance diagram shows a complex design study including 2 different phases and corresponding interventional study designs. Each design includes a definition of the corresponding study design population and nests 2 or 3 cohorts. The diagram shows that the collection of unique eligibility criterion items specifying the actual textual descriptions of the criteria is stored independently from the study designs. The eligibility criteria applicable to the specific study designs are further defined at the study design level and include the identifier and category specifications (category is not shown in the instance diagram), which can be matched to the corresponding SDTM TI domain variables IETESTCD and IECAT, respectively. Each definition refers to the corresponding eligibility criterion item text. The document-based ordering information for presentation purposes is defined using the next and previous relationships. The USDM allows for different ordering and presentations for different subdesigns, which might be needed in case of different subprotocols and/or submissions for different parts of the study.

Further, in this case, most criteria are applicable to the whole study population while a few (e.g., EX02, EX03) are only applicable to a specific cohort. This is indicated by referring to these criteria from the study cohort instead of from the study design population. In the following example, the criterion applicable to both condition X and Y (see criterion IN04) is referred to from the whole study design population for the phase 1 design since it applies to all the cohorts in the design. However, for the phase 2 design, where the criterion only applies to 2 of the 3 cohorts, it is referred to from each of the cohorts with condition X and Y, but not from the third cohort with condition Z, where it does not apply. This example also shows that multiple cohorts may refer to the same eligibility criterion. Whether a criterion is referred to from the study design population or from 1 or more cohorts is up to the implementation. However, each criterion must be referred to from either the study design population or from 1 or more cohorts.



Note that instance diagrams are created to show single use cases. Not all required attributes, relationships, and properties are presented. Cross-references between instances are presented by arrows while nested instances are represented by straight lines.

4.19 Abbreviations

4.19.1 General

Abbreviations are usually included in protocol documents. To ensure consistency of definitions throughout the study definition documents as well as in downstream processes, the USDM allows for abbreviations to be defined at the study version level (see Section 4.6, [Study, Protocols, and Amendments](#)).

Abbreviations can be reused (i.e., referenced) both from within unstructured document content and from within syntax template text (e.g., for eligibility criteria or assessment conditions). In addition, the full list of abbreviations can be easily used to automatically create the full list of abbreviations in the corresponding protocol document section.

Abbreviations consist of 2 parts: the abbreviated text and the expanded text. The following table provides examples of Abbreviation instances.

Abbreviation

id	abbreviatedText	expandedText
Abbr_1	AD	Alzheimer's disease
Abbr_2	MMSE	Mini-Mental State Examination
Abbr_3	CDR	Clinical Dementia Rating Scale
Abbr_4	FCSRT	Free and Cued Selective Recall Reminding Test
Abbr_5	AChE-Is	Acetylcholinesterase inhibitors
Abbr_6	DAT	Dementia of Alzheimer type

4.19.2 Referencing From Unstructured Text

Unstructured text (held within NarrativeContentItem instances) can directly reference an abbreviation (abbreviatedText) and/or the expanded text (expandedText) using XHTML referencing (see Section 4.22, [XHTML Attributes](#)). The following is an example of a text item concerning the rationale; this example references the preceding example abbreviations.

NarrativeContentItem		
id	Name	text
Item001	Rationale1	<div xmlns="http://www.w3.org/1999/xhtml">Currently approved <usdm:ref klass="Abbreviation" id="Abbr_1" attribute="abbreviatedText"/> treatment is purely symptomatic. Registered symptomatic treatment consists of <usdm:ref klass="Abbreviation" id="Abbr_5" attribute="expandedText"/> (<usdm:ref klass="Abbreviation" id="Abbr_5" attribute="abbreviatedText"/>) and memantine. <usdm:ref klass="Abbreviation" id="Abbr_5" attribute="abbreviatedText"/> in general and donepezil in particular can be currently regarded as gold standard for treatment of mild-to moderate <usdm:ref klass="Abbreviation" id="Abbr_6" attribute="abbreviatedText"/> and is considered as reference drug. </div>

A solution can resolve the in-text references for reading purposes which then will result in the following protocol text "Currently approved AD treatment is purely symptomatic. Registered symptomatic treatment consists of AChE-Is and memantine. AChE-Is in general and donepezil in particular can be currently regarded as gold standard for treatment of mild-to-moderate DAT and is considered as reference drug."

4.19.3 Referencing From Syntax Templates

Abbreviations can also be referenced from [syntax templates](#). Two examples, referencing the preceding example abbreviations, are provided in the following sections.

4.19.3.1 Objective

The objective class is based on syntax templates and therefore can be tagged with attributes stored with the associated dictionary and parameter maps. Instead of using AD as text, it is replaced by a corresponding tag: Objective.text= '<div>To assess the efficacy, safety and tolerability of different doses of Study Drug compared to placebo in treatment of prodromal <usdm:tag name="_AD"/></div>'

4.19.3.2 Inclusion Criterion

The inclusion criterion for the same study is defining the diagnosis and the corresponding definition. The EligibilityCriterion class which stores these criteria is also based on syntax templates and therefore these abbreviations also can be replaced by the corresponding tags:

EligibilityCriterion.text= '<div>Patients with a confirmed diagnosis of prodromal <usdm:tag name="_AD"/> on neuropsychological testing defined as: - Mini-Mental State Examination <usdm:tag name="_MMSE"/> score: ≥ 24 and - a global <usdm:tag name="_CDR"/> -score of 0 or 0.5 and - Free and Cued Selective Recall Reminding Test (<usdm:tag name="_FCSRT"/>) score: o free recall test: ≤ 20 (out of 48) and o total recall test: ≤ 42 (out of 48).</div>'

The reference from the tag used in the syntax template texts to the specific instance in the Abbreviation class is specified in the SyntaxTemplateDictionary and the ParameterMap instances:

ParameterMap		
id	tag	reference
Param001	_AD	<usdm:ref klass="Abbreviation" id="Abbr_1" attribute="abbreviatedText"/>
Param002	_MMSE	<usdm:ref klass="Abbreviation" id="Abbr_2" attribute="abbreviatedText"/>

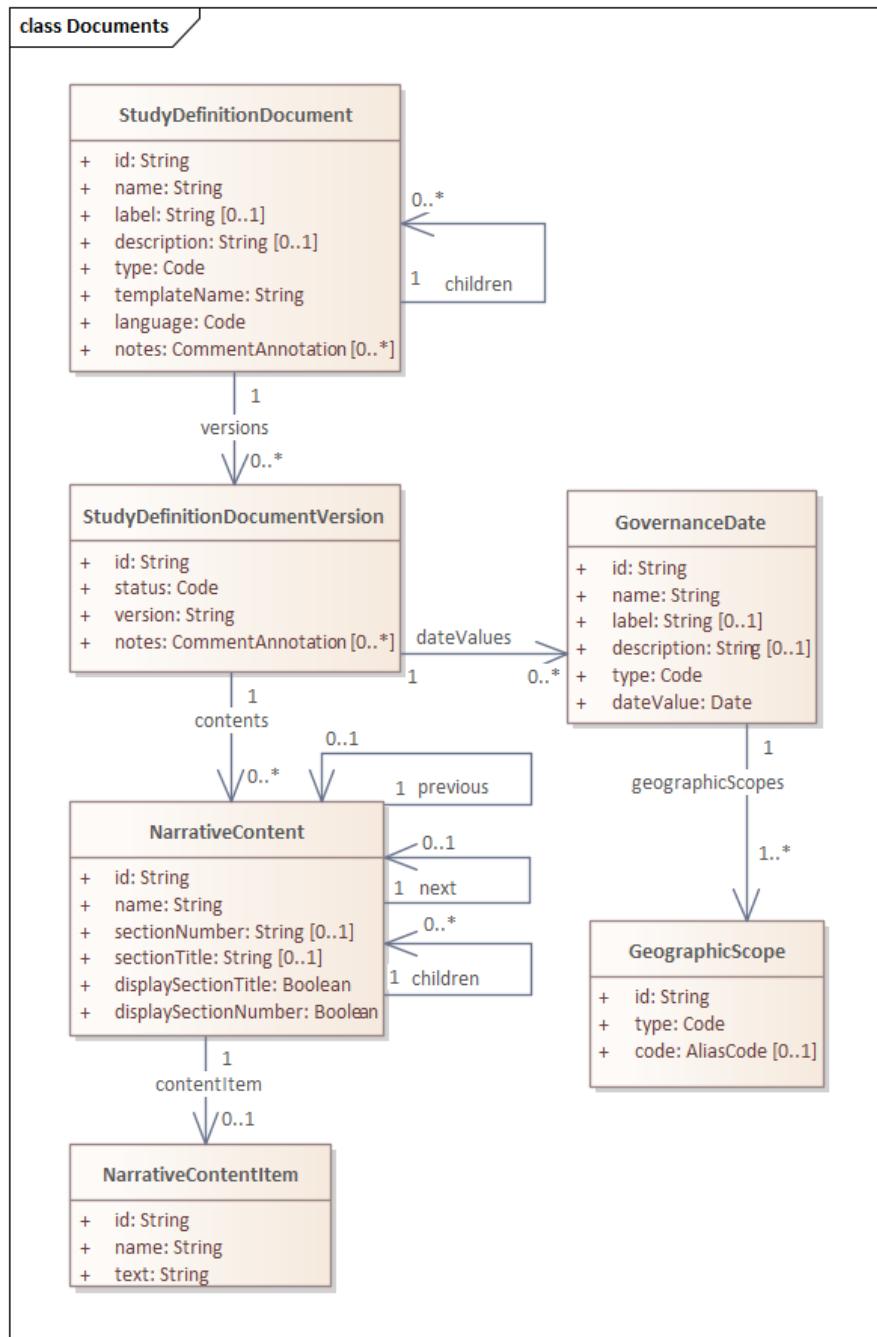
Param003	_CDR	<usdm:ref klass="Abbreviation" id="Abbr_3" attribute="abbreviatedText"/>
Param004	_FCSRT	<usdm:ref klass="Abbreviation" id="Abbr_4" attribute="abbreviatedText"/>

4.20 Unstructured Content

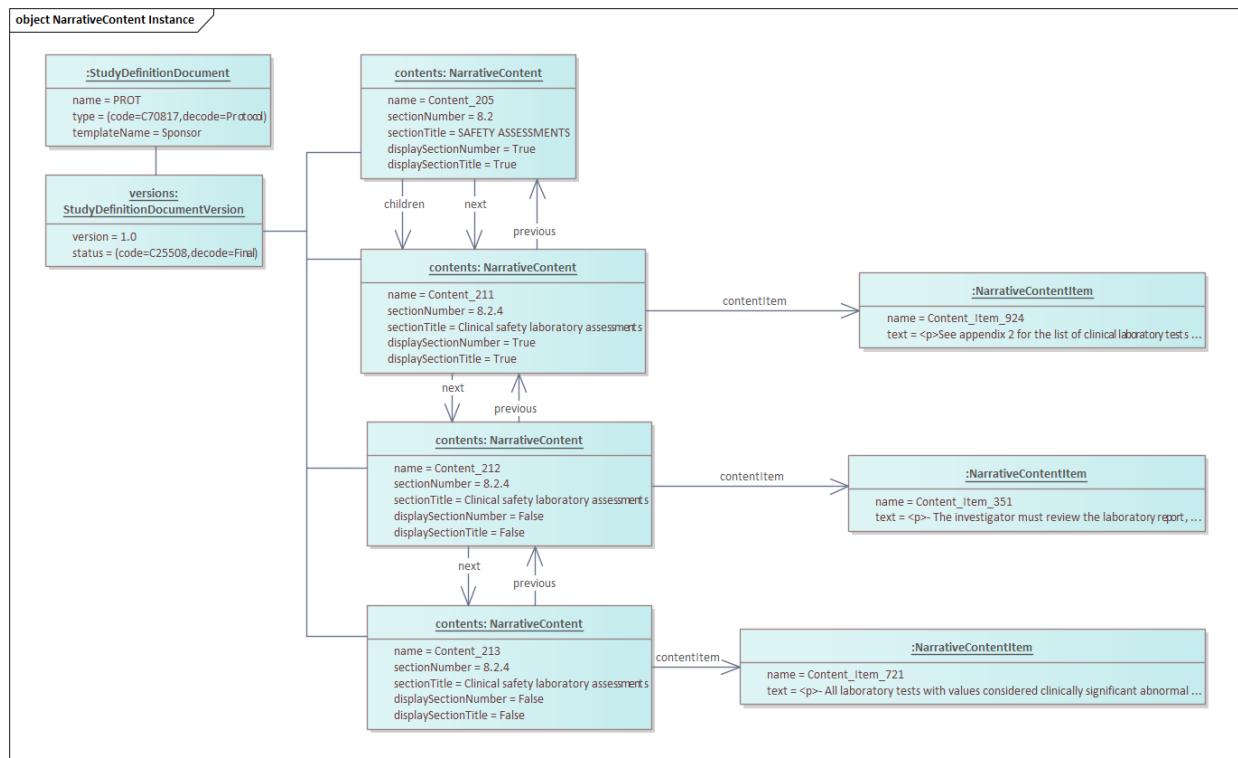
Study protocols and other study definition documents include content that is best described as "unstructured content". The USDM grants considerable flexibility in determining what information to include, the level of detail it will contain, the order in which it is introduced and discussed, and how it will be presented. Blocks of unstructured content can range from short text statements to many paragraphs which may also contain figures and tables.

The Narrative Content class in the UML is modeled to contain such blocks of user-defined unstructured content using HTML format. The recursive nature of this class with its attribute children provides the user the ability to add multiple named blocks of unstructured content, allowing for a hierarchy of related information to be built up and ordered by the section number and/or the previous and next attributes. Titles and section numbers can be defined for each block and can be optionally displayed or not. The actual blocks of unstructured content are stored in the NarrativeContentItem class allowing for reuse of text blocks within and between documents.

The HTML format of the text attribute and the section ordering provides the capability for organizing the information in a way that is compatible with any required document structure such as ICH M11,[4] the TransCelerate CPT, or a sponsor's internally defined template. Structured elements stored elsewhere in the model can be included and reused anywhere in the unstructured text using the format explained in Section 4.22, [XHTML Attributes](#).



The following instance diagram shows how a specific section of a protocol is represented in the model. Distinguished blocks of reusable text are stored in the `NarrativeContentItem` class. Each included text item is referenced by an instance in the `NarrativeContent` class which defines the hierarchy and ordering. It shows how sub-paragraphs (paragraph 8.2.4) are referenced as children within the parent (paragraph 8.2).



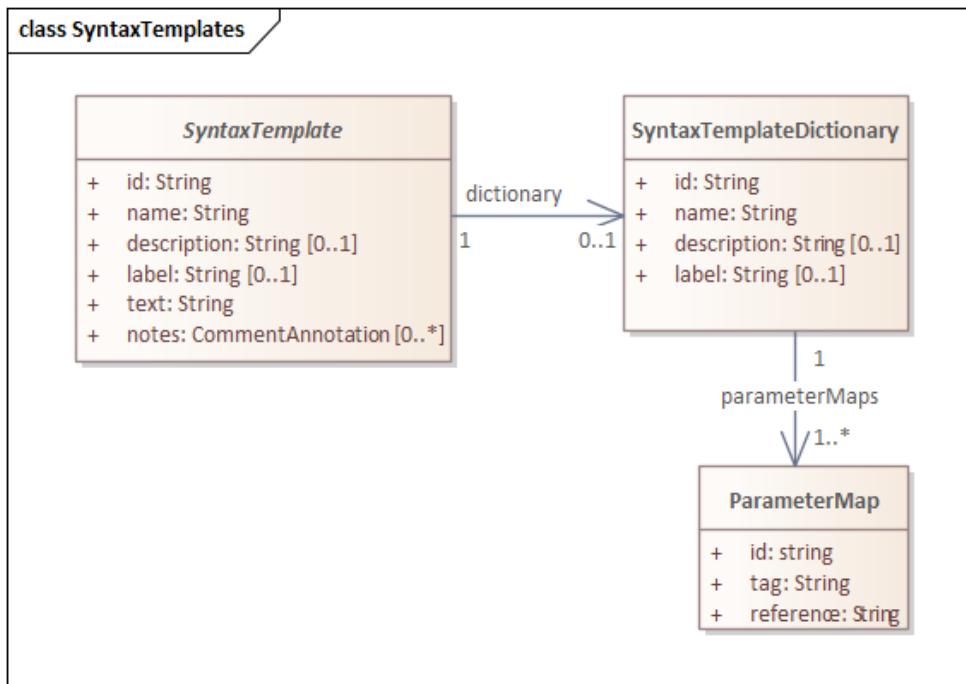
4.21 Syntax Templates

With syntax templates, human-interpretable plain text sentences are structured and linked to structured items held elsewhere in the USDM. Examples of items typically represented in the protocol as plain text that might be structured include:

- Endpoints that can be linked to a corresponding assessment and timing
- Objectives that can be linked to corresponding interventions and indications
- Eligibility criteria referring to an indication, a population, minimum and maximum age, and/or 1 or more assessments
- Conditions that can be linked to a corresponding BC or indication
- Cohort characteristics that can be linked to corresponding BCs or indications

The links are achieved by inserting tags into the plain text that reference structured content that is to be inserted into the text. These tags can be reused multiple times. This allows for consistency throughout the study design. In addition, the structured items can be more readily processed in downstream systems. The intent is that structured text allows for eligibility criteria, endpoints, objectives, and so on to be standardized and thus reused across studies, facilitating comparison and meta-analyses.

The syntax template classes are presented in the following UML.



The attributes and relationships of the `SyntaxTemplate` class are inherited by any class that is reusing its capabilities (e.g., `Endpoint`, `EligibilityCriterion`, `Characteristic`, termed "template instances"). The `text` attribute stores the structured text of the corresponding endpoint, criterion, or characteristic. The `text` attribute contains free text with embedded XHTML tags that refer to the mapping in the `SyntaxTemplateDictionary`. Within the `SyntaxTemplateDictionary` class, dictionaries can be defined that link the tags to the corresponding structured data references (to data stored elsewhere in the USDM) or to a fixed value.

The tags used within the `text` attribute of `SyntaxTemplate` are formatted as follows:

`<usdm:tag name="parametername"/>`

These tags are used as illustrated in the following example:

Subjects shall be between `<usdm:tag name="min_age"/>` and `<usdm:tag name="max_age"/>`

Instances of the `SyntaxTemplateDirectory` class are linked to 1 or more `ParameterMap` class instances. Each `ParameterMap` instance includes the tag (stored in the `tag` attribute) and a single reference or fixed value (stored in the `reference` attribute):

`<usdm:ref klass="klassName" id="idValue" attribute="attributeName"/> or 'fixedValue'`

in which:

- *klassName* is the name of the class that holds the referenced structured data.
- *idValue* is the `id` attribute value of the referenced instance of *klassName*.
- *attributeName* is the name of the referenced data attribute within *klassName*.
- *fixedValue* is a fixed string.

Some examples of `ParameterMap` references are (formatted here as `tag: reference` or `fixedValue`):

`min_age: <usdm:ref klass="Range" id="Range_3" attribute="minValue"/>`

`max_age: <usdm:ref klass="Range" id="Range_3" attribute="maxValue"/>`

`StudyPopulation: <usdm:ref klass="StudyDesignPopulation" id="StudyDesignPopulation_1"`

`attribute="description"/>`

`RefHbMax: "7.0"`

It should be noted that instances of classes that inherit from `SyntaxTemplate`, the template instances, inherit the `dictionary` relationship to the `SyntaxTemplateDictionary` class. Each of these template instances references a single dictionary but the dictionary can be shared across 1 or more of the template instances. Thus it is possible that a single dictionary instance—named, for example, `StudyDictionary`—containing a wide range of tags might be used by all the template instances or 1 dictionary instance could be created for the `IE` instances (named, for example, `IE Dictionary`), 1 dictionary instance for the `Objectives` and `Endpoints` template instances (named, for example, `OEDictionary`), or some mix thereof as required by implementers.

4.22 XHTML Attributes

The SyntaxTemplate and NarrativeContentItem classes each contain an attribute that contain XHTML formatted text:

- SyntaxTemplate text attribute
- NarrativeContentItem text attribute

The content held within these attributes should be treated at XHTML content and processed as such. It is recommended that a single root `<div xmlns="http://www.w3.org/1999/xhtml">` element is used to wrap the content of the attribute. These attributes can also contain `<usdm:ref>` elements used to reference content held within the remainder of the model. These elements use 3 attributes to form a complete reference:

`'<usdm:ref klass="klassName" id="idValue" attribute="attributeName"/>'`

where:

- *klassName* is the name of the class that holds the referenced data element.
- *idValue* is the id value of the referenced data element within *klassName*.
- *attributeName* is the attribute name of the referenced data element within *klassName*.

Further details of the use of these references can be found in Sections 4.20, Unstructured Content, and 4.21, Syntax Template.

4.23 Addressing Footnotes

Information represented by footnotes in a schedule of activities (SOA) can be stored structurally in the USDM and as such can be parsed and presented as footnotes when feasible. By using this computer-readable format, the often complex and extensive footnote information is more usable for downstream processes. This section describes the following different types of footnotes that may be identified in SOAs and how they can be stored in the USDM:

- Footnotes representing sub-timelines
- Footnotes representing timing and/or order of activities
- Footnotes representing alternative visit schedules
- Footnotes representing conditional activities, assessments, and procedures
- Repeated activities not presented in the SOA
- Footnotes representing optional alternative encounter methods
- Footnotes representing measurements to be done for a specified activity
- Footnotes representing optional alternative measurement methods
- Additional instructions for procedures and/or performing assessments
- Visit and timing window information
- Eligibility requirements
- Complex combinations

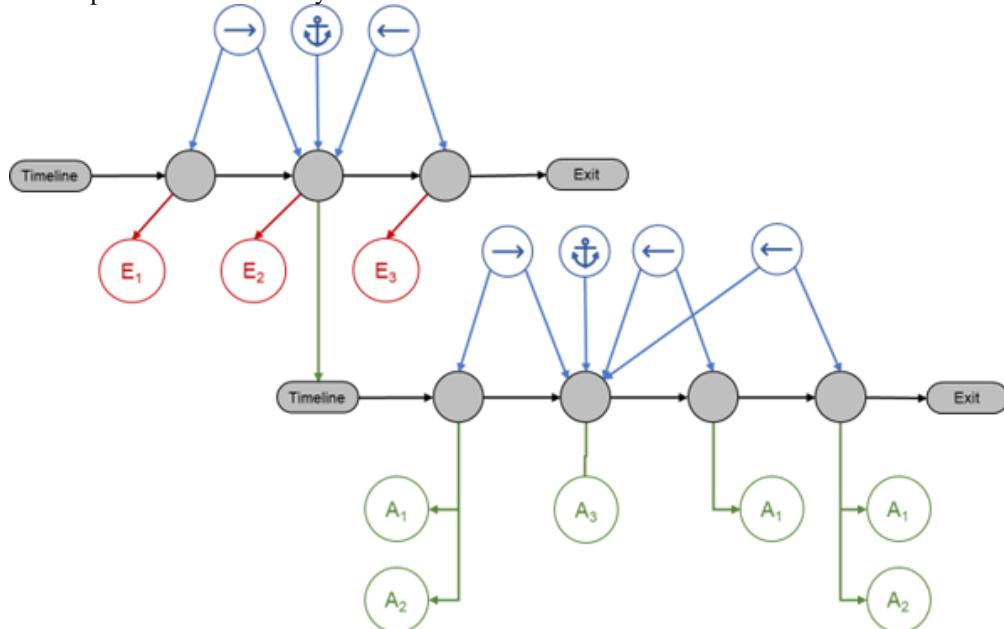
4.23.1 Footnotes Representing Sub-timelines

These footnotes indicate at what exact timepoints activities not presented in the SOA should be performed, for example:

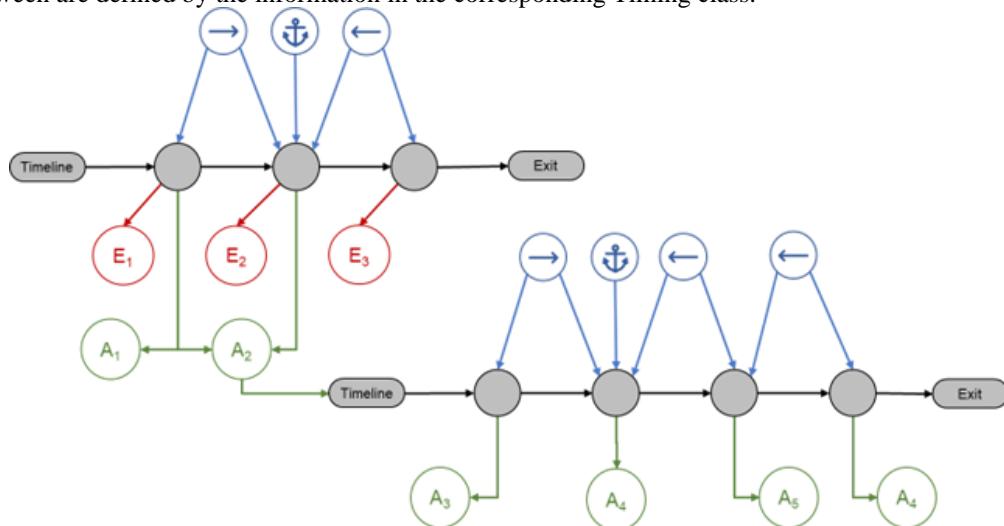
1. Blood samples for ... predose, 1h, 24 h, ...
2. X assessment to be performed predose and at 40 minutes and 1.5h postdose
3. Measurement after 5 minutes in supine position and after 3 minutes in standing position

In case of assessments relating to dosing (examples 1 and 2), individual timepoints can be stored as ScheduledActivityInstances forming together a sub-timeline (see following diagram). This sub-timeline is referred to from a ScheduledActivityInstance on the main timeline. The time relationships ($>$, $<$ in the diagram) of these instances will be defined using the corresponding Timing classes. The timing related to the instance for the dosing activity (A_3) is defined as the anchor. Activities such as pharmacokinetic samples (A_1) and vital signs measurements

(A₂) can then be added as needed, reflecting the correct timings related to dosing. Sub-timelines can be reused across multiple ScheduledActivityInstances on the main timeline.



In case of an assessment sequence relating to 1 activity (e.g., repeated blood pressure measurements in different positions), a sub-timeline can be directly referenced from the corresponding activity using the timeline relationship in this class (see following diagram). The activity A₂ (e.g., vital signs), refers to the sub-timeline indicating the corresponding positioning and assessment actions. For example, put subject in supine position (A₃), assess blood pressure (A₄); put subject in standing position (A₅) and repeat the blood pressure assessments (A₄). The timings in between are defined by the information in the corresponding Timing class.



See Section 4.14, [Study Timing](#), for more information on timelines.

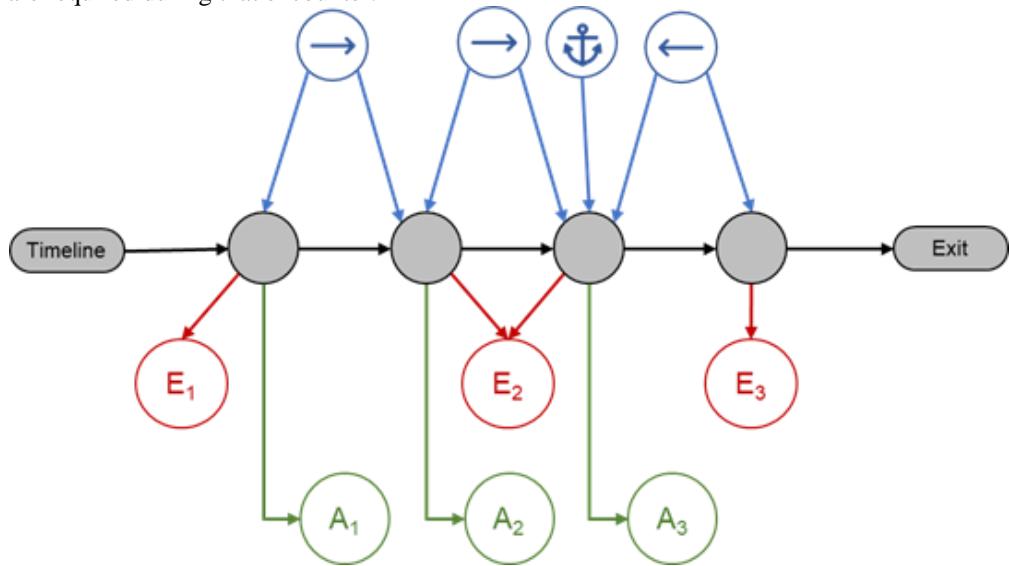
4.23.2 Footnotes Representing Timing and/or Order of Activities

These footnotes indicate an order of activities and what should be done first, for example:

1. Informed consent must be obtained prior to any study-related procedure
2. Assessment X should be done before all other
3. Assessments to be done on day of admission

A simple sequence of 1 activity or groups of activities can be represented by separate instances of the scheduledActivityInstance class in the main timeline pointing to the same encounter. For example, in the following

diagram, encounter E2 includes 2 scheduledactivityInstances. The first links to activities that need to be done prior to any other activity (e.g., informed consent) and the second scheduledActivityInstance relates to all other activities that are required during that encounter.

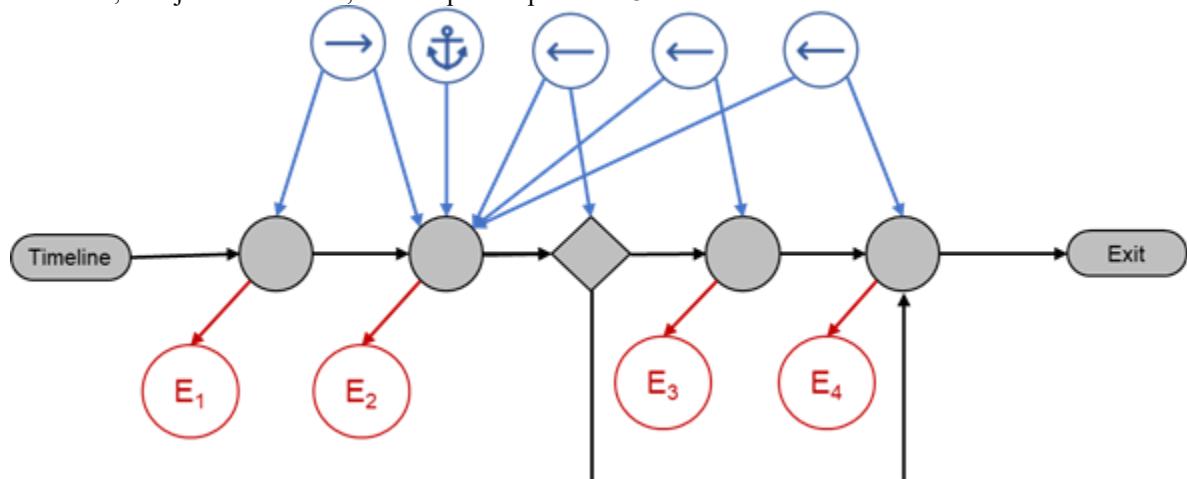


4.23.3 Footnotes Representing Alternative Visit Schedules

These footnotes indicate optional alternative visits based on conditions, for example:

1. Visits in case of events, inability to continue, or withdrawal (early-withdrawal visit)
2. An additional optional period of up to 3 weeks is permitted
3. Visits can occur on same day if no additional period is needed

To optionally add a visit, a scheduledDecisionInstance needs to be added to the timeline. Apart from the default next step in the timeline (defined by a defaultCondition), this scheduledDecisionInstance includes a condition and corresponding alternative next step that can be defined. In the following diagram, encounter E3 is skipped when the condition is met. This condition as defined in the attribute conditionAssignments could then be “inability to continue”, “subject withdrawn”, or “no optional period of 3 weeks”.



Example 3, visits occurring on the same day, is more complex. Visits can optionally be combined; the ScheduledDecisionInstance needs to be set to “no additional period needed?” If yes, then the next visit (E3) can be skipped. In cases where activities were planned at this skipped visit E3 (and not at the previous visit E2), these should be added to the previous visit E2 with the conditionality that they only need to be done when the next visit is skipped.

4.23.4 Footnotes Representing Conditional Activities, Assessments, and Procedures

These footnotes indicate conditions for a specified activity to be performed (or not), such as:

1. Assessments only for women with childbearing potential
2. At the discretion of the investigator
3. Assessments only if within x days after y
4. Only in case of extra wash-out needed; all others to perform assessment at end of week x
5. Discharge after criteria for discharge are met
6. Only if dipstick urinalysis is positive
7. Assessment to be done every 3 cycles
8. Only for subjects electing to participate in the additional substudy
9. If needed

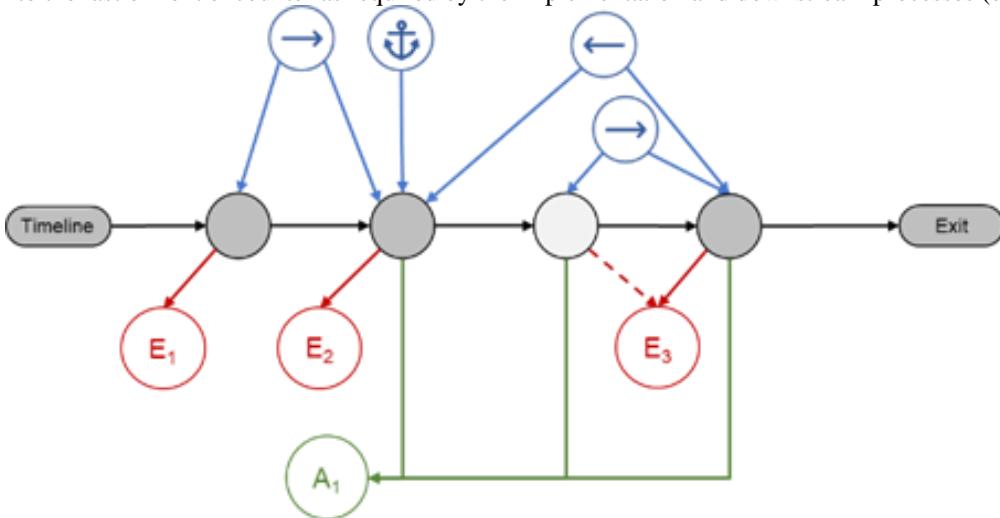
These footnotes can be stored in the Condition class. The footnote text is stored in the text attribute and can optionally link to other elements stored in the USDM as described for syntax templates (see [Section 4.21](#)). Each specified condition in this class applies to the whole activity, a BC, a BC category, a BC surrogate, or a procedure. The context indicates to what part of the SOA it applies. This relates to where the footnote indicator is placed in the SOA. A footnote directly linked to the activity description is applicable for all occasions of that activity and should therefore have the context related to that activity. If the condition holds for a specific timepoint of that activity, then the context should be set to the corresponding scheduledActivityInstance to indicate when it is applicable. See [Section 4.11, Activities](#), for more information.

4.23.5 Additional timepoints Not Presented in the SOA

These footnotes specify activities that are not directly presented in the SOA because they need to be done in between regular visits, for example:

1. Questionnaire will be filled in every 2 weeks until ...
2. During run-in period, patients will perform XX measurements and inhale placebo medication at approximately 12-hour intervals for a minimum of 14 days and maximum of 21 days.

The first step in mapping these activities is to identify instances where they do not match the regular encounters represented in the SOA. These instances need to be added as ScheduledActivityInstances to the timeline with the corresponding timing information. The implementer can choose to create a separate encounter for them or to link them to the last or next encounter as required by the implementation and downstream processes (e.g., EDC setup).



4.23.6 Footnotes Representing Optional Alternative Encounter Methods

These footnotes specify potential encounter methods, such as:

1. Performed by telephone by qualified staff
2. If regulatory allowed, visits may take place at home

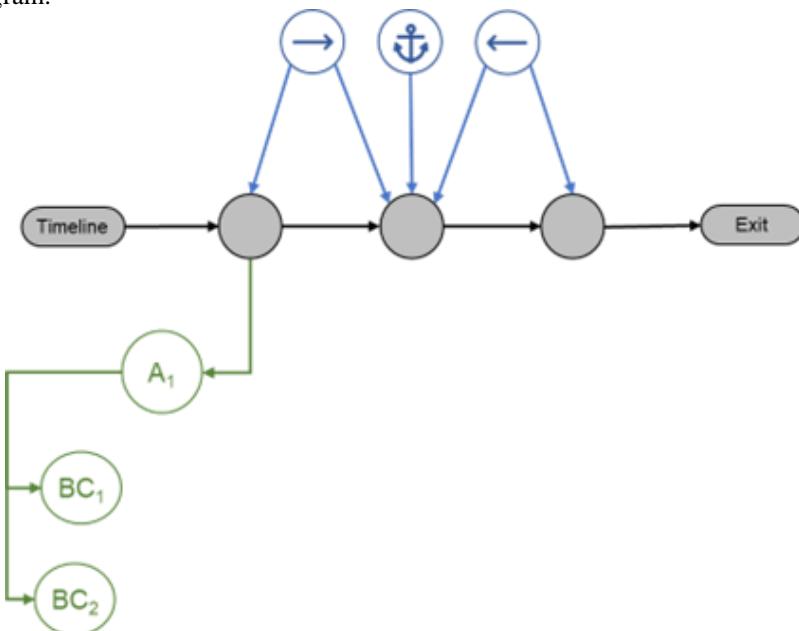
The encounter methods are specified by the attributes environmentalSetting and contactModes in the Encounter class. If optional alternative encounter methods are allowed then more than 1 contactMode and/or environmental setting may be specified.

4.23.7 Footnotes Representing Measurements to Be Done for a Specified Activity

In most protocols the exact assessments to be done are specified in dedicated paragraphs. However, in some cases, they are specified in the footnotes of the SOA, for example:

1. Hematology must include CBC with differential including but not limited to
2. T/B/NK cell count (i.e. CD3, CD4, CD8, CD19, CD16/56)

These assessments can be specified as BCs and linked to the corresponding SOA activity as shown in the following diagram.



4.23.8 Footnotes Representing Optional Alternative Measurement Methods

These footnotes indicate more than 1 alternative for an assessment, for example:

1. Diagnosis confirmed with either chest x-ray or CT scan
2. Urine or plasma pregnancy test

As with conditional footnotes, these footnotes can be handled using the Condition class. The text can then be stored in the corresponding text attribute. Both assessments need to be specified as a BC, procedure, or BC surrogate. The specified condition then can be related to both using the appliesTo relationship.

4.23.9 Additional Instructions for Procedures and/or Performing Assessments

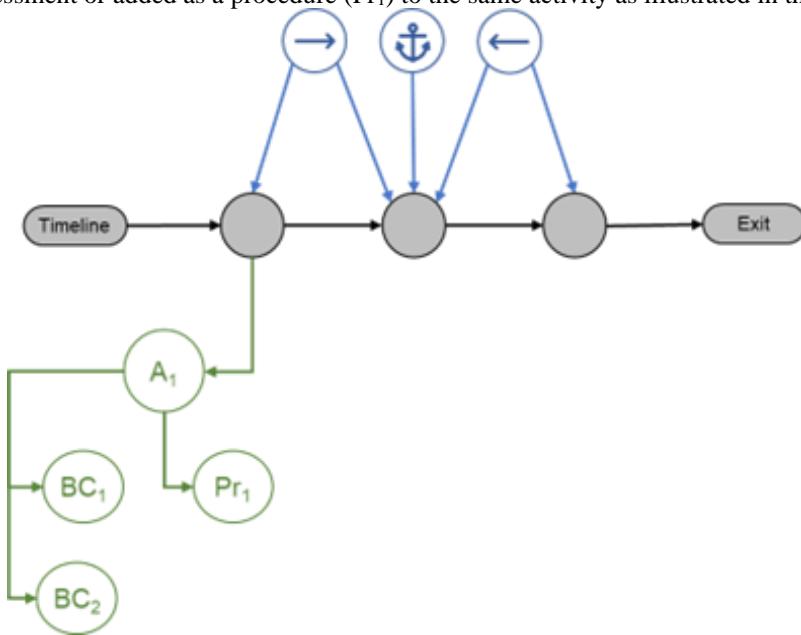
These footnotes give details on how assessments need to be done, for example:

1. A ruler will be provided to assess ...
2. Samples will be sent to ...
3. Subjects should adhere to low-fat diet on day of sample collection
4. In order to assess y, the add-on medication should be continued for at least x weeks

5. X will be assessed by a blinded assessor

6. Patients should be instructed to use the inhaler in the morning at approximately the same time

Depending on the nature and level of instruction, this can be included in the BC when directly related to a specific assessment or added as a procedure (Pr_1) to the same activity as illustrated in the following diagram.



4.23.10 Visit and Timing Window Information

Visit window information is often shown in the column header of the corresponding visit, but in some cases may be added as footnotes; for example:

1. Assessments need to be done within 10 minutes after dosing
2. Visits need to take place between 5 and 10 days after dosing

As explained in Section 4.14, Study Timing, all specific groups of activities that occur at a specific timepoint are stored as separate scheduledActivityInstances and are linked to the corresponding timing. This timing class has attributes that can be used to specify the timing window. The window attribute is used to store the textual value of the window (e.g., “within 10 minutes after dosing”) whereas the windowLower and windowUpper attributes are used for the computer readable version in ISO 8601 format (e.g., “T0M”, “T10M”).

4.23.11 Eligibility Requirements

Eligibility criteria are stored in the EligibilityCriteria class (see Section 4.18, Populations, Cohorts, and Eligibility Criteria). In some cases they are repeated in the SOA; for example:

1. Screening spirometry must demonstrate a value of In the morning of the first day of treatment value must also be in range
2. Patients must demonstrate $\geq 15\%$ reversibility of FEV1 within .. following inhalation of ...

The EligibilityCriteria class uses text templates for the specifications of the criteria. Using these text templates, criteria can refer to the corresponding activity or assessment (BC) in the SOA. If required, these cross-references could be used by an implementation to link the criteria to the SOA and present them with the corresponding activities in the SOA.

4.23.12 Complex Combinations

Footnotes are often complex, long text that includes different kinds of requirements (e.g., a combination of timing, duration, conditionality, and/or methods), such as:

1. All subjects will perform a X profile for any 3 days (not required to be consecutive) during week (-2) to week (01), week 11-12, week 23-24 and week 51-52. Blood glucose readings will consist of 3 preprandial

measurements (1~15 minutes before breakfast, 1~15 minutes before lunch, and 1~15 minutes before dinner) AND 3 postprandial measurements (1~1~2 hours after breakfast, 1~1~2 hours after lunch, and 1~1~2 hours after dinner.) The initial preprandial 6-point glucose measurement on the x day should be a fasting plasma glucose reading.

2. SpO₂ before activity (baseline), during activity until the end of anaesthesia, and during postoperative recovery

For the purpose of comprehensibility of the SOA and for consistency throughout the study process, it is helpful to deduct the separate requirements from these footnotes and digitize them according to the solutions presented in this section.

4.24 Complex Study Designs

A complex study design is not a delineated concept. Although not exhaustive, the aim of this section is to provide insights in how complex aspects of study designs can be modeled in the USDM, including:

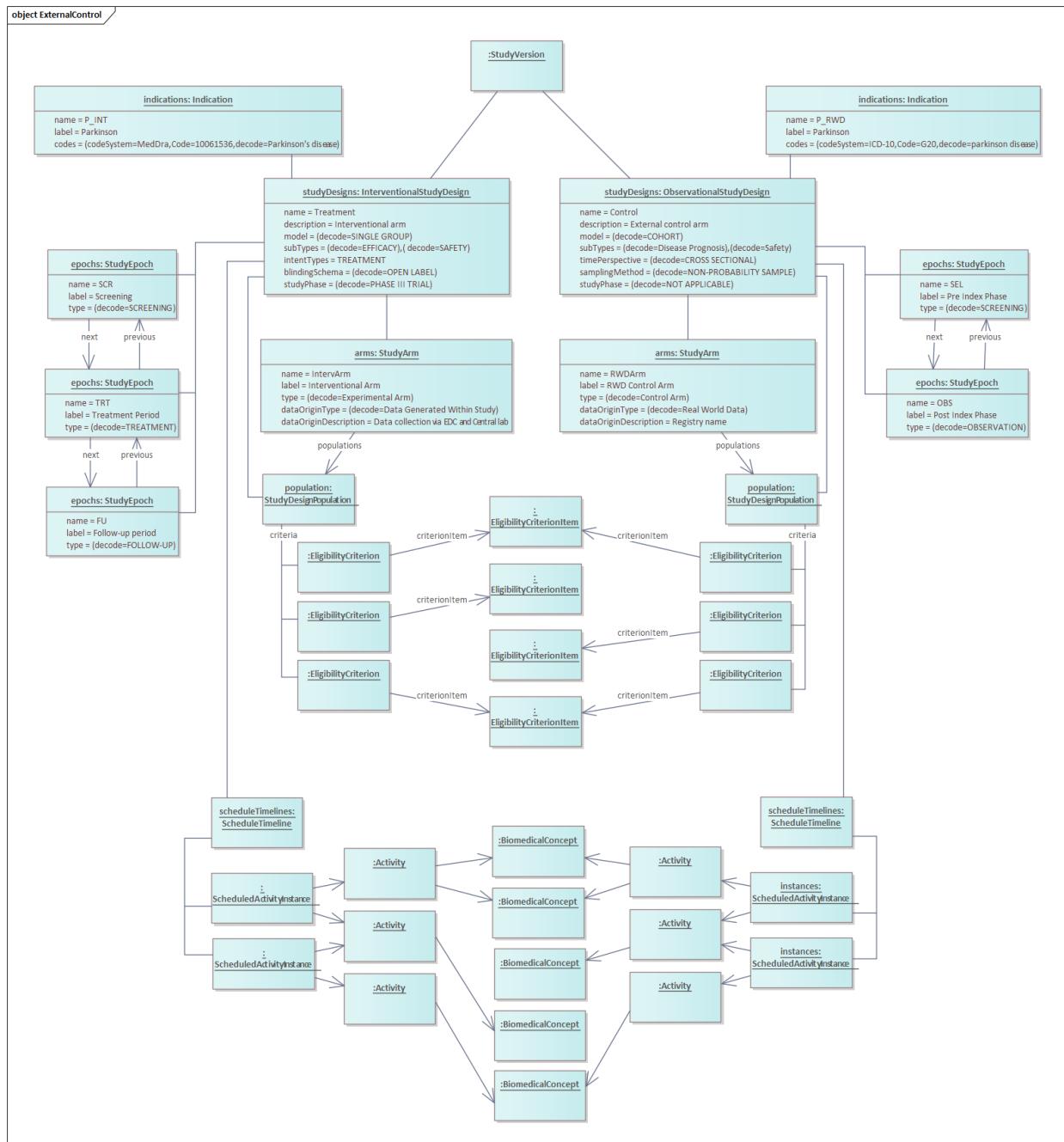
- External control arms
- Multiple cohorts
- Multistep intervention schedules
- Basket, umbrella and multiphased studies
- Decentralized trials

4.24.1 External control arms

An study with an external control usually includes an arm that follows an interventional trial schedule and an arm that is based on real-world data, synthetic data, or historical control trial data. Although the aim is to have a similar design for both the interventional arm and the control arm, the different nature of the data collection has an influence on study design elements like eligibility criteria, study epochs, timeline visits, and corresponding windowing and assessment details. Therefore, although it is up to the implementer how it is modeled, storing both arms in a separate study design is recommended. This aligns with the observed usual practice that the control arm is described in a separate protocol.

The following instance diagram shows basic principles of how an external control arm design can be stored in the USDM. It includes the following features:

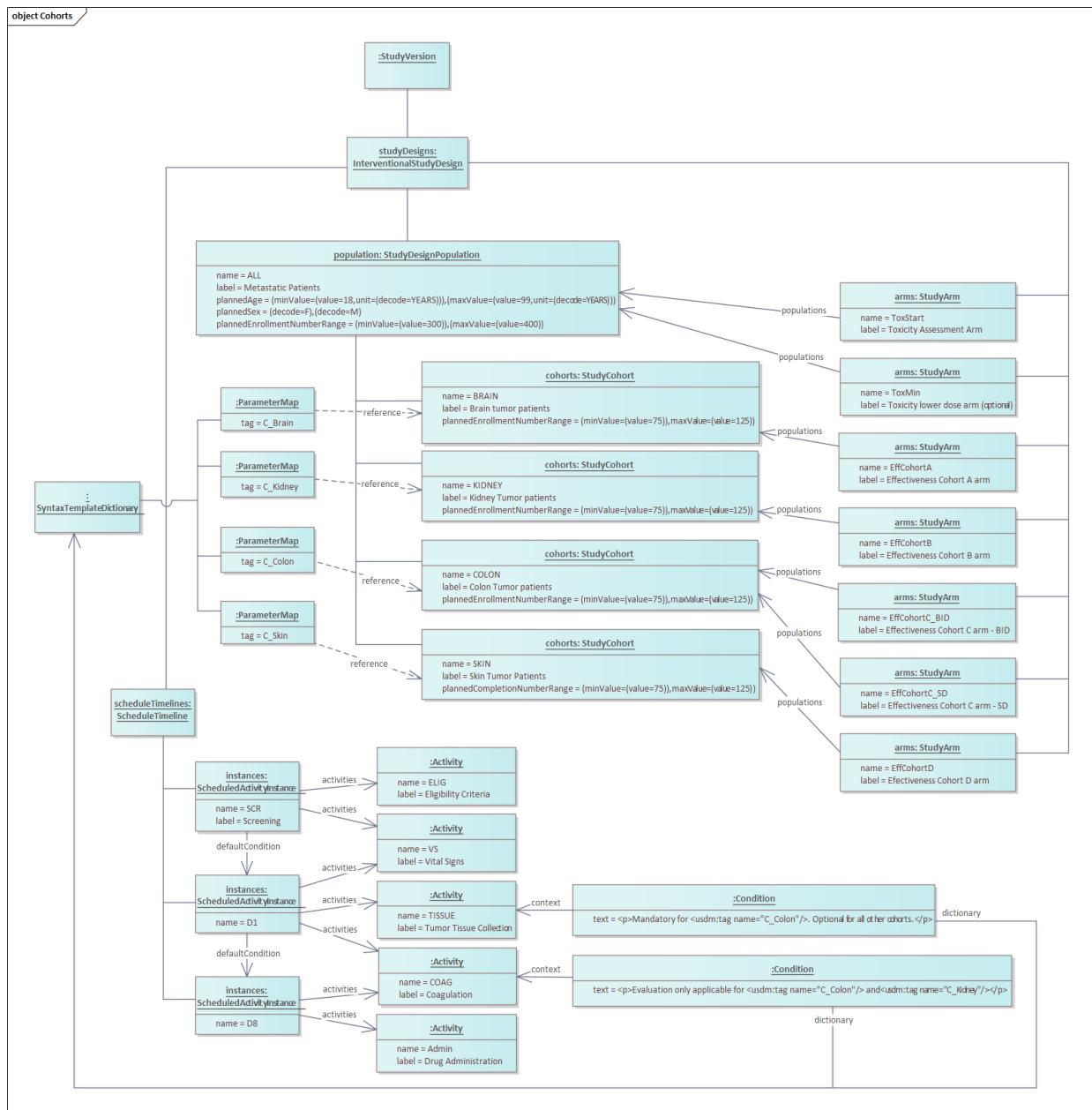
1. The interventional arm is specified in the InterventionalStudyDesign class with corresponding design specific attributes while the observational real-world data control arm is specified in the ObservationalStudyDesign class.
2. The indication is specified for each of the study design separately. Although the same indication is intended for both arms, coding can be adjusted to the specific source data used for the arm. In this example, the MedDRA code is specified for the interventional arm while the corresponding ICD-10 code is specified for the real-world data control arm.
3. Epochs (study periods) are specified per design and therefore may reflect differences between arms. Whereas an external control arm may not have a treatment phase and/or a clear distinction between treatment and follow-up, the interventional arm has typically separate epochs for treatment and follow-up. In the example, these epochs for the interventional arm match the observation epoch of the control arm.
4. Although expected to be similar, study population details are specified per design. The corresponding eligibility criteria may point to shared items or may be specific to the interventional or observational nature of the design. (See Section 4.18, [Populations, Cohorts, and Eligibility Criteria](#), for a more detailed example of shared criteria.)
5. External control arms usually have similar time points as the interventional arm. However, due to the nature of the data, larger windows may be applicable, and number of assessments and visits might be limited in the external control arm. Therefore, the timelines and corresponding activities are defined within the design with the option to refer to shared assessments stored in BC. Note that if assessments differ in some aspects, this would require separate BC specifications although they usually will refer to the same controlled terminology. If needed, both arms can be matched according to equal time point values which are computer readable and specified in ISO 8601 format.



4.24.2 Multiple Cohorts

As presented in Section 4.18, [Populations, Cohorts, and Eligibility Criteria](#), a population can be divided into multiple cohorts when feasible for the study design. In case assessments and schedules differ greatly between the cohorts, it is better to model them into separate designs as illustrated in the preceding external control arm example. However, if all cohorts and arms follow the same schedule with few exceptions, it is more efficient to combine them into a single design. This example is based on a number of oncology phase 1-2 designs obtained from ClinicalTrials.gov. Such designs usually start with an arm that combines different indications to test for toxicity while the follow-up arms are looking at the effectiveness per disease area. The instance diagram shows basic principles for such a design. It includes the following features:

1. The general study design population is divided into cohorts. Characteristics of the study population and corresponding cohorts can either be defined at the study population level or the cohort level, or both. In this case the planned age and gender were defined at the study design population level and the planned enrollment number both at the study design population level (300-400) and at the cohort level (75-125).
2. The 2 toxicity assessment arms point to the general study design population because patients with any of the study design indications are included in these arms. The effectiveness arms, however, point to the corresponding cohorts because these are specific for the corresponding cohort disease indication. For 1 of those cohorts, 2 different dosing regimens are tested in separate arms. Therefore, both arms point to the same study cohort defined for the indication. Note that this is an example; the USDM is flexible and modeling of cohorts is not necessarily bound by disease indication. In addition, a study arm may also point to multiple cohorts if needed.
3. In this example, all arms are following the same schedule of activities, which is represented in the USDM schedule timeline and corresponding activities. The simplified example shows 3 different time points referring to a number of activities. Note that these activities are typically shown in the left column of an SOA and that the USDM subsequently links them to the corresponding procedures and assessments (see Section 4.14, Study Timing) that may be further described elsewhere in the protocol.
4. Some of the activities are conditional for a specific cohort. This is noted in conditions which inherited the syntax template feature (see Section 4.21). To enable a direct link between the condition and the corresponding cohort, a syntax template parameterMap was created for each studyCohort label. The actual cohort name in the condition text is replaced by the corresponding tag. This has 2 major advantages:
 - a. If cohort labels are changed, this is directly reflected in the condition text (usually shown as footnotes to the SOA).
 - b. Conditions can be filtered based on tags for a specific condition, allowing for the creation of cohort- or patient-specific journeys.



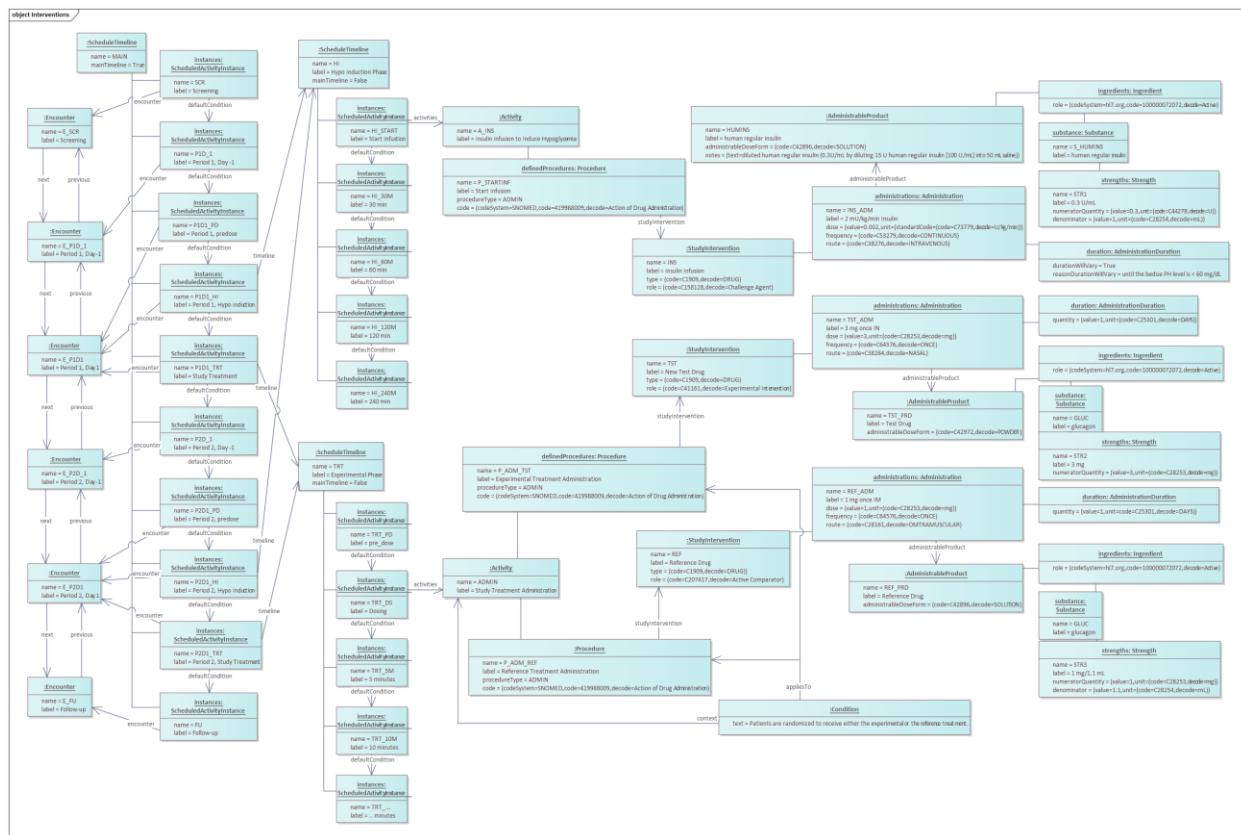
4.24.3 Multistep Intervention Schedules

Study designs become more complex from an interventional perspective when they include multiple intervention steps. An example of this are studies where all patients start with the same treatment but are randomized afterwards to get a different follow-up treatment and/or a different add-on treatment. The following instance diagram shows such a study in which patients are first challenged with insulin to reach hypoglycemic levels and thereafter are randomized to get the test or control treatment to test their effectiveness on restoring glycemic levels. The study is also a randomized crossover study, which adds an extra layer of complexity because both the challenge and the treatment phase are repeated for both periods. The instance diagram shows how this can be represented in USDM. It includes the following features:

1. The main timeline represents the main schedule of activities in the protocol. The day 1 visit (stored in the encounter class) is divided into 3 different scheduled activity instances to indicate the different periods during the day (i.e., predose phase, hypoglycemic induction phase, treatment phase). Note that in a

document representation of the SOA this can be combined again and explained using footnotes, while a study design solution allows one to follow the logic within an encounter using expand functionalities.

2. The specific assessments within each phase are modeled using sub-timelines (see section 4.14, Study Timing) for both the hypoglycemic induction phase and the treatment phase. This allows for clearness in timing in relation to the specific administration. In a document representation, these sub-timelines are often represented as separate tables or as footnote instructions.
3. The additional advantage of a sub-timeline is that they can be referenced multiple times (e.g., in a crossover study or repeat-cycle study). In this crossover example, each sub-timeline is referenced both from period 1 and from period 2.
4. All activities and corresponding labels (usually presented in the left column of the SOA) are stored in the Activity class. In this example, only the dosing activities are shown.
 - a. The activity "Insulin infusion to Induce Hypoglycemia" includes a specific start-administration procedure which refers to the corresponding study intervention instance.
 - b. The activity "Study Treatment Administration" includes 2 different procedures, 1 for the new test drug administration and 1 for the reference drug administration. A condition in the context of the activity is applicable to both procedures to indicate that the administration of either is based on randomization.
5. For each kind of intervention, a separate StudyIntervention instance is stored in the StudyIntervention part of the USDM. This includes details on administration duration, administrable product, and corresponding ingredients and strengths. Additional notes may be added if helpful for downstream processes, for example to include more instructions on preparation and administration as shown in the example for the human regular insulin administrable product. (For more information on this part of the model, see Section 4.15, Study Interventions.)



4.24.4 Basket, Umbrella, and Multiphased studies

Basket trials are trials in which a specific intervention is tested for multiple indications; in umbrella trials, multiple interventions are tested for a single indication. These kinds of trials allow for more efficiency and consistency

because basic parts of the study design can be fixed and/or controlled; only subparts need to be flexible and adjusted for the specific indication or intervention. *Multiphased trials* are trials in which multiple objectives and study phases are combined into a single design, again combining multiple (sub-)trials for efficiency and consistency. Moreover, combinations of these types of complex designs also are possible. The preceding multiple cohort is a good example of a combination of a multiphase and umbrella trial.

The USDM is flexible in storing the study design information for these complex trials. Depending on how flexible the subpart is, one can decide to store and exchange it as 1 design or as multiple designs. If the timeline is equal for all the designs, it is probably more efficient to store it in a single design (as in the multiple cohort example).

Regarding the documentation, a master protocol with corresponding subprotocols might be applicable to these kinds of studies. For an example of the storage of these documents in the USDM, see Section 4.6, [Study, Protocols, and Amendments](#).

4.24.5 Decentralized Trials

Decentralized trials are characterized by more remote activities (e.g., informed consent, visits, drug supplies). Although more challenging from a trial execution perspective, the design aspects are similar to regular clinical trials. To address the remoteness, the USDM encounter contact modes and environmental settings identify how patients are contacted and where they are located during the visit. If more options are allowed per design then more contact modes and/or environmental settings can be specified. Conditional and/or optional activities can be handled in the conditions class, similar to regular trial design, and optional assessment features can be enabled for each assessment using the BC features (see Section 4.11, [Activities](#)).

4.25 Schedule of Activity Views

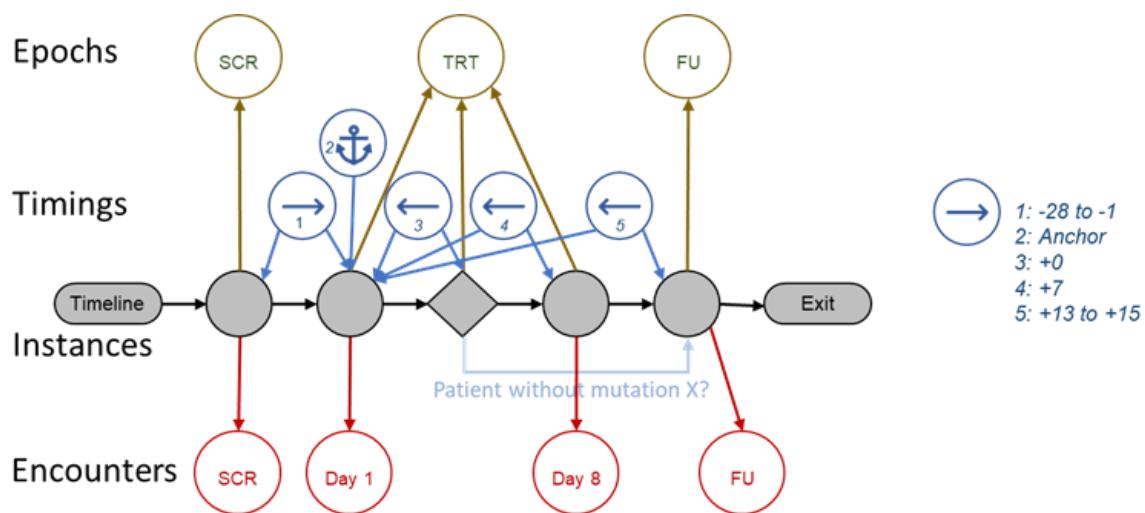
Based on the objectives and endpoints of a study, the assessments, procedures, and the corresponding timings are planned and described in the study design and corresponding protocol. The SOA provides a broad overview of the timeline and activities at each time point. However, for a visual representation of this timeline and corresponding details, options are limited by space (e.g., document page, screen) and by the aim of visual clearness. For this reason many details of a timeline are currently handled in footnotes and/or in-text. Stakeholders in downstream processes, however, may require a different view on the SOA than the study investigator who approves the design and protocol.

This section provides an example of how SOA details can be presented in and outside a document.

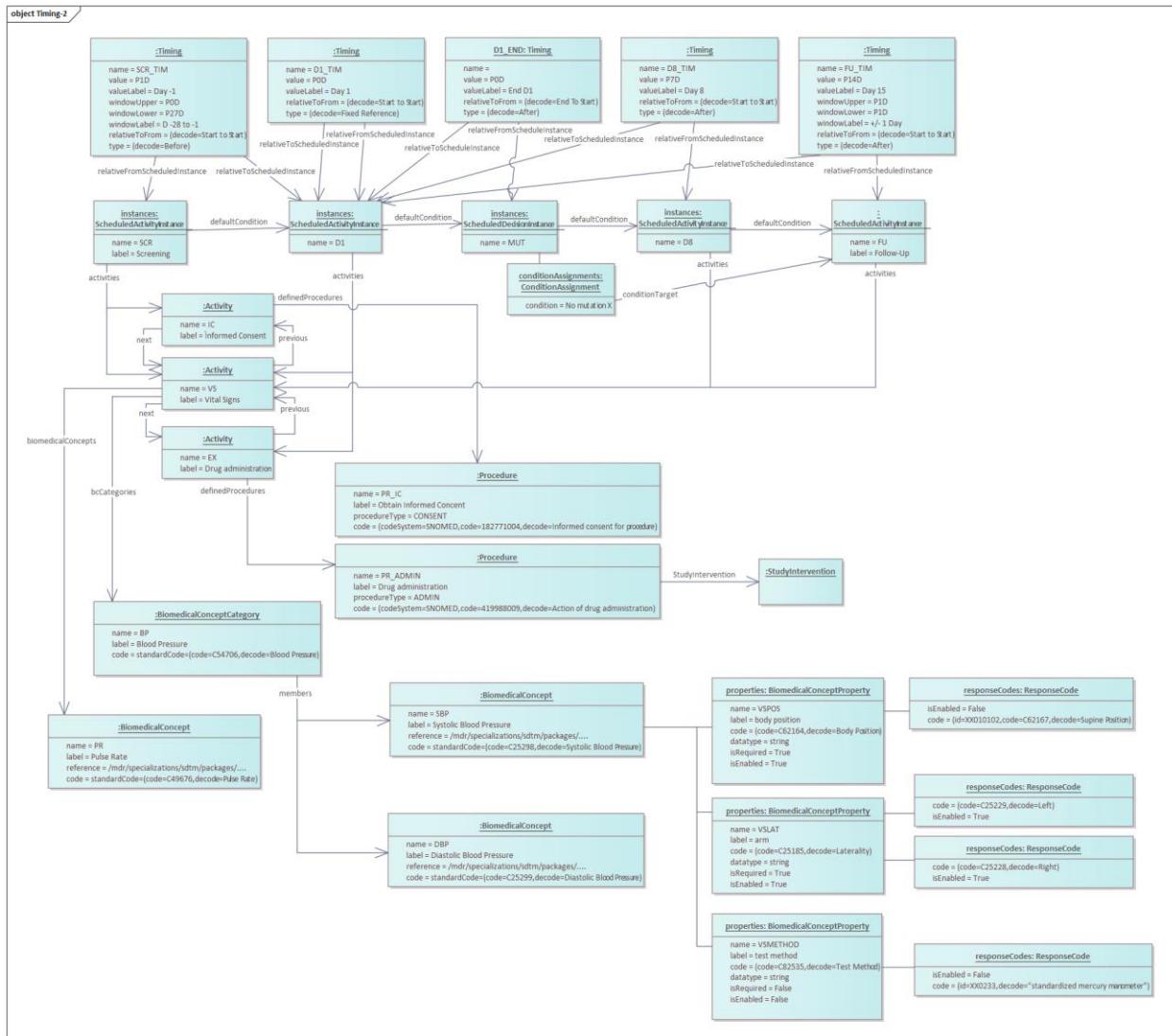
	Screening	Treatment Phase	Follow-up	
Activity	Day -28 to -1	Day 1	Day 8	Day 15 (+/- 1 day)
Informed Consent	X			
Vital Signs	X	X	X ^{a)}	X
Drug administration		X		

^{a)} Only applicable for patients with mutation X

From a logical USDM perspective, this simple SOA can be presented as depicted in the following diagram (see Section 4.14, [Study Timing](#), for details around timeline and USDM representation). The instances of the main timeline refer to an encounter and an epoch. The timing between these instances is defined and the footnote indicating the optionality of a visit is added as a decision instance in the diagram. Note that multiple instances may refer to the same encounter (visit) and/or epoch.



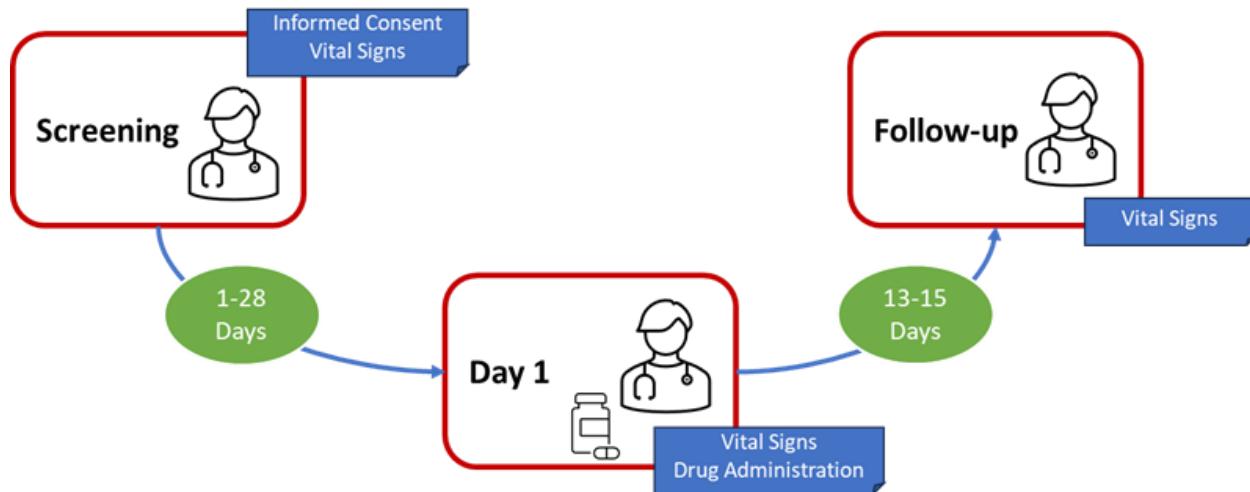
The following diagram aligns to the SOA timeline. Although epoch and encounter references are not included, activity details like procedures and BC are. Although not presented in the SOA, this information can automatically be linked to the activity by a solution and then represented in any way needed for a specific view on the SOA. Some of these examples are presented here.



Note that instance diagrams are created to show single use cases. Not all required attributes, relationships, and properties are presented. Cross-references between instances are presented by arrows while nested instances are represented by straight lines.

SOA information stored in USDM format facilitates the creation of patient journeys based on the decision instances and conditions defined in the USDM. For an example of conditional assessments, see the multiple cohort example in Section 4.24, Complex Study Designs.

The following patient journey diagram is created based on the information presented in the instance diagram. It illustrates the journey for patients without mutation X. Note that visit 8 for these patients is automatically excluded based on the scheduled decision instance and corresponding condition assignment which directly points to the follow-up assessment. The timing between the visits is stored in ISO 8601 format and can therefore be used to automate the calculation of the period between the subsequent visits.

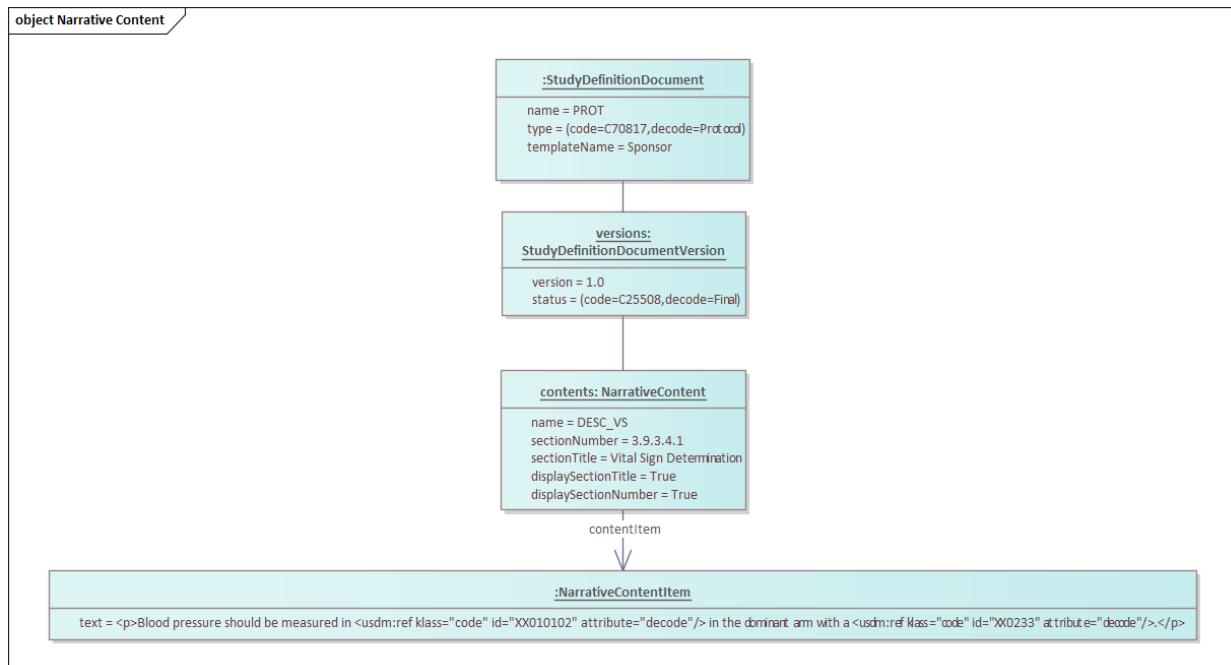


As shown in the instance diagram, an activity description in the SOA may point to one or more procedures and assessments. Details of these procedures are usually described in footnotes, separate tables (for lab), and in-text. The following protocol text snippet describes details on the vital signs measurement to be performed. These described details of the vital signs measurements are actually aspects of the BCs linked to the corresponding activities.

3.9.3.1 Vital Sign Determination

Blood pressure should be measured in supine position in the dominant arm with a standardized mercury manometer.

The protocol text may refer to these details stored in the BCs. This allows for automation in text construction and for consistency in alignment between text and structured content which then can be used in downstream processes. The following instance diagram shows how the text from this snippet refers to specific codes and corresponding attributes stored in the BC property and response code class. The flexible text tagging approach of the USDM (see Section 4.22, [XHTML Attributes](#)) enables automated text construction based on the information stored in the BCs or, alternatively, BC property and response enabling can based on specifications in the structured text elements.



All details stored in the timeline—including encounter (visit), epoch, activity, and corresponding procedure and assessment (BC) information—can be used by the EDC system for EDC design and user views. The level of detail in the USDM can be chosen based on the use case and implementing system. This includes the following options:

- Store the activities within a visit into separate activity instances to structure the order of assessments during the visit and provide a means to create separate corresponding EDC entry pages. The order will be determined by the defaultCondition while all instances can be bound to the same encounter. (For an example of how to handle multiple activity instances within the visit, see the multistep intervention schedule example in Section 4.24, [Complex Study Designs](#).)
- Use the BC properties and corresponding enabled response codes to automate the selection and/or design of entry forms.
- Provide an overview of timeline assessments and procedures for a specific caregiver and/or third party (e.g., investigator activities, lab assessments).

Finally, the SOA encounter details and corresponding planned activities can be used to create SDTM Trial Design domains (see [Section 7.1](#)) and build the outline for other SDTM domains.

5 USDM Data Dictionary

Note: Properties without a description in the following table are either relationships or instance identifiers and were deemed to be out of scope for terminology development. Please see Section 4.4, [Internal Identifiers Within the Model](#), for additional information on the use of identifier variables in the model.

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
Abbreviation			C42610		Abbreviation	A set of letters that are drawn from a word or from a sequence of words and that are used for brevity in place of the full word or phrase. (CDISC Glossary)		
	id	string						
	abbreviatedText	string	C42610		Abbreviation	A set of letters that are drawn from a word or from a sequence of words and that are used for brevity in place of the full word or phrase. (CDISC Glossary)		
	expandedText	string	CNEW		Abbreviation Long Name	The full literal representation of the abbreviation.		
	notes	CommentAnnotation	CNEW		Abbreviation Notes	A brief written record relevant to the abbreviation.		
Activity			C71473		Study Activity	An action, undertaking, or event, which is anticipated to be performed or observed, or was performed or observed, according to the study protocol during the execution of the study.		
	id	string						
	name	string	C18884-2		Study Activity Name	The literal identifier (i.e., distinctive designation) of the study activity.		
	description	string	C70960		Study Activity Description	A narrative representation of the study activity.		
	label	string	C20745-8		Study Activity Label	The short descriptive designation for the study activity.		
	notes	CommentAnnotation	CNEW		Activity Notes	A brief written record relevant to the activity.		
	definedProcedures	Procedure		0..*		A USDM relationship between the Activity and Procedure classes which identifies the set of defined procedures associated with the activity.		
	biomedicalConcepts	BiomedicalConcept		0..*		A USDM relationship between the Activity and BiomedicalConcept classes which identifies the set of biomedical concepts associated with the activity.		
	next	Activity		0..1		A USDM relationship within the Activity class which identifies the activity that follows the current activity in the display order.		
	timeline	ScheduleTimeline		0..1		A USDM relationship between the Activity and ScheduleTimeline classes which provides the details associated with an instance of the scheduled timeline related to the activity.		
	children	Activity		0..*		A USDM relationship within the Activity class which identifies the set of child activities associated with an activity.		
	previous	Activity		0..1		A USDM relationship within the Activity class which identifies the activity that precedes the current activity in the display order.		
	bcSurrogates	BiomedicalConceptSurrogate		0..*		A USDM relationship between the Activity and BiomedicalConceptSurrogate classes which identifies the set of biomedical concept surrogates associated with the activity.		
	bcCategories	BiomedicalConceptCategory		0..*		A USDM relationship between the Activity and BiomedicalConceptCategory classes which identifies the set of biomedical concept categories associated with the activity.		
Address			C25407		Address	A standardized representation of the location of a person, business, building, or organization. (NCI)		
	id	string						
	text	string	C20131-1		Address Full Text	A standardized representation of the complete set of components denoting the physical address of the person, business, building, or organization.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	lines	string	C25690		Address Line	The street name and number, building number, apartment or unit number, or post office box number where an entity is physically located.		
	district	string	C176229		District	An administrative or territorial division of a city, town, county, parish, state, country, or other locality based on a shared characteristic.		
	city	string	C25160		City	A relatively large and/or densely populated area of human habitation with administrative or legal status that may be specified as a component of a postal address.		
	postalCode	string	C25621		Postal Code	An alphanumeric code assigned to a mail delivery area.		
	state	string	C87194		State	A sub-division of a country that forms part of a federal union. States are usually, but not always, more autonomous than provinces and may have different laws from the central government.		
	country	Code	C25464		Country	A sovereign nation occupying a distinct territory and ruled by an autonomous government.	(Point out to ISO 3166-1 Alpha-3 Country code)	
AdministrableProduct			CNEW		Administrable Product	Any study product that is formulated and presented in the form that is suitable for administration to a study participant.		
	id	string						
	name	string	CNEW		Administrable Product Definition Name	The literal identifier (i.e., distinctive designation) of the administrable product.		
	description	string	CNEW		Administrable Product Definition Description	A narrative representation of the administrable product.		
	label	string	CNEW		Administrable Product Definition Label	The short descriptive designation for the administrable product.		
	administrableDoseForm	AliasCode	CNEW		Administrable Product Dose Form	The physical form in which formulated ingredient(s) are presented in the administrable product.	SDTM Terminology Codelist C66726	
	sourcing	Code	CNEW		Administrable Product Sourcing	An indication as to whether the administrable product is obtained from a local or central source.	CNEW - Product Sourcing Value Set	
	productDesignation	Code	CNEW		Administrable Product Product Designation	An indication as to whether the administrable product is an investigational medicinal product or an auxiliary medicinal product.	C207418	
	pharmacologicClass	Code	CNEW		Administrable Product Pharmacologic Class	The pharmacological class of the administrable product.	(Points to external codelists such as UNII, MED-RT)	
	notes	CommentAnnotation	CNEW		Administrable Product Notes	A brief written record relevant to the administrable product.		
	identifiers	AdministrableProductIdentifier		0..*		A USDIM relationship between the AdministrableProduct and AdministrableProductIdentifier classes which provides the set of identifiers related to the administrable product.		
	properties	AdministrableProductProperty		0..*		A USDIM relationship between the AdministrableProduct and AdministrableProductProperty classes which provides the set of properties related to the administrable product.		
	ingredients	Ingredient		0..*		A USDIM relationship between the AdministrableProduct and Ingredient classes which provides the set of ingredients related to the administrable product.		
AdministrableProductIdentifier			CNEW		Administrable Product Identifier	A sequence of characters used to identify, name, or characterize the administrable product.		
	id	string					Identifier	
	text	string	CNEW		Administrable Product Identifier Text	An instance of structured text that represents the administrable product.		Identifier
	scope	Organization		1		A USDIM relationship between the AdministrableProductIdentifier and Organization class which provides the details associated with which provides the details associated with each organization that has assigned the administrable product identifier.		Identifier

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
AdministrableProductProperty			CNEW		Administrable Product Property	A characteristic from a set of characteristics used to define an administrable product.		
	id	string						
	name	string	CNEW		Administrable Product Property Name	The literal identifier (i.e., distinctive designation) of the administrable product property.		
	type	Code	CNEW		Administrable Product Property Type	A characterization or classification of the administrable product property.	CNEW Administrable Product Property Type	
	text	string	CNEW		Administrable Product Property Text	An instance of structured text that represents the administrable product property.		
	quantity	Quantity	CNEW		Administrable Product Property Quantity Value	The numeric value associated with an administrable product property.		
Administration			C25409		Administration	The act of dispensing, applying, or tendering a product, agent, or therapy.		
	id	string						
	name	string	C20746 5		Administration Name	The literal identifier (i.e., distinctive designation) for the administration of a product, agent, or therapy.		
	description	string	C20746 3		Administration Description	A narrative representation for the administration of a product, agent, or therapy.		
	label	string	C20746 4		Administration Label	The short descriptive designation for the administration of a product, agent, or therapy.		
	dose	Quantity	C16719 0		Administration Dose	The value representing the amount of an agent given to an individual at one time.		
	frequency	AliasCode	C89081		Dosing Frequency	The number of doses administered per a specific interval.	SDTM Terminology Codelist C71113	
	route	AliasCode	C38114		Route of Administration	The pathway by which a substance is administered in order to reach the site of action in the body.	SDTM Terminology Codelist C66729	
	notes	CommentAnnotation	CNEW		Administration Notes	A brief written record relevant to the administration of the product, agent, or therapy.		
	administrableProduct	AdministrableProduct		0..1		A USDIM relationship between the Administration and AdministrableProductDefinition classes which identifies the administrable product associated with the administration of the product, agent, or therapy.		
	duration	AdministrationDuration		1		A USDIM relationship between the Administration and AdministrationDuration classes which provides the duration of an instance of product, agent, or therapy administration.		
	medicalDevice	MedicalDevice		0..1		A USDIM relationship between the Administration and MedicalDevice classes which identifies the medical device associated with an instance of product, agent, or therapy administration.		
AdministrationDuration			C69282		Administration Duration	The amount of time elapsed during the administration of an agent.		
	id	string						
	description	string	C20745 9		Administration Duration Description	A narrative representation of the agent administration duration.		
	quantity	Quantity	C20746 0		Administration Duration Quantity Value	The value representing the amount of time over which the administration of an agent occurs.		
	durationWillVary	Boolean	C20746 1		Administration Duration Will Vary Indicator	An indication as to whether the agent administration duration is planned to vary within and/or across subjects.		
	reasonDurationWillVary	string	C20746 2		Administration Duration Reason Duration Will Vary	The explanation for why the agent administration duration will vary within and/or across subjects.		
AliasCode			C20134 4		Alias Code	An alternative symbol or combination of symbols which is assigned to the members of a collection.		
	id	string						
	standardCode	Code	CNEW		Standard Code	A combination of symbols that is used to represent the standard code.		
	standardCodeAliases	Code	CNEW		Standard Code Aliases	Alternative combinations of symbols used to represent aliases or alternatives to the standard code.		
AnalysisPopulation			C18881 4		Analysis Population	A target study population on which an analysis is performed. These may be represented by the entire study population, a subgroup.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						defined by a particular characteristic measured at baseline, or a principal stratum defined by the occurrence (or non-occurrence, depending on context) of a specific intercurrent event. (ICH E9 R1 Addendum)		
	id	string						
	text	string	C20746 8		Analysis Population Text	An instance of unstructured text that represents the analysis population.		
	name	string	C20746 7		Analysis Population Name	The literal identifier (i.e., distinctive designation) of the analysis population.		
	description	string	C18885 4		Analysis Population Description	A narrative representation of the analysis population.		
	label	string	C20746 6		Analysis Population Label	The short descriptive designation for the analysis population.		
	notes	CommentAnnotation	CNEW		Analysis Population Notes	A brief written record relevant to the analysis population.		
	subsetOf	PopulationDefinition		0..*		A USDM relationship between the AnalysisPopulation and PopulationDefinition classes which identifies the population definition of which the analysis population is a subset.		
AssignedPerson			CNEW		Assigned Person	An individual person who is allotted or appointed to a particular role, function, or other entity.		
	id	string						
	name	string	CNEW		Assigned Person Name	The literal identifier (i.e., distinctive designation) of the assigned person.		
	description	string	CNEW		Assigned Person Description	A narrative representation of the assigned person.		
	label	string	CNEW		Assigned Person Label	The short descriptive designation for the assigned person.		
	jobTitle	string	CNEW		Assigned Person Job Title	An identifying designation related to the assigned person's occupation.		
	organization	Organization		0..1		A USDM relationship between the AssignedPerson and Organization classes that identifies that organization to which the assigned person belongs.		
BiomedicalConcept			C20134 5		Biomedical Concept	A unit of biomedical knowledge created from a unique combination of characteristics that include implementation details like variables and terminologies, used as building blocks for standardized, hierarchically structured clinical research information.		
	id	string						
	name	string	C20131 2		Biomedical Concept Name	The literal identifier (i.e., distinctive designation) of the biomedical concept.		
	label	string	C20747 0		Biomedical Concept Label	The short descriptive designation for the biomedical concept.		
	synonyms	string	C20131 4		Biomedical Concept Synonym	A word or an expression that serves as a figurative, symbolic, or exact substitute for a biomedical concept, and which has the same meaning.		
	reference	string	C20131 3		Biomedical Concept Reference	A citation to an authoritative source for a biomedical concept.		
	code	AliasCode	C20746 9		Biomedical Concept Concept Code	A concept unique identifier assigned to a biomedical concept that points to the meaning of that biomedical concept.		
	notes	CommentAnnotation	CNEW		Biomedical Concept Notes	A brief written record relevant to the biomedical concept.		
	properties	BiomedicalConceptProperty		0..*		A USDM relationship between the BiomedicalConcept and BiomedicalConceptProperty classes which identifies the set of properties associated with the biomedical concept.		
BiomedicalConceptCategory			C20134 6		Biomedical Concept Category	A grouping of biomedical concepts based on some commonality or by user defined characteristics.		
	id	string						
	name	string	C20131 7		Biomedical Concept Category Name	The literal identifier (i.e., distinctive designation) of the biomedical concept category.		
	description	string	C20131 6		Biomedical Concept Category Description	A narrative representation of the biomedical concept category.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	label	string	C20747 1		Biomedical Concept Category Label	The short descriptive designation for the biomedical concept category.		
	code	AliasCode	C20131 5		Biomedical Concept Category Code	A symbol or combination of symbols which is assigned to the biomedical concept category.		
	notes	CommentAnnotation	CNEW		Biomedical Concept Category Notes	A brief written record relevant to the biomedical concept category.		
	members	BiomedicalConcept		0..*		A USDIM relationship between the BiomedicalConceptCategory and BiomedicalConcept classes which identifies the set of biomedical concept members associated with the biomedical concept category.		
	children	BiomedicalConceptCategory		0..*		A USDIM relationship within the BiomedicalConceptCategory class which identifies the set of child categories of a biomedical concept.		
BiomedicalConceptProperty			C20249 3		Biomedical Concept Property	A characteristic from a set of characteristics used to define a biomedical concept.		
	id	string						
	name	string	C20249 4		Biomedical Concept Property Name	The literal identifier (i.e., distinctive designation) of the biomedical concept property.		
	label	string	C20747 2		Biomedical Concept Property Label	The short descriptive designation for the biomedical concept property.		
	isRequired	Boolean	C20249 5		Biomedical Concept Property Required Indicator	An indication as to whether the biomedical concept property is required.		
	isEnabled	Boolean	C20249 6		Biomedical Concept Property Enabled Indicator	An indication as to whether the biomedical concept property is activated for use within a given usage context for a biomedical concept.		
	datatype	string	C20131 9		Biomedical Concept Property Response Data Type	The structural format of the biomedical concept property response value. The datatype is carried in the attribute and influences the set of allowable values the attribute may assume. (After HL7)		
	code	AliasCode	C20131 8		Biomedical Concept Property Concept Code	A concept unique identifier assigned to a biomedical concept property that points to the meaning of that biomedical concept property.		
	notes	CommentAnnotation	CNEW		Biomedical Concept Property Notes	A brief written record relevant to the biomedical concept property.		
	responseCodes	ResponseCode		0..*		A USDIM relationship between the BiomedicalConceptProperty and ResponseCode classes which identifies the set of response codes associated with the biomedical concept property.		
BiomedicalConceptSurrogate			C20759 0		Biomedical Concept Surrogate	A concept that substitutes for a standard biomedical concept from the designated source.		
	id	string						
	name	string	C20747 4		Biomedical Concept Surrogate Name	The literal identifier (i.e., distinctive designation) of the biomedical concept surrogate.		
	description	string	C20132 0		Biomedical Concept Surrogate Description	A narrative representation of the biomedical concept surrogate.		
	label	string	C20747 3		Biomedical Concept Surrogate Label	The short descriptive designation for the biomedical concept surrogate.		
	reference	string	C20132 1		Biomedical Concept Surrogate Reference	A citation to an authoritative source for a biomedical concept surrogate.		
	notes	CommentAnnotation	CNEW		Biomedical Concept Surrogate Notes	A brief written record relevant to the biomedical concept surrogate.		
BiospecimenRetention			CNEW		Biospecimen Retention	The continued possession, cataloging, and storage of collected biological specimens beyond their initial use.		
	id	string						
	name	string	CNEW		Biospecimen Retention Name	The literal identifier (i.e., distinctive designation) of the biospecimen retention.		
	description	string	C18123 1		Biospecimen Retention Description	A narrative representation of the biospecimen retention.		
	label	string	CNEW		Biospecimen Retention Label	The short descriptive designation for the biospecimen retention.		
	isRetained	Boolean	C16462 0		Biospecimen Retention Indicator	An indication as to whether biospecimens were retained.		
	includesDNA	Boolean	C12777 7		Biospecimen Retention	An indication as to whether retained biospecimens contain DNA.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
Characteristic					Includes DNA Indicator			
	id	string	C25447		Characteristic	The distinguishing qualities or prominent aspects of an entity.		SyntaxTemplate
	name	string	C20747 7		Characteristic Name	The literal identifier (i.e., distinctive designation) of the characteristic.		SyntaxTemplate
	description	string	C20747 5		Characteristic Description	A narrative representation of the characteristic.		SyntaxTemplate
	label	string	C20747 6		Characteristic Label	The short descriptive designation for the characteristic.		SyntaxTemplate
	text	string	C20747 8		Characteristic Text	An instance of structured text that represents the characteristic.		SyntaxTemplate
	notes	CommentAnnotation	CNEW		Characteristic Notes	A brief written record relevant to the characteristic.		SyntaxTemplate
	dictionary	SyntaxTemplateDictionary		0..1		A USDM relationship between the Characteristic and SyntaxTemplateDictionary classes which provides the set of dictionary entries related to characteristics.		SyntaxTemplate
Code			C25162		Code	A symbol or combination of symbols which is assigned to the members of a collection.		
	id	string						
	code	string	C18885 8		Code Value	The literal value of a code.		
	codeSystem	string	C18885 9		Code System Name	The literal identifier (i.e., distinctive designation) of the system used to assign and/or manage codes.		
	codeSystemVersion	string	C18886 8		Code System Version	The version of the code system.		
	decode	string	C18886 1		Decode	Standardized or dictionary-derived human readable text associated with a code.		
CommentAnnotation			C44272		Comment Annotation	An explanatory or critical comment, or other in-context information (e.g., pattern, motif, link), that has been associated with data or other types of information.		
	id	string						
	text	string	CNEW		Comment Annotation Text	An instance of unstructured text that represents the comment annotation.		
	codes	Code	CNEW		Comment Annotation Code	A symbol or combination of symbols which is assigned to the comment annotation.		
Condition			C25457		Condition	A state of being.		
	id	string						SyntaxTemplate
	name	string	C20748 3		Condition Name	The literal identifier (i.e., distinctive designation) of the condition.		SyntaxTemplate
	description	string	C20748 1		Condition Description	A narrative representation of the condition.		SyntaxTemplate
	label	string	C20748 2		Condition Label	The short descriptive designation for the condition.		SyntaxTemplate
	text	string	C20748 4		Condition Text	An instance of structured text that represents the condition.		SyntaxTemplate
	notes	CommentAnnotation	CNEW		Condition Notes	A brief written record relevant to the condition.		SyntaxTemplate
	dictionary	SyntaxTemplateDictionary		0..1		A USDM relationship between the Condition and SyntaxTemplateDictionary classes which provides the set of dictionary entries related to conditions.		SyntaxTemplate
	context	Activity, ScheduledActivityInstance		0..*		A USDM relationship between the Condition and the ScheduledActivityInstance or Activity classes which identifies the scheduled activity instance or activity to which the condition belongs.		
	appliesTo	Activity, BiomedicalConcept, BiomedicalConceptCategory, BiomedicalConceptSurrogate, Procedure		0..*		A USDM relationship between the Condition and the Activity, Procedure, BiomedicalConcept, BiomedicalConceptSurrogate, or BiomedicalConceptCategory classes which identifies the procedure, activity, biomedical concept, biomedical concept surrogate, or biomedical concept category that applies to the condition.		
ConditionAssignment			C20133 5		Condition Assignment	An allotting or appointment to a condition or set of conditions that are to be met in order to make a logical decision.		
	id	string						
	condition	string	C47953		Logical Condition	An assumption on which rests the validity or effect of something else.		
	conditionTarget	ScheduledInstance		1		A USDM relationship between the ConditionAssignment and ScheduledInstance classes which identifies the scheduled		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						instance associated with the condition assignment.		
DocumentContentReference			CNEW		Document Content Reference	A citation pointing to the location of specific content within a document.		
	id	string						
	sectionNumber	string	CNEW		Document Content Reference Section Number	The numeric identifier of a particular section for the document content reference.		
	sectionTitle	string	CNEW		Document Content Reference Section Title	An identifying designation for a particular section for the document content reference.		
	appliesTo	StudyDefinitionDocument		1		A USDM relationship between the DocumentContentReference and StudyDefinitionDocument classes which identifies the study definition document to which the document content reference applies.		
EligibilityCriterion			C16112		Study Eligibility Criterion	Characteristics which are necessary to allow a subject to participate in a clinical study, as outlined in the study protocol. The concept covers inclusion and exclusion criteria.		
	id	string						
	name	string	C20748 8		Study Eligibility Criterion Name	The literal identifier (i.e., distinctive designation) of the study eligibility criterion.		
	description	string	C20748 6		Study Eligibility Criterion Description	A narrative representation of the study eligibility criterion.		
	label	string	C20748 7		Study Eligibility Criterion Label	The short descriptive designation for the study eligibility criterion.		
	identifier	string	C20748 9		Study Eligibility Criterion Identifier	A sequence of characters used to identify, name, or characterize the inclusion or exclusion criterion.		
	category	Code	C83016		Study Eligibility Criterion Category	A classification of the inclusion exclusion criterion.	SDTM Terminology Codelist C66797	
	notes	CommentAnnotation	CNEW		Eligibility Criterion Notes	A brief written record relevant to the eligibility criterion.		
	criterionItem	EligibilityCriterionItem		1		A USDM relationship between the EligibilityCriterion and EligibilityCriterionItem classes which identifies the item belonging to the eligibility criterion.		
	next	EligibilityCriterion		0..1		A USDM relationship within the EligibilityCriterion class which identifies the eligibility criterion that follows the current eligibility criterion in the display order.		
	previous	EligibilityCriterion		0..1		A USDM relationship within the EligibilityCriterion class which identifies the eligibility criterion that precedes the current eligibility criterion in the display order.		
EligibilityCriterionItem			CNEW		Eligibility Criterion Item	An individual item within the container that holds an instance of an eligibility criterion.		
	id	string					SyntaxTemplate	
	name	string	CNEW		Eligibility Criterion Item Name	The literal identifier (i.e., distinctive designation) of the eligibility criterion item.	SyntaxTemplate	
	description	string	CNEW		Eligibility Criterion Item Description	A narrative representation of the eligibility criterion item.	SyntaxTemplate	
	label	string	CNEW		Eligibility Criterion Item Label	The short descriptive designation for the eligibility criterion item.	SyntaxTemplate	
	text	string	CNEW		Eligibility Criterion Item Text	An instance of structured text that represents the eligibility criterion item.	SyntaxTemplate	
	notes	CommentAnnotation	CNEW		Eligibility Criterion Item Notes	A brief written record relevant to the eligibility criterion item.	SyntaxTemplate	
	dictionary	SyntaxTemplateDictionary		0..1		A USDM relationship between the EligibilityCriterionItem and SyntaxTemplateDictionary classes which provides the dictionary entry associated with a eligibility criterion item.		SyntaxTemplate
Encounter			CNEW		Study Encounter	Any physical or virtual contact between two or more parties involved in a study, at which an assessment or activity takes place.		
	id	string						
	name	string	C17101 0		Study Encounter Name	The literal identifier (i.e., distinctive designation) for a protocol-defined study encounter.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	description	string	C18883 6		Study Encounter Description	A narrative representation of the protocol-defined study encounter.		
	label	string	C20749 0		Study Encounter Label	The short descriptive designation for the study encounter.		
	type	Code	C18883 9		Study Encounter Type	A characterization or classification of the study encounter.	C188728	
	environmentalSettings	Code	C18884 0		Environmental Setting	The environment/setting where the event, intervention, or finding occurred.	SDTM Terminology Codelist C127262	
	contactModes	Code	C18884 1		Contact Mode	The means by which an interaction occurs between the subject/participant and person or entity (e.g., a device).	SDTM Terminology Codelist C171445	
	notes	CommentAnnotation	CNEW		Encounter Notes	A brief written record relevant to the study encounter.		
	transitionEndRule	TransitionRule		0..1		A USDM relationship between the Encounter and TransitionRule classes which provides the details associated with a transition rule used to trigger the end of an encounter.		
	next	Encounter		0..1		A USDM relationship within the Encounter class which identifies the encounter that chronologically follows the current encounter.		
	transitionStartRule	TransitionRule		0..1		A USDM relationship between the Encounter and TransitionRule classes which provides the details associated with a transition rule used to trigger the start of an encounter.		
	scheduledAt	Timing		0..1		A USDM relationship between the Encounter and Timing classes which provides information related to the scheduled timing of an encounter.		
	previous	Encounter		0..1		A USDM relationship within the Encounter class which identifies the encounter that chronologically precedes the current encounter.		
Endpoint			C25212		Study Endpoint	A defined variable intended to reflect an outcome of interest that is statistically analyzed to address a particular research question. NOTE: A precise definition of an endpoint typically specifies the type of assessments made, the timing of those assessments, the assessment tools used, and possibly other details, as applicable, such as how multiple assessments within an individual are to be combined. After BEST Resource (CDISC Glossary)		
	id	string					SyntaxTemplate	
	name	string	C20749 2		Study Endpoint Name	The literal identifier (i.e., distinctive designation) of the study endpoint.	SyntaxTemplate	
	description	string	C18882 4		Study Endpoint Description	A narrative representation of the study endpoint.	SyntaxTemplate	
	label	string	C20749 1		Study Endpoint Label	The short descriptive designation for the study endpoint.	SyntaxTemplate	
	text	string	C20749 3		Study Endpoint Text	An instance of structured text that represents the study endpoint.	SyntaxTemplate	
	notes	CommentAnnotation	CNEW		Endpoint Notes	A brief written record relevant to the study endpoint.	SyntaxTemplate	
	dictionary	SyntaxTemplateDictionary		0..1		A USDM relationship between the Endpoint and SyntaxTemplateDictionary classes which provides the set of dictionary entries related to study endpoints.	SyntaxTemplate	
	level	Code	C18882 6		Study Endpoint Level	A characterization or classification of the study endpoint that determines its category of importance relative to other study endpoints.	C188726	
	purpose	string	C18882 5		Study Endpoint Purpose Description	The textual representation of the study endpoint purpose.		
Estimand			C18881 3		Estimand	A precise description of the treatment effect reflecting the clinical question posed by a given clinical trial objective. It summarises at a population level what the outcomes would be in the same patients under different treatment conditions being compared. (ICH E9 R1 Addendum)		
	id	string						
	populationSummary	string	C18885 3		Population-Level Summary	A synopsis of the clinical endpoint of interest within the analysis target study population.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	name	string	CNEW		Estimand Name	The literal identifier (i.e., distinctive designation) of the estimand.		
	description	string	CNEW		Estimand Description	A narrative representation of the estimand.		
	label	string	CNEW		Estimand Label	The short descriptive designation for the estimand.		
	notes	CommentAnnotation	CNEW		Estimand Notes	A brief written record relevant to the study estimand.		
	analysisPopulation	AnalysisPopulation		1		A USDM relationship between the Estimand and AnalysisPopulation classes which provides the details associated with an instance of the analysis population used to partially define a study estimand.		
	variableOfInterest	Endpoint		1		A USDM relationship between the Estimand and Endpoint classes which provides the details associated with an instance of the variable of interest within a study endpoint used to partially define a study estimand.		
	intercurrentEvents	IntercurrentEvent		1..*		A USDM relationship between the Estimand and IntercurrentEvent classes which identifies the set of intercurrent events associated with a study estimand.		
	interventions	StudyIntervention		1..*		A USDM relationship between the Estimand and StudyIntervention classes which identifies the set of study interventions associated with the Estimand.		
ExtensionAttribute								
	id	string						
	url	string						
	valueString	string						
	valueBoolean	Boolean						
	valueInteger	Integer						
	valueId	string						
	valueRange	Range						
	valueCode	Code						
	valueQuantity	Quantity						
	valueAliasCode	AliasCode						
	extensionAttributes	ExtensionAttribute		0 ..*				
	valueExtensionClass	ExtensionClass		0..1				
ExtensionClass								
	id	string						
	url	string						
	extensionAttributes	ExtensionAttribute		1..*				
GeographicScope			C20759 1		Geographic Scope	The extent or range related to the physical location of an entity.		
	id	string						
	type	Code	C20749 5		Geographic Scope Type	A characterization or classification of the geographic scope.	C207412	
	code	AliasCode	C20749 4		Geographic Scope Code	A symbol or combination of symbols which is assigned to the geographic scope.	(Point out to external dictionaries: Standard code is ISO-3166; Alias codes drawn from GENC, UN Region Codes, etc.)	
GovernanceDate			C20759 5		Study Governance Date	Any of the dates associated with event milestones within a clinical study's oversight and management framework.		
	id	string						
	name	string	C20749 9		Study Governance Date Name	The literal identifier (i.e., distinctive designation) of the study governance date.		
	description	string	C20749 7		Study Governance Date Description	A narrative representation of the study governance date.		
	label	string	C20749 8		Study Governance Date Label	The short descriptive designation for the study governance date.		
	type	Code	C20749 6		Study Governance Date Type	A characterization or classification of the study governance date.	C207413	
	dateValue	Date	C20750 0		Study Governance Date Value	The information contained in the date field.		
	geographicScopes	GeographicScope		1..*		A USDM relationship between the GovernanceDate and GeographicScope classes which identifies the set of geographic scopes associated with the governance date.		
Identifier			C25364		Identifier	One or more characters used to identify, name, or characterize the nature, properties, or contents of a thing.		
	id	string						
	text	string	CNEW		Identifier Text	An instance of structured text that represents the identifier.		
	scope	Organization		1		A USDM relationship between the Identifier and Organization classes which provides the details associated		

CDISC Draft for Publication (Version 4.0 (Final))

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
Indication			C41184		Disease/Condition Indication	with each organization that has assigned the identifier.		
	id	string						
	name	string	C20750 3		Disease/Condition Indication Name	The literal identifier (i.e., distinctive designation) of the disease/condition indication.		
	description	string	C11203 8		Disease/Condition Indication Description	A narrative representation of the condition, disease or disorder that the clinical trial is intended to investigate or address.		
	label	string	C20750 2		Disease/Condition Indication Label	The short descriptive designation for the disease/condition indication.		
	isRareDisease	Boolean	C20750 1		Disease/Condition Indication Is Rare Disease Indicator	An indication as to whether the disease/condition indication under study is considered a rare disease.		
	codes	Code	C18882 2		Disease/Condition Indication Code	A short sequence of characters that represents the disease/condition indication.	(Point out to multiple Biomedical coding dictionaries such as SNOMEDCT (for FDA), MedDRA, NCI, ICD's, etc.)	
	notes	Comment Annotation	CNEW		Indication Notes	A brief written record relevant to the disease/condition indication.		
Ingredient			C51981		Ingredient	Any component that constitutes a part of a compounded substance or mixture.		
	id	string						
	role	Code	CNEW		Ingredient Role	The intended use of the ingredient within the context of the compounded substance or mixture.	(Point to FHIR value set: Ingredient Role)	
	substance	Substance		1		A USDIM relationship between the Ingredient and Substance classes that identifies the substance associated with the ingredient.		
IntercurrentEvent			C18881 5		Intercurrent Event	An event(s) occurring after treatment initiation that affects either the interpretation or the existence of the measurements associated with the clinical question of interest (ICH E9 Addendum on Estimands)		
	id	string					SyntaxTemplate	
	name	string	C18885 5		Intercurrent Event Name	The literal identifier (i.e., distinctive designation) of the intercurrent event.	SyntaxTemplate	
	description	string	C18885 6		Intercurrent Event Description	A narrative representation of the intercurrent event.	SyntaxTemplate	
	label	string	C20750 4		Intercurrent Event Label	The short descriptive designation for the intercurrent event.	SyntaxTemplate	
	text	string	CNEW		Intercurrent Event Text	An instance of structured text that represents the intercurrent event.	SyntaxTemplate	
	notes	CommentAnnotation	CNEW		Intercurrent Event Notes	A brief written record relevant to the intercurrent event.	SyntaxTemplate	
	dictionary	SyntaxTemplateDictionary		0..1		A USDIM relationship between the IntercurrentEvent and SyntaxTemplateDictionary classes which provides the set of dictionary entries related to the intercurrent event.	SyntaxTemplate	
	strategy	string	C18885 7		Intercurrent Event Strategy	A textual description of the planned strategy to manage and/or mitigate intercurrent events.		
InterventionalStudyDesign			CNEW		Interventional Study Design	The strategy that specifies the structure of an interventional trial in terms of the planned activities (including timing) and statistical analysis approach intended to meet the objectives of the study.		
	id	string					StudyDesign	
	name	string	CNEW		Interventional Study Design Name	The literal identifier (i.e., distinctive designation) of the interventional study design.	StudyDesign	
	description	string	CNEW		Interventional Study Design Description	A narrative representation of the interventional study design.	StudyDesign	
	label	string	CNEW		Interventional Study Design Label	The short descriptive designation for the interventional study design.	StudyDesign	
	rationale	string	CNEW		Interventional Study Design Rationale	Reason(s) for choosing the interventional study design. This may include reasons for the choice of control or comparator, as well as the scientific rationale for the study design.	StudyDesign	
	therapeuticAreas	Code	CNEW		Interventional Study Design Therapeutic Areas	A categorization of a disease, disorder, or other condition based on common characteristics and often associated with a medical specialty focusing on research	(Point out to external dictionaries)	StudyDesign

CDISC Draft for Publication (Version 4.0 (Final))

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						and development of specific therapeutic interventions for the purpose of treatment and prevention, which is associated with the interventional study design.		
	studyType	Code	CNEW		Interventional Study Design Study Type	The study type associated with the interventional study design.	SDTM Terminology Codelist C99077	StudyDesign
	characteristics	Code	CNEW		Interventional Study Design Characteristics	The distinguishing qualities or prominent aspects of an interventional study design.	C207416	StudyDesign
	studyPhase	AliasCode	CNEW		Interventional Study Design Study Phase	The study phase associated with the interventional study design.	SDTM Terminology Codelist C66737	StudyDesign
	notes	CommentAnnotation	CNEW		Interventional Study Design Notes	A brief written record relevant to the interventional study design.		StudyDesign
	activities	Activity		0..*		A USDM relationship between the InterventionalStudyDesign and Activity classes which identifies the set of activities associated with the interventional study design.		StudyDesign
	biospecimenRetentions	BiospecimenRetention		0..*		A USDM relationship between the InterventionalStudyDesign and BiospecimenRetention classes which identifies the status of biospecimen retentions related to the interventional study design.		StudyDesign
	encounters	Encounter		0..*		A USDM relationship between the InterventionalStudyDesign and Encounter classes which identifies the set of encounters associated with the interventional study design.		StudyDesign
	estimands	Estimand		0..*		A USDM relationship between the InterventionalStudyDesign and Estimand classes which identifies the set of estimands associated with the interventional study design.		StudyDesign
	indications	Indication		0..*		A USDM relationship between the InterventionalStudyDesign and Indication classes which identifies the set of indications associated with the interventional study design.		StudyDesign
	objectives	Objective		0..*		A USDM relationship between the InterventionalStudyDesign and Objective classes which identifies the set of objectives associated with the interventional study design.		StudyDesign
	scheduleTimelines	ScheduleTimeline		0..*		A USDM relationship between the InterventionalStudyDesign and ScheduleTimeline classes which identifies the set of scheduled timelines associated with the interventional study design.		StudyDesign
	arms	StudyArm		1..*		A USDM relationship between the InterventionalStudyDesign and StudyArm classes which identifies the set of study arms associated with the interventional study design.		StudyDesign
	studyCells	StudyCell		1..*		A USDM relationship between the InterventionalStudyDesign and StudyCell classes which identifies the set of study cells associated with the interventional study design.		StudyDesign
	documentVersions	StudyDefinitionDocumentVersion		0..*		A USDM relationship between the InterventionalStudyDesign and StudyDefinitionDocumentVersion classes which identifies the version of the study definition documents associated with the interventional study design.		StudyDesign
	elements	StudyElement		0..*		A USDM relationship between the InterventionalStudyDesign and StudyElement classes which identifies the set of study elements associated with the interventional study design.		StudyDesign
	studyInterventions	StudyIntervention		0..*		A USDM relationship between the InterventionalStudyDesign and StudyIntervention classes which identifies the set of study interventions associated with interventional study design.		StudyDesign

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	epochs	StudyEpoch		1..*		A USDM relationship between the InterventionalStudyDesign and StudyEpoch classes which identifies the set of study epochs associated with the interventional study design.		StudyDesign
	population	StudyDesignPopulation		1		A USDM relationship between the InterventionalStudyDesign and StudyDesignPopulation classes which identifies the population associated with the interventional study design.		StudyDesign
	model	Code	C98746		Intervention Model Type	The general design of the strategy for assigning interventions to subjects in a clinical study. (clinicaltrials.gov)	SDTM Terminology Codelist C99076	
	subTypes	Code	C49660		Trial Type	The nature of the interventional study for which information is being collected.	SDTM Terminology Codelist C66739	
	blindingSchema	AliasCode	C49658		Trial Blinding Schema	The type of experimental design used to describe the level of awareness of the study subjects and/or study personnel as it relates to the respective intervention(s) or assessments being observed, received or administered.	SDTM Terminology Codelist C66735	
	intentTypes	Code	C49652		Trial Intent Type	The planned purpose of the therapy, device, or agent under study in the clinical trial.	SDTM Terminology Codelist C66736	
Masking			C19127 8		Masking	The mechanism used to obscure the distinctive characteristics of the study intervention or procedure to make it indistinguishable from a comparator. (CDISC Glossary)		
	id	string						
	text	string	CNEW		Masking Text	An instance of unstructured text that represents how the masking is performed and maintained.		
	isMasked	Boolean	CNEW		Masked Indicator	An indication as to whether the study role is masked.		
MedicalDevice			C16830		Medical Device	Any instrument, apparatus, implement, machine, appliance, implant, reagent for in vitro use, software, material or other similar or related article, intended by the manufacturer to be used, alone or in combination for, one or more specific medical purpose(s). After REGULATION (EU) 2017/745 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2017 on medical devices		
	id	string						
	name	string	CNEW		Medical Device Name	The literal identifier (i.e., distinctive designation) of the medical device.		
	description	string	CNEW		Medical Device Description	A narrative representation of the medical device.		
	label	string	CNEW		Medical Device Label	The short descriptive designation for the medical device.		
	hardwareVersion	string	CNEW		Hardware Version	A form or variant of hardware; one of a sequence of copies of the physical components from which a computer is constructed, each incorporating new modifications.		
	softwareVersion	string	C11109 3		Software Version	A form or variant of software; one of a sequence of copies of a software program, each incorporating new modifications. (NCI)		
	sourcing	Code	CNEW		Medical Device Sourcing	An indication as to whether the medical device is obtained from a local or central source.	CNEW - Product Sourcing Value Set	
	notes	CommentAnnotation	CNEW		Medical Device Notes	A brief written record relevant to the medical device.		
	embeddedProduct	AdministrableProduct		0..1		A USDM relationship between the MedicalDevice and AdministrableProduct classes which identifies the administrable product that is an integral component of the medical device.		
	identifiers	MedicalDeviceIdentifier		0..*		A USDM relationship between the MedicalDevice and MedicalDeviceIdentifier classes which provides the set of identifiers related to the medical device.		
MedicalDeviceIdentifier			CNEW		Medical Device Identifier	A sequence of characters used to identify, name, or characterize the medical device.		
	id	string						Identifier

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	text	string	CNEW		Medical Device Identifier Text	An instance of structured text that represents the medical device identifier.		Identifier
	scope	Organization		1		A USDM relationship between the MedicalDeviceIdentifier and Organization classes which provides the details associated with each organization that has assigned the identifier.		Identifier
	type	Code	CNEW		Medical Device Identifier Type	A characterization or classification of the medical device identifier.	CNEW - Medical Device Identifier Type Value Set	
NarrativeContent			C20759 2		Narrative Content	The container that holds an instance of unstructured text and which may include objects such as tables, figures, and images.		
	id	string						
	name	string	C20750 7		Narrative Content Name	The literal identifier (i.e., distinctive designation) of the narrative content.		
	sectionNumber	string	C20750 9		Narrative Content Section Number	The numeric identifier assigned to a particular document section containing narrative content.		
	sectionTitle	string	C20751 0		Narrative Content Section Title	An identifying designation for the document section containing narrative content.		
	displaySectionTitle	Boolean	CNEW		Narrative Content Section Title Display Indicator	An indication as to whether the section title is to be displayed in the document containing narrative content.		
	displaySectionNumber	Boolean	CNEW		Narrative Content Section Number Display Indicator	An indication as to whether the section number is to be displayed in the document containing narrative content.		
	contentItem	NarrativeContentItem		0..1		A USDM relationship between the NarrativeContent and NarrativeContentItem classes which identifies the content item associated with the narrative content.		
	previous	NarrativeContent		0..1		A USDM relationship within the NarrativeContent class which identifies the narrative content that precedes the current narrative content in the display order.		
	next	NarrativeContent		0..1		A USDM relationship within the NarrativeContent class which identifies the narrative content that follows the current narrative content in the display order.		
	children	NarrativeContent		0..*		A USDM relationship within the NarrativeContent class which identifies the set of child content associated with an instance of narrative content.		
NarrativeContentItem			CNEW		Narrative Content Item	An individual item within the container that holds an instance of unstructured text and which may include objects such as tables, figures, and images.		
	id	string						
	name	string	CNEW		Narrative Content Item Name	The literal identifier (i.e., distinctive designation) of the narrative content item.		
	text	string	CNEW		Narrative Content Item Text	An instance of unstructured text that represents the narrative content item.		
Objective			C14245 0		Study Objective	The reason for performing a study in terms of the scientific questions to be answered by the analysis of data collected during the study.		
	id	string					SyntaxTemplate	
	name	string	C20751 2		Study Objective Name	The literal identifier (i.e., distinctive designation) of the study objective.		SyntaxTemplate
	description	string	C94090		Study Objective Description	A narrative representation of the study objective. (BRIDG)		SyntaxTemplate
	label	string	C20751 1		Study Objective Label	The short descriptive designation for the study objective.		SyntaxTemplate
	text	string	C20751 3		Study Objective Text	An instance of structured text that represents the study objective.		SyntaxTemplate
	notes	CommentAnnotation	CNEW		Objective Notes	A brief written record relevant to the study objective.		SyntaxTemplate
	dictionary	SyntaxTemplateDictionary		0..1		A USDM relationship between Objective and SyntaxTemplateDictionary classes which provides the set of dictionary entries related to study objectives.		SyntaxTemplate
	level	Code	C18882 3		Study Objective Level	A characterization or classification of the study objective that determines its category of importance relative to other study objectives.	C188725	
	endpoints	Endpoint		0..*		A USDM relationship between the Objective and		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						Endpoint classes which identifies the set of endpoints associated with the study objective.		
ObservationalStudyDesign			CNEW		Observational Study Design	The strategy that specifies the structure of an observational study in terms of the planned activities (including timing) and statistical analysis approach intended to meet the objectives of the study.		
	id	string						StudyDesign
	name	string	CNEW		Observational Study Design Name	The literal identifier (i.e., distinctive designation) of the observational study design.		StudyDesign
	description	string	CNEW		Observational Study Design Description	A narrative representation of the observational study design.		StudyDesign
	label	string	CNEW		Observational Study Design Label	The short descriptive designation for the observational study design.		StudyDesign
	rationale	string	CNEW		Observational Study Design Rationale	Reason(s) for choosing the observational study design. This may include reasons for the choice of control or comparator, as well as the scientific rationale for the study design.		StudyDesign
	therapeuticAreas	Code	CNEW		Observational Study Design Therapeutic Areas	A categorization of a disease, disorder, or other condition based on common characteristics and often associated with a medical specialty focusing on research and development of specific therapeutic interventions for the purpose of treatment and prevention, which is associated with the observational study design.	(Point out to external dictionaries)	StudyDesign
	studyType	Code	CNEW		Observational Study Design Study Type	The study type associated with the observational study design.	SDTM Terminology Codelist C99077	StudyDesign
	characteristics	Code	CNEW		Observational Study Design Characteristics	The distinguishing qualities or prominent aspects of an observational study design.	C207416	StudyDesign
	studyPhase	AliasCode	CNEW		Observational Study Design Study Phase	The study phase associated with the observational study design.	SDTM Terminology Codelist C66737	StudyDesign
	notes	CommentAnnotation	CNEW		Observational Study Design Notes	A brief written record relevant to the observational study design.		StudyDesign
	activities	Activity		0..*		A USDIM relationship between the ObservationalStudyDesign and Activity classes which identifies the set of activities associated with the observational study design.		StudyDesign
	biospecimenRetentions	BiospecimenRetention		0..*		A USDIM relationship between the ObservationalStudyDesign and BiospecimenRetention classes which identifies the status of biospecimen retentions related to the observational study design.		StudyDesign
	encounters	Encounter		0..*		A USDIM relationship between the ObservationalStudyDesign and Encounter classes which identifies the set of encounters associated with the observational study design.		StudyDesign
	estimands	Estimand		0..*		A USDIM relationship between the ObservationalStudyDesign and Estimand classes which identifies the set of estimands associated with the observational study design.		StudyDesign
	indications	Indication		0..*		A USDIM relationship between the ObservationalStudyDesign and Indication classes which identifies the set of indications associated with the observational study design.		StudyDesign
	objectives	Objective		0..*		A USDIM relationship between the ObservationalStudyDesign and Objective classes which identifies the set of objectives associated with the observational study design.		StudyDesign
	scheduleTimelines	ScheduleTimeline		0..*		A USDIM relationship between the ObservationalStudyDesign and ScheduleTimeline classes which identifies the set of scheduled timelines associated with the observational study design.		StudyDesign
	arms	StudyArm		1..*		A USDIM relationship between the ObservationalStudyDesign and StudyArm classes which identifies the set of study arms		StudyDesign

CDISC Draft for Publication (Version 4.0 (Final))

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						associated with the observational study design.		
	studyCells	StudyCell		1..*		A USDM relationship between the ObservationalStudyDesign and StudyCell classes which identifies the set of study cells associated with the observational study design.		StudyDesign
	documentVersions	StudyDefinitionDocumentVersion		0..*		A USDM relationship between the ObservationalStudyDesign and StudyDefinitionDocumentVersion classes which identifies the version of the study definition documents associated with the observational study design.		StudyDesign
	elements	StudyElement		0..*		A USDM relationship between the ObservationalStudyDesign and StudyElement classes which identifies the set of study elements associated with the observational study design.		StudyDesign
	studyInterventions	StudyIntervention		0..*		A USDM relationship between the ObservationalStudyDesign and StudyIntervention classes which identifies the set of study interventions associated with observational study design.		StudyDesign
	epochs	StudyEpoch		1..*		A USDM relationship between the ObservationalStudyDesign and StudyEpoch classes which identifies the set of study epochs associated with the observational study design.		StudyDesign
	population	StudyDesignPopulation		1		A USDM relationship between the ObservationalStudyDesign and StudyDesignPopulation classes which identifies the population associated with the observational study design.		StudyDesign
	model	Code	C14713 8		Observation Study Design Model Type	The general design of the strategy for identifying and following up with participants during observational studies. (clinicaltrials.gov)	SDTM Terminology Codelist C127259	
	subTypes	Code	CNEW		Observational Study Type	The nature of the observational study for which information is being collected.	CNEW - Observational Study Type Response	
	timePerspective	Code	C12606 5		Observational Time Perspective	The temporal relationship between the observation period and time of subject enrollment. (ClinicalTrials.gov)	SDTM Terminology Codelist C127261	
	samplingMethod	Code	C12606 7		Observational Study Sampling Method	The sampling method used to assign study participants into groups or cohorts within an observational study.	SDTM Terminology Codelist C127260	
Organization			C19711		Organization	A formalized group of persons or other organizations collected together for a common purpose (such as administrative, legal, political) and the infrastructure to carry out that purpose. (BRIDG)		
	id	string						
	name	string	C93874		Organization Name	The literal identifier (i.e., distinctive designation) of the organization.		
	label	string	C20751 4		Organization Label	The short descriptive designation for the organization.		
	identifier	string	C93401		Organization Identifier	A unique symbol that establishes identity of the organization. (BRIDG)		
	identifierScheme	string	C18881 9		Identifier Provider Organization Name	The name of the organization that provides the identifier for the entity.		
	type	Code	C18882 0		Organization Type	A characterization or classification of the formalized group of persons or other organizations collected together for a common purpose (such as administrative, legal, political) and the infrastructure to carry out that purpose.	C188724	
	legalAddress	Address		0..1		A USDM relationship between the Organization and Address classes which provides the legal address for an organization.		
	managedSites	StudySite		0..*		A USDM relationship between the Organization and StudySite classes which identifies the set of study sites managed by the organization.		
ParameterMap			C20745 6		Parameter Map	The paired name and value for a given parameter.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	id	string						
	tag	string	C207515		Programming Tag	Character strings bounded by angle brackets that act as containers for programming language elements.		
	reference	string	C207516		Programming Tag Reference	The reference for a tag used in programming languages, such as a markup language (e.g., HTML, XML), to store attributes and elements.		
PopulationDefinition			C207593		Population Definition	A concise explanation of the meaning of a population.		
	id	string						
	name	string	C207520		Population Definition Name	The literal identifier (i.e., distinctive designation) of the population definition.		
	description	string	C207517		Population Definition Description	A narrative representation of the population definition.		
	label	string	C207519		Population Definition Label	The short descriptive designation for the population definition.		
	plannedSex	Code	C207523		Population Definition Planned Sex	The protocol-defined sex within the population definition.	SDTM Terminology Codelist C66732	
	includesHealthySubjects	Boolean	C207518		Population Definition Includes Healthy Subjects Indicator	An indication as to whether the population definition includes healthy subjects, that is, subjects without the disease or condition under study.		
	plannedAge	Range	C207701		Population Definition Planned Age	The anticipated age of subjects within the population definition.		
	plannedCompletionNumberRange	Range	CNEW		Population Definition Planned Completion Number Range	The range of values representing the planned number of subjects that must complete the study in order to meet the objectives and endpoints of the study, within the population definition.		
	plannedCompletionNumberQuantity	Quantity	CNEW		Population Definition Planned Completion Number Quantity	The value representing the planned number of subjects that must complete the study in order to meet the objectives and endpoints of the study, within the population definition.		
	plannedEnrollmentNumberRange	Range	CNEW		Population Definition Planned Enrollment Number Range	The range of values representing the planned number of subjects to be entered in a clinical trial, within the population definition.		
	plannedEnrollmentNumberQuantity	Quantity	CNEW		Population Definition Planned Enrollment Number Quantity	The value representing the planned number of subjects to be entered in a clinical trial, within the population definition.		
	notes	CommentAnnotation	CNEW		Population Definition Notes	A brief written record relevant to the population definition.		
	criteria	EligibilityCriterion		0..*		A USDM relationship between the PopulationDefinition and EligibilityCriterion classes which identifies the set of eligibility criteria associated with the population definition.		
Procedure			C98769		Procedure	Any activity performed by manual and/or instrumental means for the purpose of diagnosis, assessment, therapy, prevention, or palliative care.		
	id	string						
	name	string	C201325		Procedure Name	The literal identifier (i.e., distinctive designation) of the procedure.		
	description	string	C201324		Procedure Description	A narrative representation of the procedure.		
	label	string	C207524		Procedure Label	The short descriptive designation for the procedure.		
	procedureType	string	C188848		Procedure Type	A characterization or classification of the study procedure.		
	code	Code	C154626		Procedure Code	A symbol or combination of symbols which is assigned to medical procedure.	(Point out to external dictionary like CPT, MedDRA, SNOMEDCT, etc.)	
	notes	CommentAnnotation	CNEW		Procedure Notes	A brief written record relevant to the procedure.		
	studyIntervention	StudyIntervention		0..1		A USDM relationship between the Procedure and StudyInterventionclasses which provides the details associated with an instance of an intervention performed during the conduct of a procedure.		
ProductOrganizationRole			CNEW		Product Organization Role	A designation that identifies the function of an organization within the context of the product.		
	id	string						

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	name	string	CNEW		Product Organization Role Name	The literal identifier (i.e., distinctive designation) of the product organization role.		
	description	string	CNEW		Product Organization Role Description	A narrative representation of the product organization role.		
	label	string	CNEW		Product Organization Role Label	The short descriptive designation for the product organization role.		
	code	Code	CNEW		Product Organization Role Code	A symbol or combination of symbols which is assigned to the product organization role.	• CNEW Product Organization Role Code Value Set	
	appliesTo	AdministrableProduct, MedicalDevice		0..*		A USDIM relationship between the ProductOrganizationRole and either the AdministrableProduct or MedicalDevice class that identifies the administrable product or medical device to which the product organization role applies.		
	organization	Organization		1		A USDIM relationship between the ProductOrganizationRole and Organization classes which identifies the organization associated with the product organization role.		
Quantity			C25256		Quantity	How much there is of something that can be measured; the total amount or number.		
	id	string						
	value	Float	C25712		Quantity Value	A numerical quantity measured or assigned or computed.		
	unit	AliasCode	C44258		Quantity Unit	The type of unit of measure being used to express a quantity.	SDTM Terminology Codelist C71620	
Range			C38013		Range	The difference between the lowest and highest numerical values; the limits or scale of variation.		
	id	string						
	minValue	Quantity	C25570		Minimum Value	The smallest value in quantity or degree in a set of values.		
	maxValue	Quantity	C25564		Maximum Value	The largest value in quantity or degree in a set of values.		
	isApproximate	Boolean	C20752 5		Value Range is Approximate Indicator	An indication as to whether the value range is almost, but not quite, exact.		
ReferenceIdentifier			CNEW		Reference Identifier	A sequence of characters used to identify, name, or characterize the reference.		
	id	string					Identifier	
	text	string	CNEW		Reference Identifier Text	An instance of structured text that represents the reference identifier.		Identifier
	scope	Organization		1		A USDIM relationship between the ReferenceIdentifier and Organization classes which provides the details associated with each organization that has assigned the reference identifier.		Identifier
	type	Code	CNEW		Reference Identifier Type	A characterization or classification of the reference identifier.	CNEW Reference Identifier Type	
ResponseCode			C20134 7		Response Code	A symbol or combination of symbols representing the response to the question.		
	id	string						
	isEnabled	Boolean	C20133 0		Response Code Enabled Indicator	An indication as to whether the response code is activated for use within a given usage context.		
	code	Code	C25162		Code	A symbol or combination of symbols which is assigned to the members of a collection.		
ScheduleTimeline			C20134 8		Schedule Timeline	A chronological schedule of planned temporal events.		
	id	string						
	name	string	C20133 4		Schedule Timeline Name	The literal identifier (i.e., distinctive designation) of the schedule timeline.		
	description	string	C20133 2		Schedule Timeline Description	A narrative representation of the schedule timeline.		
	label	string	C20753 0		Schedule Timeline Label	The short descriptive designation for the schedule timeline.		
	entryCondition	string	C20133 3		Schedule Timeline Entry Condition	A logical evaluation on which rests the validity of entry into a schedule timeline.		
	mainTimeline	Boolean	C20133 1		Main Timeline Indicator	An indication as to whether the timeline or timeline component is part of the central or principal timeline.		
	instances	ScheduledInstance		0..*		A USDIM relationship between the		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						ScheduleTimeline and ScheduledInstance classes which identifies the set of scheduled instances (e.g., scheduled activity instances or scheduled decision instances) associated with the scheduled timeline.		
	entry	ScheduledInstance		1		A USDM relationship between the ScheduleTimeline and ScheduledInstance classes which defines the entry into a scheduled instance (e.g., scheduled activity instances or scheduled decision instances) for a timeline.		
	exits	ScheduleTimelineExit		0..*		A USDM relationship between the ScheduleTimeline and ScheduleTimelineExit classes which identifies the set of exits from the scheduled timeline.		
	timings	Timing		0..*		A USDM relationship between the ScheduleTimeline and Timing classes which identifies the set of timings associated with the scheduled timeline.		
ScheduleTimelineExit			C201349		Schedule Timeline Exit	To go out of or leave the schedule timeline.		
	id	string	C201350		Scheduled Activity Instance	A scheduled occurrence of an activity event.		
ScheduledActivityInstance								ScheduledInstance
	id	string						ScheduledInstance
	name	string	C207533		Scheduled Activity Instance Name	The literal identifier (i.e., distinctive designation) of the scheduled activity instance.		ScheduledInstance
	description	string	C207531		Scheduled Activity Instance Description	A narrative representation of the scheduled activity instance.		ScheduledInstance
	label	string	C207532		Scheduled Activity Instance Label	The short descriptive designation for the scheduled activity instance.		ScheduledInstance
	defaultCondition	ScheduledInstance		0..1		A USDM relationship within the ScheduledActivityInstance class which identifies the default condition within a scheduled activity instance.		ScheduledInstance
	epoch	StudyEpoch		0..1		A USDM relationship between the ScheduledActivityInstance and StudyEpoch classes which identifies the study epoch associated with a scheduled activity instance.		ScheduledInstance
	activities	Activity		0..*		A USDM relationship between the ScheduledActivityInstance and Activity classes which identifies the set of activities associated with a scheduled activity instance.		
	encounter	Encounter		0..1		A USDM relationship between the ScheduledActivityInstance and Encounter classes which defines the subject encounter associated with the ScheduledActivityInstance.		
	timeline	ScheduleTimeline		0..1		A USDM relationship between the ScheduledActivityInstance and ScheduleTimeline classes which provides the details associated with an instance of a scheduled timeline related to a scheduled activity instance.		
	timelineExit	ScheduleTimelineExit		0..1		A USDM relationship between the ScheduledActivityInstance and ScheduleTimelineExit classes which provides the details associated with the exit from a timeline related to a scheduled activity instance.		
ScheduledDecisionInstance			C201351		Scheduled Decision Instance	A scheduled occurrence of a decision event.		
	id	string						ScheduledInstance
	name	string	C207536		Scheduled Decision Instance Name	The literal identifier (i.e., distinctive designation) of the scheduled Decision instance.		ScheduledInstance
	description	string	C207534		Scheduled Decision Instance Description	A narrative representation of the scheduled Decision instance.		ScheduledInstance
	label	string	C207535		Scheduled Decision Instance Label	The short descriptive designation for the scheduled Decision instance.		ScheduledInstance
	defaultCondition	ScheduledInstance		0..1		A USDM relationship within the ScheduledDecisionInstance class which identifies the		ScheduledInstance

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						default condition within a scheduled decision instance.		
	epoch	StudyEpoch		0..1		A USDM relationship between the ScheduledDecisionInstance and StudyEpoch classes which identifies the study epoch associated with a scheduled decision instance.		ScheduledInstance
	conditionAssignments	ConditionAssignment		1..*		A USDM relationship between the ScheduledDecisionInstance and ConditionAssignment classes which identifies the set of condition assignments associated with a scheduled decision instance.		
ScheduledInstance			C20129_9		Scheduled Instance	A scheduled occurrence of a temporal event.		
	id	string						
	name	string	C20745_5		Scheduled Instance Name	The literal identifier (i.e., distinctive designation) of the scheduled instance.		
	description	string	C20745_3		Scheduled Instance Description	A narrative representation of the scheduled instance.		
	label	string	C20745_4		Scheduled Instance Label	The short descriptive designation for the scheduled instance.		
	defaultCondition	ScheduledInstance		0..1		A USDM relationship within the ScheduledInstance class which identifies the default condition within a scheduled instance.		
	epoch	StudyEpoch		0..1		A USDM relationship between the ScheduledInstance and StudyEpoch classes which identifies the study epoch associated with a scheduled instance.		
Strength			CNEW		Substance Strength	The content of an substance expressed quantitatively per dosage unit, per unit of volume, or per unit of weight, according to the pharmaceutical dose form of the product.		
	id	string						
	name	string	CNEW		Substance Strength Name	The literal identifier (i.e., distinctive designation) of the substance strength.		
	description	string	CNEW		Substance Strength Description	A narrative representation of the substance strength.		
	label	string	CNEW		Substance Strength Label	The short descriptive designation for the substance strength.		
	numeratorRange	Range	CNEW		Substance Strength Numerator Range	The lowest and highest numerical values that define a range for the substance strength.		
	numeratorQuantity	Quantity	CNEW		Substance Strength Numerator Quantity	The value representing the numerator for the substance strength.		
	denominator	Quantity	C80489		Denominator	The divisor of a fraction.		
Study			C15206		Clinical Study	A clinical study involves research using human volunteers (also called participants) that is intended to add to medical knowledge. There are two main types of clinical studies: clinical trials (also called interventional studies) and observational studies. (CDISC Glossary)		
	id	string						
	name	string	C68631		Clinical Study Name	The literal identifier (i.e., distinctive designation) of the clinical study.		
	description	string	C14270_4		Clinical Study Description	A narrative representation of the clinical study.		
	label	string	C20747_9		Clinical Study Label	The short descriptive designation for the clinical study.		
	versions	StudyVersion		0..*		A USDM relationship between the Study and StudyVersion classes which identifies the set of versions associated with the study.		
	documentedBy	StudyDefinitionDocument		0..*		A USDM relationship between the Study and StudyDefinitionDocument classes signifying that the study is documented in a study definition document.		
StudyAmendment			C20759_4		Study Amendment	A written description of a change(s) to, or formal clarification of, a study.		
	id	string						
	number	string	C20753_7		Study Amendment Number	A string of numerals that uniquely identifies a protocol amendment.		
	notes	CommentAnnotation	CNEW		Study Amendment Notes	A brief written record relevant to the study amendment.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	summary	string	C115627		Study Amendment Summary	A short narrative representation describing the changes introduced in the current version of the protocol.		
	geographicScopes	GeographicScope		1..*		A USDM relationship between the StudyAmendment and GeographicScope classes which identifies the set of geographic scopes associated with the study amendment.		
	dateValues	GovernanceDate		0..*		A USDM relationship between the StudyAmendment and GovernanceDate classes which provides the set of governance dates associated with the study amendment.		
	impacts	StudyAmendmentImpact		0..*		A USDM relationship between the StudyAmendment and StudyAmendmentImpact classes which identifies the set of impacts that the study amendment has on the study or study subjects.		
	enrollments	SubjectEnrollment		0..*		A USDM relationship between the StudyAmendment and SubjectEnrollment classes which provides the set of subject enrollments associated with the study amendment.		
	secondaryReasons	StudyAmendmentReason		0..*		A USDM relationship between the StudyAmendment and StudyAmendmentReason classes which identifies the set of secondary reasons for issuing the study amendment.		
	changes	StudyChange		1..*		A USDM relationship between the StudyAmendment and StudyChange classes which identifies the set of changes associated with the study amendment.		
	previous	StudyAmendment		0..1		A USDM relationship within the StudyAmendment class which identifies the study amendment that chronologically precedes the current study amendment.		
	primaryReason	StudyAmendmentReason		1		A USDM relationship between the StudyAmendment and StudyAmendmentReason classes which identifies the primary reason for issuing the study amendment.		
StudyAmendmentImpact			CNEW		Study Amendment Impact	The effect or consequence of an amendment on some aspect of the study.		
	id	string						
	text	string	CNEW		Study Amendment Impact Text	An instance of unstructured text that represents the study amendment impact.		
	isSubstantial	Boolean	C207538		Study Amendment Impact Substantial Indicator	An indication as to whether the study amendment's impact on the study is substantial.		
	type	Code	CNEW		Study Amendment Impact Type	A characterization or classification of the study amendment impact.	CNEW Study Amendment Impact Type Response	
	notes	CommentAnnotation	CNEW		Study Amendment Impact Notes	A brief written record relevant to the study amendment impact.		
StudyAmendmentReason			C207457		Study Amendment Reason	The rationale for the change(s) to, or formal clarification of, a protocol.		
	id	string						
	otherReason	string	C207539		Other Reason for Study Amendment	The rationale for the change(s) to, or formal clarification of, a protocol that is not otherwise specified.		
	code	Code	C207540		Study Amendment Reason Code	A symbol or combination of symbols which is assigned to the study amendment reason.	C207415	
StudyArm			C174447		Study Arm	A planned pathway assigned to the subject as they progress through the study, usually referred to by a name that reflects one or more treatments, exposures, and/or controls included in the path.		
	id	string						
	name	string	C170984		Study Arm Name	The literal identifier (i.e., distinctive designation) of the study arm.		
	description	string	C93728		Study Arm Description	A narrative representation of the study arm.		
	label	string	C172456		Study Arm Label	The short descriptive designation for the study arm.		
	type	Code	C188827		Study Arm Type	A characterization or classification of the study arm.	Protocol Terminology Codelist C174222	

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	dataOriginType	Code	C188829		Study Arm Data Origin Type	A characterization or classification of the study arm with respect to where the study arm data originates.	C188727	
	dataOriginDescription	string	C188828		Study Arm Data Origin Description	The textual representation of the study arm data origin.		
	notes	CommentAnnotation	CNEW		Study Arm Notes	A brief written record relevant to the study arm.		
	populations	PopulationDefinition		0..*		A USDM relationship between the StudyArm and PopulationDefinition classes which identifies the set of populations associated with the study arm.		
StudyCell			C188810		Study Design Cell	A partitioning of a study arm into individual pieces, which are associated with an epoch and any number of sequential elements within that epoch.		
	id	string						
	arm	StudyArm		1		A USDM relationship between the StudyCell and StudyArm classes which identifies the study arm associated with a study cell.		
	epoch	StudyEpoch		1		A USDM relationship between the StudyCell and StudyEpoch classes which identifies the study epoch associated with a study cell.		
	elements	StudyElement		1..*		A USDM relationship between the StudyCell and StudyElement classes which identifies the set of study elements associated with the study cell.		
StudyChange			CNEW		Study Change	The act of alteration or modification to a study.		
	id	string						
	name	string	CNEW		Study Change Name	The literal identifier (i.e., distinctive designation) of the study change.		
	description	string	CNEW		Study Change Description	A narrative representation of the study change.		
	label	string	CNEW		Study Change Label	The short descriptive designation for the study change.		
	rationale	string	CNEW		Study Change Rationale	An explanation as to the logical reasons for why a study change has occurred.		
	summary	string	CNEW		Study Change Summary	A short narrative representation describing the changes introduced in the current version of the study.		
	changedSections	DocumentContentReference		1..*		A USDM relationship between the StudyChange and DocumentContentReference class which provides the set of changed document sections related to the study change.		
StudyCohort			C61512		Study Cohort	A group of individuals who share a set of characteristics (e.g., exposures, experiences, attributes), which logically defines a population under study.		
	id	string						PopulationDefinition
	name	string	C207544		Study Cohort Name	The literal identifier (i.e., distinctive designation) of the study cohort.		PopulationDefinition
	description	string	C207542		Study Cohort Description	A narrative representation of the study cohort.		PopulationDefinition
	label	string	C207543		Study Cohort Label	The short descriptive designation for the study cohort.		PopulationDefinition
	plannedSex	Code	C207541		Study Cohort Planned Sex	The protocol-defined sex within the study cohort.	SDTM Terminology Codelist C66732	PopulationDefinition
	includesHealthySubjects	Boolean	C207480		Study Cohort Includes Healthy Subjects Indicator	An indication as to whether the study cohort includes healthy subjects, that is, subjects without the disease or condition under study.		PopulationDefinition
	plannedAge	Range	C207545		Study Cohort Planned Age	The anticipated age of subjects within the study cohort.		PopulationDefinition
	plannedCompletionNumberRange	Range	CNEW		Study Cohort Planned Completion Number Range	The range of values representing the planned number of subjects that must complete the study in order to meet the objectives and endpoints of the study, within the study cohort.		PopulationDefinition
	plannedCompletionNumberQuantity	Quantity	CNEW		Study Cohort Planned Completion Number Quantity	The value representing the planned number of subjects that must complete the study in order to meet the objectives and endpoints of the study, within the study cohort.		PopulationDefinition
	plannedEnrollmentNumberRange	Range	CNEW		Study Cohort Planned Enrollment Number Range	The range of values representing the planned number of subjects to be entered in a clinical trial, within the study cohort.		PopulationDefinition
	plannedEnrollmentNumberQuantity	Quantity	CNEW		Study Cohort Planned Enrollment	The value representing the planned number of subjects to		PopulationDefinition

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
					Number Quantity	be entered in a clinical trial, within the study cohort.		
	notes	CommentAnnotation	CNEW		Study Cohort Notes	A brief written record relevant to the study cohort.		PopulationDefinition
	criteria	EligibilityCriterion		0..*		A USDM relationship between the StudyCohort and EligibilityCriterion classes which identifies the set of eligibility criteria associated with the study cohort.		PopulationDefinition
	characteristics	Characteristic		0..*		A USDM relationship between the StudyCohort and Characteristic classes which identifies the set of subject characteristics associated with the study cohort.		
	indications	Indication		0..*		A USDM relationship between the StudyCohort and Indication classes which identifies the set of indications associated with the study cohort.		
StudyDefinitionDocument			CNEW		Study Definition Document	Any physical or electronic document that is related to defining a study or part of a study.		
	id	string				The literal identifier (i.e., distinctive designation) of the study definition document.		
	name	string	CNEW		Study Definition Document Name			
	description	string	CNEW		Study Definition Document Description	A narrative representation of the study definition document.		
	label	string	CNEW		Study Definition Document Label	The short descriptive designation for the study definition document.		
	type	Code	CNEW		Study Definition Document Type	A characterization or classification of the study definition document.	CNEW Study Definition Document Type	
	templateName	string	CNEW		Study Definition Document Template Name	The literal identifier (i.e., distinctive designation) of the study definition document template.		
	language	Code	CNEW		Study Definition Document Language	The language in which the study definition document is written.	(Point out to ISO 639 language value list)	
	notes	CommentAnnotation	CNEW		Study Definition Document Notes	A brief written record relevant to the study definition document.		
	versions	StudyDefinitionDocumentVersion		0..*		A USDM relationship between the StudyDefinitionDocument and StudyDefinitionDocumentVersion classes which identifies the set of versions associated with the study definition document.		
StudyDefinitionDocumentVersion			CNEW		Study Definition Document Version	A representation of a particular edition or snapshot of the study definition document as it exists at a particular point in time.		
	id	string						
	status	Code	CNEW		Study Definition Document Status	A condition of the study definition document at a point in time with respect to its state of readiness for implementation.	C188723	
	version	string	CNEW		Study Definition Document Version	A representation of a particular edition or snapshot of the study definition document as it exists at a particular point in time.		
	notes	CommentAnnotation	CNEW		Study Definition Document Version Notes	A brief written record relevant to the study definition document version.		
	dateValues	GovernanceDate		0..*		A USDM relationship between the StudyDefinitionDocumentVersion and GovernanceDate classes which provides the set of governance dates associated with the study definition document version.		
	contents	NarrativeContent		0..*		A USDM relationship between the StudyDefinitionDocumentVersion and NarrativeContent classes which identifies the set of narrative content associated with the version of the study definition document.		
	children	StudyDefinitionDocumentVersion		0..*		A USDM relationship within the StudyDefinitionDocumentVersion class which identifies the set of child documents of a study definition document version.		
StudyDesign			C15320		Study Design	A plan detailing how a study will be performed in order to represent the phenomenon		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						under examination, to answer the research questions that have been asked, and informing the statistical approach.		
	id	string						
	name	string	C20133 8		Study Design Name	The literal identifier (i.e., distinctive designation) of the study design.		
	description	string	C14713 9		Study Design Description	A narrative representation of the study design.		
	label	string	C20754 8		Study Design Label	The short descriptive designation for the study design.		
	rationale	string	C14270 5		Study Design Rationale	Reason(s) for choosing the study design. This may include reasons for the choice of control or comparator, as well as the scientific rationale for the study design.		
	therapeuticAreas	Code	C10130 2		Therapeutic Areas	A categorization of a disease, disorder, or other condition based on common characteristics and often associated with a medical specialty focusing on research and development of specific therapeutic interventions for the purpose of treatment and prevention.	(Point out to external dictionaries)	
	studyType	Code	C14217 5		Study Type	The nature of the investigation for which study information is being collected. (After clinicaltrials.gov)	SDTM Terminology Codelist C99077	
	characteristics	Code	C20754 7		Study Design Characteristic	The distinguishing qualities or prominent aspect of a study design.	C207416	
	studyPhase	AliasCode	C48281		Trial Phase	A step in the clinical research and development of a therapy from initial clinical trials to post-approval studies. NOTE: Clinical trials are generally categorized into four (sometimes five) phases. A therapeutic intervention may be evaluated in two or more phases simultaneously in different trials, and some trials may overlap two different phases. 21 CFR section 312.21; After ICH Topic E8 NOTE FOR GUIDANCE ON GENERAL CONSIDERATIONS FOR CLINICAL TRIALS , CPMP/ICH/291/95 March 1998	SDTM Terminology Codelist C66737	
	notes	CommentAnnotation	CNEW		Study Design Notes	A brief written record relevant to the study design.		
	activities	Activity		0..*		A USDM relationship between the StudyDesign and Activity classes which identifies the set of activities associated with the study design.		
	biospecimenRetentions	BiospecimenRetention		0..*		A USDM relationship between the StudyDesign and BiospecimenRetention classes which identifies the status of biospecimen retentions related to the study design.		
	encounters	Encounter		0..*		A USDM relationship between the StudyDesign and Encounter classes which identifies the set of encounters associated with the study design.		
	estimands	Estimand		0..*		A USDM relationship between the StudyDesign and Estimand classes which identifies the set of estimands associated with the study design.		
	indications	Indication		0..*		A USDM relationship between the StudyDesign and Indication classes which identifies the set of indications associated with the study design.		
	objectives	Objective		0..*		A USDM relationship between the StudyDesign and Objective classes which identifies the set of objectives associated with the study design.		
	scheduleTimelines	ScheduleTimeline		0..*		A USDM relationship between the StudyDesign and ScheduleTimeline classes which identifies the set of scheduled timelines associated with the study design.		
	arms	StudyArm		1..*		A USDM relationship between the StudyDesign and StudyArm classes which identifies the set of study arms associated with the study design.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	studyCells	StudyCell		1..*		A USDM relationship between the StudyDesign and StudyCell classes which identifies the set of study cells associated with the study design.		
	documentVersions	StudyDefinitionDocumentVersion		0..*		A USDM relationship between the StudyDesign and StudyDefinitionDocumentVersion classes which identifies the version of the study definition documents associated with the study design.		
	elements	StudyElement		0..*		A USDM relationship between the StudyDesign and StudyElement classes which identifies the set of study elements associated with the study design.		
	studyInterventions	StudyIntervention		0..*		A USDM relationship between the StudyDesign and StudyIntervention classes which identifies the set of study interventions associated with study design.		
	epochs	StudyEpoch		1..*		A USDM relationship between the StudyDesign and StudyEpoch classes which identifies the set of study epochs associated with the study design.		
	population	StudyDesignPopulation		1		A USDM relationship between the StudyDesign and StudyDesignPopulation classes which identifies the population associated with the study design.		
StudyDesignPopulation			C142728		Study Design Population	The population within the general population to which the study results can be generalized.		
	id	string						PopulationDefinition
	name	string	C20753		Study Design Population Name	The literal identifier (i.e., distinctive designation) of the study design population.		PopulationDefinition
	description	string	C70834		Study Design Population Description	A narrative representation of the study design population.		PopulationDefinition
	label	string	C207550		Study Design Population Label	The short descriptive designation for the study design population.		PopulationDefinition
	plannedSex	Code	C207551		Study Design Population Planned Sex	The protocol-defined sex within the study design population.	SDTM Terminology Codelist C66732	PopulationDefinition
	includesHealthySubjects	Boolean	C207549		Study Design Population Includes Healthy Subjects Indicator	An indication as to whether the study design population includes healthy subjects, that is, subjects without the disease or condition under study.		PopulationDefinition
	plannedAge	Range	C207450		Study Design Population Planned Age	The anticipated age of subjects within the study design population.		PopulationDefinition
	plannedCompletionNumberRange	Range	CNEW		Study Design Population Planned Completion Number Range	The range of values representing the planned number of subjects that must complete the study in order to meet the objectives and endpoints of the study, within the study design population.		PopulationDefinition
	plannedCompletionNumberQuantity	Quantity	CNEW		Study Design Population Planned Completion Number Quantity	The value representing the planned number of subjects that must complete the study in order to meet the objectives and endpoints of the study, within the study design population.		PopulationDefinition
	plannedEnrollmentNumberRange	Range	CNEW		Study Design Population Planned Enrollment Number Range	The range of values representing the planned number of subjects to be entered in a clinical trial, within the study design population.		PopulationDefinition
	plannedEnrollmentNumberQuantity	Quantity	CNEW		Study Design Population Planned Enrollment Number Quantity	The value representing the planned number of subjects to be entered in a clinical trial, within the study design population.		PopulationDefinition
	notes	CommentAnnotation	CNEW		Study Design Population Notes	A brief written record relevant to the study design population.		PopulationDefinition
	criteria	EligibilityCriterion		0..*		A USDM relationship between the StudyDesignPopulation and EligibilityCriterion classes which identifies the set of eligibility criteria associated with the study design population.		PopulationDefinition
	cohorts	StudyCohort		0..*		A USDM relationship between the StudyDesignPopulation and StudyCohort classes which identifies the set of study		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
StudyElement			C14273 5		Study Design Element	cohorts associated with the study design population.		
	id	string						
	name	string	C18883 3		Study Design Element Name	The literal identifier (i.e., distinctive designation) of the study design element.		
	description	string	C18883 4		Study Design Element Description	A narrative representation of the study design element.		
	label	string	C20755 4		Study Design Element Label	The short descriptive designation for the study design element.		
	notes	CommentAnnotation	CNEW		Study Element Notes	A brief written record relevant to the study element.		
	transitionEndRule	TransitionRule		0..1		A USDM relationship between the StudyElement and TransitionRule classes which provides the details associated with a transition rule used to trigger the end of a study element.		
	studyInterventions	StudyIntervention		0..*		A USDM relationship between the StudyElement and StudyIntervention classes which identifies the set of study interventions associated with the study element.		
	transitionStartRule	TransitionRule		0..1		A USDM relationship between the StudyElement and TransitionRule classes which provides the details associated with a transition rule used to trigger the start of a study element.		
StudyEpoch			C71738		Study Epoch	A named time period defined in the protocol, wherein a study activity is specified and unchanging throughout the interval, to support a study-specific purpose.		
	id	string						
	name	string	C93825		Study Epoch Name	The literal identifier (i.e., distinctive designation) of the study epoch, i.e., the named time period defined in the protocol, wherein a study activity is specified and unchanging throughout the interval, to support a study-specific purpose.		
	description	string	C93824		Study Epoch Description	A narrative representation of the study epoch.		
	label	string	C20755 5		Study Epoch Label	The short descriptive designation for the study epoch.		
	type	Code	C18883 0		Study Epoch Type	A characterization or classification of the study epoch, i.e., the named time period defined in the protocol, wherein a study activity is specified and unchanging throughout the interval, to support a study-specific purpose.	SDTM Terminology Codelist C99079	
	notes	CommentAnnotation	CNEW		Study Epoch Notes	A brief written record relevant to the study epoch.		
	previous	StudyEpoch		0..1		A USDM relationship within the StudyEpoch class which identifies the study epoch that chronologically precedes the current study epoch.		
	next	StudyEpoch		0..1		A USDM relationship within the StudyEpoch class which identifies the study epoch that chronologically follows the current study epoch.		
StudyIdentifier			C83082		Study Identifier	A sequence of characters used to identify, name, or characterize the study.		
	id	string						Identifier
	text	string	CNEW		Study Identifier Text	An instance of structured text that represents the study identifier.		Identifier
	scope	Organization		1		A USDM relationship between the StudyIdentifier and Organization classes which provides the details associated with each organization that has assigned the study identifier.		Identifier
StudyIntervention			C20764 9		Study Intervention	Any agent, device, or procedure being tested or used as a reference or comparator in the conduct of a clinical trial.		
	id	string						
	description	string	C20764 7		Study Intervention Description	A narrative representation of the study intervention.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	name	string	C20755 8		Study Intervention Name	The literal identifier (i.e., distinctive designation) of the study intervention.		
	label	string	C20755 6		Study Intervention Label	The short descriptive designation for the study intervention.		
	role	Code	C20756 0		Study Intervention Role	The intended use of the trial intervention within the context of the study design.	C207417	
	type	Code	C98747		Study Intervention Type	The kind of product or procedure studied in a trial.	SDTM Terminology Codelist C99078	
	codes	Code	C20764 8		Study Intervention Code	A symbol or combination of symbols which is assigned to the study intervention.	(Point out to multiple Biomedical coding dictionaries such as WHODrug, ATC, UNII, etc.)	
	minimumResponseDuration	Quantity	C20755 7		Study Intervention Minimum Response Duration	The value representing the minimum amount of time required to meet the criteria for response to study intervention.		
	notes	CommentAnnotation	CNEW		Study Intervention Notes	A brief written record relevant to the study intervention.		
	administrations	Administration		0..*		A USDM relationship between the StudyIntervention and AgentAdministration classes which identifies the set of agent administrations associated with the study intervention.		
StudyRole			CNEW		Study Role	A designation that identifies the function of study personnel or an organization within the context of the study.		
	id	string						
	name	string	CNEW		Study Role Name	The literal identifier (i.e., distinctive designation) of the study role.		
	label	string	CNEW		Study Role Label	The short descriptive designation for the study role.		
	description	string	CNEW		Study Role Description	A narrative representation of the study role.		
	code	Code	CNEW		Study Role Code	A symbol or combination of symbols which is assigned to the study role.	CNEW Study Role Code	
	assignedPersons	AssignedPerson		0..*		A USDM relationship between the StudyRole and AssignedPerson classes that identifies the set of individuals that are assigned to fill a particular role within the study.		
	masking	Masking		0..1		A USDM relationship between the StudyRole and Masking classes which describes the masking associated with the study role.		
	organizations	Organization		0..*		A USDM relationship between the StudyRole and Organization classes which identifies the set of organizations associated with the study role.		
	appliesTo	StudyDesign, StudyVersion		0..*		A USDM relationship between the StudyRole and either StudyVersion or StudyDesign classes that identifies the study version or study design to which the study role applies.		
StudySite			C80403		Study Site	The location at which a study investigator conducts study activities.		
	id	string						
	name	string	C20756 6		Study Site Name	The literal identifier (i.e., distinctive designation) of the study site.		
	description	string	C20756 4		Study Site Description	A narrative representation of the study site.		
	label	string	C20756 5		Study Site Label	The short descriptive designation for the study site.		
	country	Code	C17099 0		Country of Study Site	The country in which the study site is located.	(Point out to ISO 3166-1 Alpha-3 Country code)	
StudyTitle			C49802		Study Title	The sponsor-defined name of the clinical study.		
	id	string						
	type	Code	C20756 8		Study Title Type	A characterization or classification of the study title.	C207419	
	text	string	C20756 7		Study Title Text	An instance of unstructured text that represents the study title.		
StudyVersion			C18881 6		Study Version	A plan at a particular point in time for a study.		
	id	string						
	versionIdentifier	string	C20757 0		Study Version Identifier	A sequence of characters used to identify, name, or characterize the study version.		
	businessTherapeuticAreas	Code	C20132 2		Business Therapeutic Areas	A therapeutic area classification based on the structure and operations of the business unit.	(Point out to external dictionaries)	
	rationale	string	C94122		Study Rationale	A statement describing the overall rationale of the study. This field describes the		

CDISC Draft for Publication (Version 4.0 (Final))

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
						contribution of this study to product development, i.e., what knowledge is being contributed from the conduct of this study.		
	notes	CommentAnnotation	CNEW		Study Version Notes	A brief written record relevant to the study version.		
	abbreviations	Abbreviation		0..*		A USDM relationship between the StudyVersion and Abbreviation classes which provides the set of abbreviations associated with the study version.		
	dateValues	GovernanceDate		0..*		A USDM relationship between the StudyVersion and GovernanceDate classes which provides the set of governance dates associated with the study version.		
	referenceIdentifiers	ReferenceIdentifier		0..*		A USDM relationship between the StudyVersion and ReferenceIdentifier classes which identifies the set of reference identifiers associated with the study version.		
	amendments	StudyAmendment		0..*		A USDM relationship between the StudyVersion and StudyAmendment classes which identifies the set of study amendments associated with the study version.		
	documentVersions	StudyDefinitionDocumentVersion		0..*		A USDM relationship between the StudyVersion and StudyDefinitionDocumentVersion classes which identifies the version of the study definition document associated with the study version.		
	studyDesigns	StudyDesign		0..*		A USDM relationship between the StudyVersion and StudyDesign classes which identifies the set of study designs associated with the study version.		
	studyIdentifiers	StudyIdentifier		1..*		A USDM relationship between the StudyVersion and StudyIdentifier classes which identifies the set of study identifiers associated with the study version.		
	titles	StudyTitle		1..*		A USDM relationship between the StudyVersion and StudyTitle classes which identifies the set of study titles associated with the study version.		
SubjectEnrollment			C37948		Subject Enrollment	The act of enrolling subjects into a study. The subject will have met the inclusion/exclusion criteria to participate in the trial and will have signed an informed consent form. (CDISC Glossary)		
	id	string						
	name	string	CNEW		Subject Enrollment Name	The literal identifier (i.e., distinctive designation) of the subject enrollment.		
	description	string	CNEW		Subject Enrollment Description	A narrative representation of the subject enrollment.		
	label	string	CNEW		Subject Enrollment Label	The short descriptive designation for the subject enrollment.		
	quantity	Quantity	C20757 3		Subject Enrollment Quantity Value	The value representing the number of individuals enrolled in a study.		
	forGeographicScope	GeographicScope		0..1		A USDM relationship between the SubjectEnrollment and GeographicScope classes which identifies the geographic scope to which the subject enrollment applies.		
	forStudyCohort	StudyCohort		0..1		A USDM relationship between the SubjectEnrollment and StudyCohort classes which identifies the study cohort to which the subject enrollment applies.		
	forStudySite	StudySite		0..1		A USDM relationship between the SubjectEnrollment and StudySite classes which identifies the study site to which the subject enrollment applies.		
Substance			C45306		Substance	Any matter of defined composition that has discrete existence, whose origin may be biological, mineral or chemical.		
	id	string						

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	name	string	CNEW		Substance Name	The literal identifier (i.e., distinctive designation) of the substance.		
	description	string	CNEW		Substance Description	A narrative representation of the substance.		
	label	string	CNEW		Substance Label	The short descriptive designation for the substance.		
	codes	Code	CNEW		Substance Code	A symbol or combination of symbols which is assigned to the substance.	(Point out to multiple Biomedical coding dictionaries such as WHODrug, ATC, UNII, etc.)	
	strengths	Strength		1..*		A USDM relationship between the Substance and Strength class which provides the values of the strengths of the substance.		
	referenceSubstance	Substance		0..1		A USDM relationship within the Substance class that identifies the association between two substances, one of which is used as a reference for the other.		
SyntaxTemplate			C20759 6		Syntax Template	A standardized pattern used for the arrangement of words and phrases to create well-formed, structured sentences.		
	id	string						
	name	string	C20757 7		Syntax Template Name	The literal identifier (i.e., distinctive designation) of the syntax template.		
	description	string	C20757 5		Syntax Template Description	A narrative representation of the syntax template.		
	label	string	C20757 6		Syntax Template Label	The short descriptive designation for the syntax template.		
	text	string	C20757 8		Syntax Template Text	A structured text string containing prescribed text interspersed with user-defined parameter values.		
	notes	CommentAnnotation	CNEW		Syntax Template Notes	A brief written record relevant to the syntax template.		
	dictionary	SyntaxTemplateDictionary		0..1		A USDM relationship between the SyntaxTemplate and SyntaxTemplateDictionary classes which provides the dictionary entry associated with a syntax template.		
SyntaxTemplateDictionary			C20759 7		Syntax Template Dictionary	A reference source that provides a listing of valid parameter names and values used in syntax template text strings.		
	id	string						
	name	string	C20758 1		Syntax Template Dictionary Name	The literal identifier (i.e., distinctive designation) of the syntax template dictionary.		
	description	string	C20757 9		Syntax Template Dictionary Description	A narrative representation of the syntax template dictionary.		
	label	string	C20758 0		Syntax Template Dictionary Label	The short descriptive designation for the syntax template dictionary.		
	parameterMaps	ParameterMap		1..*		A USDM relationship between the SyntaxTemplateDictionary and ParameterMap classes which identifies the set of parameter maps (parameter map entries) associated with a syntax template dictionary.		
Timing			C80484		Timing	The chronological relationship between temporal events.		
	id	string						
	name	string	C20758 4		Timing Name	The literal identifier (i.e., distinctive designation) of the timing.		
	description	string	C16464 8		Timing Description	A narrative representation of the chronological relationship between temporal events.		
	label	string	C20758 3		Timing Label	The short descriptive designation for the timing.		
	type	Code	C20129 8		Timing Type	A characterization or classification of the chronological relationship between temporal events.	C201264	
	relativeToFrom	Code	C20129 7		Timing Relative To From	The name of the reference event used to define the temporal relationship with another event.	C201265	
	value	string	C20134 1		Timing Value	The temporal value of the chronological relationship between temporal events.		
	valueLabel	string	C20758 5		Timing Value Label	The short descriptive designation for the timing value.		
	windowLabel	string	C20758 6		Timing Window Label	The short descriptive designation for a time period, or other type of interval, during which a temporal event may be achieved, obtained, or observed.		

Class Name	Attribute Name	Data Type	NCI C-Code	Cardinality	Preferred Term	Definition	Codelist Ref	Inherited From
	windowLower	string	C20134 2		Timing Window, Lower	The earliest chronological value of an allowable period of time during which a temporal event takes place.		
	windowUpper	string	C20134 3		Timing Window, Upper	The latest chronological value of an allowable period of time during which a temporal event takes place.		
	relativeToScheduledInstance	ScheduledInstance		0..1		A USDM relationship between the Timing and ScheduledInstance classes which identifies the scheduled instance (e.g., scheduled activity instances or scheduled decision instances) to which the timing is relative to.		
	relativeFromScheduledInstance	ScheduledInstance		1		A USDM relationship between the Timing and ScheduledInstance classes which identifies the scheduled instance (e.g., scheduled activity instances or scheduled decision instances) to which the timing applies.		
TransitionRule			C82567		Transition Rule	A guide that governs the allocation of subjects to operational options at a discrete decision point or branch (e.g., assignment to a particular arm, discontinuation) within a clinical trial plan.		
	id	string						
	name	string	C20758 8		Transition Rule Name	The literal identifier (i.e., distinctive designation) of the transition rule.		
	description	string	C18883 5		Transition Rule Description	A narrative representation of the transition rule.		
	label	string	C20758 7		Transition Rule Label	The short descriptive designation for the transition rule.		
	text	string	C20758 9		Transition Rule Text	An instance of unstructured text that represents the transition rule.		

6 USDM API

- [General](#)
- [Serialization](#)
- [Additional Attributes and Required Content](#)
- [Extension Mechanism](#)

6.1 General

The reference architecture API is designed as a mechanism for bulk transfer to allow for the reading, updated and/or creation of a study within a target solution (e.g. study design solution, data repository). No other API features are defined, nor is a granular API defined at this time. The API has been defined using the [OpenAPI Specification](#). The various routes, rules, and constraints for the use of the API are contained within the API specification itself. If further routes, rules, and constraints are required, these will be added to the machine-readable specification.

6.2 Serialization

When expressing USDM data in a monolithic, hierarchical document format (e.g., JSON, XML), the same element will appear multiple times because the model uses only class references for USDM entities. This is not optimal for an API and, so as not to repeat the same information within the JSON structure, the API has been designed to include an instance once and only once and allow for zero, 1, or more references to it as dictated by the USDM and the relationships therein. This mechanism relies on the unique identifiers of each class.

To ensure no duplication of content in the API JSON format, the following steps are taken to translate the logical USDM into the JSON format:

1. Where content is shared (referenced from 2 or more places), the "natural parent" relationship is identified. An example is the Endpoint class that is referenced from both the Objective and Estimand classes. Objective is considered the natural parent.
2. If a natural parent can be identified in the API, then the content of the child is included in the corresponding item of the natural parent (attribute names remain unchanged) and other relationships are added as cross-references, with the attribute names modified with a suffix of "Id" (singular) or "Ids" (plural) relationships. The datatype is modified to string so as to accommodate the cross-references and the corresponding identifiers.
3. If the natural parent cannot be identified, then a "collection" from a logical higher level class is formed and all relationships to this class in the logical model are added as cross-references in the API with the corresponding naming modifications as specified in step 2. This results in an additional relationship in the API for the higher level class to the collection. An example is for the class BiomedicalConcepts, where a collection is placed within the StudyDesign class.

6.3 Additional Attributes and Required Content

6.3.1 API Additional Attributes

A number of additional attributes have been added to the API to aid processing. The following additional attributes are API-only artifacts and, as such, are not present within the UML specification or defined in CT:

1. An **instanceType** attribute, included within all classes and used to state the class name
2. Three attributes, included within the root node of the API:
 - a. **usdmVersion**: The version of the USDM to which the data transported have been generated from and conform to. This is a required attribute.
 - b. **systemName**: The name of the system that generated the data. This is an optional attribute.

- c. **systemVersion:** The version of the system that generated the data. This is an optional attribute.

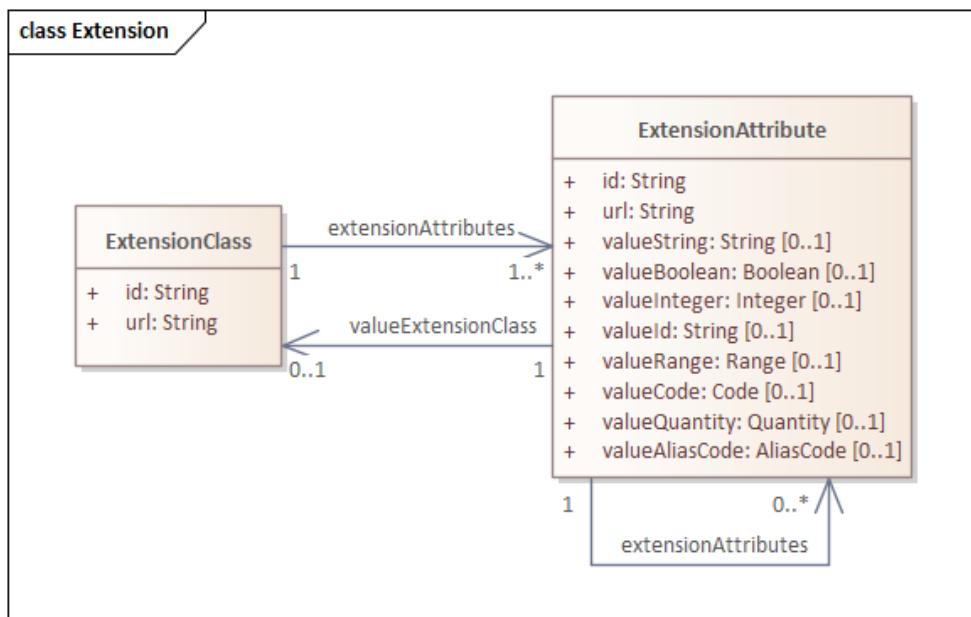
6.3.2 API Required Content

When sending data using the API, it is recommended that the data include the following:

1. There is only 1 StudyVersion.
2. There is 1 StudyIdentifier within the StudyVersion which is scoped by an organization that is referred to by the clinical study sponsor (C70793) role.
3. There is at least 1 StudyDesign within the StudyVersion.

6.4 Extension Mechanism

Although the USDM aims to store and exchange all study design information, additional information that is not stored in the USDM might be needed for a specific purpose. The API enables exchange of this extra information by its extension mechanism.



7 Mapping to Other Standards and Formats

- [Creation of SDTM Trial Design Domains](#)
- [Informing ClinicalTrials.gov Registry](#)
- [Informing CTIS Registry](#)
- [Creation of M11 documents](#)
- [Use of USDM for Populating Protocol Content](#)

7.1 Creation of SDTM Trial Design Domains

Alignment between the USDM and SDTM Trial Design domains and controlled terminology elements related to study design enables the (automated) creation of the SDTM Trial Design Domains. The [SDTM Implementation Guide](#) (SDTMIG) includes a section related to Trial Design datasets. The corresponding trial design concepts include:

- Trial design
- Epoch
- Arm
- Study cell
- Element
- Branch
- Treatments
- Visit
- Criteria

These concepts are used for the following Trial Design Domains:

- Trial Arms (TA)
- Trial Elements (TE)
- Trial Visits (TV)
- Trial Inclusion/Exclusion Criteria (TI)
- Trial Summary (TS)

Other trials design domains (e.g., Trial Disease Assessments (TD), Trial Disease Milestones (TM)) are described in the SDTMIG contain information that is stored in the USDM as well but are not explicitly discussed in this section. The USDM structure that informs the TA, TE, and TV domains is described in Section 4.10, [Arms and Epochs](#). The USDM structure that informs the TI domain is described in the [Populations, Cohorts, and Eligibility Criteria](#) section. The design specific variables that are stored in the TS domain are stored in the USDM as well in different parts of the model.

The corresponding mapping from USDM to all these domains is stored in Excel as stdm_mapping.xlsx and can be found in the DDF-RA GitHub Documents/Mappings directory of the corresponding USDM version.

7.2 Informing ClinicalTrials.gov Registry

The ClinicalTrials.gov registry can largely be filled with the study design information captured in the USDM. The definitions for protocol registration data elements submitted to [ClinicalTrials.gov](#) for interventional studies (clinical trials) and observational studies are provided on the corresponding [definitions site](#). This table lists included topics and whether they are covered in USDM.

CT.gov topic	USDM coverage
Study Identification	Yes
Study Status	No; not available at study design stage
Sponsor/Collaborators	Yes; review and additional selection may be needed
Oversight	No

CT.gov topic	USDM coverage
Study Description	No; protocol text covered by the Unstructured Content (see Section 4.20) class may be used for this.
Conditions and Keywords	No
Study Design	Yes
Arms, Groups, and Interventions	Yes
Outcome Measures	Yes
Eligibility	Yes; Interventional Study design parameters
Contacts, Locations, and Investigator Information	Limited; not presented in this overview
IPD Sharing Statement	No
References	No

The corresponding mapping from USDM to all these topic areas is stored in Excel as ct-gov_mapping.xlsx and can be found in the DDF-RA GitHub Documents/Mappings directory of the corresponding USDM version.

7.3 Informing CTIS Registry

The CTIS Registry can be partly filled with the study design information collected in the USDM. The mapping from USDM structured data elements to the elements defined in the "Clinical Trial Information System (CTIS) structured data form - Multi trial substantial modification" ([see the CTIS training and Support website](#)) is stored in Excel as ctis_mapping.xlsx and can be found in the DDF-RA GitHub Documents/Mappings directory of the corresponding USDM version.

7.4 Creation of M11 documents

The draft M11 Clinical Electronic Structured Harmonised Protocol (CeSHarP), and the corresponding guideline and technical specification are available via the [ICH guidelines website](#). USDM v4.0 is aligned to this version of M11. The USDM includes corresponding data elements and/or more granular data elements that can map to corresponding M11 elements. The actual mapping from USDM to M11 is stored in Excel as m11_mapping.xlsx and can be found in the DDF-RA GitHub Documents/Mappings directory of the corresponding USDM version.

7.5 Use of USDM for Populating Protocol Content

The TransCelerate CPT is a [publicly available resource](#) proposed to harmonize clinical trial protocol content in a streamlined format.

The mapping from USDM to CPT version v010 including the [CPT_BWE document](#) that is the base Word template and the [CPT_TEE document](#) is stored in Excel as cpt_mapping.xlsx and can be found in the DDF-RA GitHub Documents/Mappings directory of the corresponding USDM version.

8 Appendices

- [USDM Team](#)
- [Glossary and Abbreviations](#)
- [References](#)
- [Revision History](#)
- [Representations and Warranties, Limitations of Liability, and Disclaimers](#)

8.1 USDM Team

Name	Institution/Organization
John Owen	Project Manager, CDISC
Dave Iberson-Hurst	USDM Product Owner and Technical Expert, CDISC
Berber Snoeijer	USDM Technical Team Lead, CDISC
Erin Muhlbradt	Controlled Terminology Expert, NCI-EVS
Craig Zwickl	Controlled Terminology Expert, CDISC
Richard Marshall	USDM Developer, CDISC

The USDM has been developed in partnership with TransCelerate Biopharma and Accenture. CDISC would like to acknowledge the support and input from the following groups:

- TransCelerate DDF Core Team
- TransCelerate member company subject-matter experts
- Accenture DDF development team
- CDISC DDF volunteer teams and volunteer vendor organizations

8.2 Glossary and Abbreviations

The following abbreviations and terms are used in this document. Additional definitions can be found in Section 5, [USDM Data Dictionary](#), and in the [CDISC Glossary](#).

API	Application programming interface
BRIDG	Biomedical Research Integrated Domain Group
BC	Biomedical concept: A unit of biomedical knowledge created from a unique combination of characteristics that include implementation details like variables and terminologies, used as building blocks for standardized, hierarchically structured clinical research information
CDISC	Clinical Data Interchange Standards Consortium
CeSHarP	(ICH) Clinical Electronic Structured Harmonised Protocol
Collected	“Collected” refers to information that is recorded and/or transmitted to the sponsor. This includes data entered by the site on CRFs/eCRFs as well as vendor data such as core lab data. This term is a synonym for “captured.”
CPT	(TransCelerate) Common Protocol Template
CRF	Case report form (sometimes, case record form): A printed, optical, or electronic document designed to record all required information to be reported to the sponsor for each trial subject
CRO	Contract research organization
CT	Controlled terminology: A finite set of values that represent the only allowed values for a data item. These values may be codes, text, or numeric. A codelist is a type of controlled terminology.

CTIS	Clinical Trials Information System (EMA)
CTR	Clinical Trial Registry
DDF	Digital Data Flow (project)
Domain	A collection of observations with a topic-specific commonality about a subject
DUNS	Data universal numbering system
eCRF	Electronic case report form
ECG	Electrocardiogram
EDC	Electronic data capture
EHR	Electronic health record
EMA	European Medicines Agency
ePRO	Electronic patient-reported outcome
EudraCT	European Union Drug Regulating Authorities Clinical Trial Database
FDA	(US) Food and Drug Administration
FHIR	(HL7) Fast Healthcare Interoperability Resources
GARD	(NIH) Genetic and Rare Diseases Information Center
GENC	(FDA) Geopolitical Entities, Names and Codes
HL7	Health Level Seven International
HTML	HyperText Markup Language
ICE	Intercurrent events; events that occur after randomization and alter the course of the randomized treatment during the intended study treatment period
ICD	International Classification of Diseases
ICH	International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use
IDMP	(ISO) Identification of Medicinal Products (standards)
IMP	Investigational medical product
IOS	International Organization for Standardization
JSON	JavaScript Object Notation
LOINC	Logical Observation Identifiers Names and Codes
MedDRA	Medical Dictionary for Regulatory Activities. A global standard medical terminology designed to supersede, in regulatory submissions, other terminologies previously used in the medical product development process (such as COSTART and ICD9).
MeSH	Medical Subject Headings (thesaurus)
NCI EVS	(NIH) National Cancer Institute Enterprise Vocabulary Services
NCT	National clinical trial
NIH	National Institutes of Health
NMP	Noninvestigational medical product
ODM	Operational Data Model
On-Demand USDM Training	Official USDM educational material available for learners to access from the CDISC Learning Management System (LMS). Training materials and resources are available to learners at any time and from any location. This type of training allows individuals to access courses, videos, tutorials, and other educational content whenever they need it, rather than following a fixed schedule.
Patient	A recipient of medical treatment
PDF	Portable data format
PHR	Personal health record
POC	Proof of concept
POV	Proof of viability
PRM	Protocol Representation Model
PRO	Patient-reported outcome
SDM-XML	Study/Trial Design Model in XML, extension of ODM-XML
SDR	Study Definitions Repository
SDTM	Study Data Tabulation Model
SDTMIG	SDTM Implementation Guide (for Human Clinical Trials)
SME	Subject-matter expert
SNOMED	Systemized Nomenclature of Medicine

SOA	Schedule of activities
SSU	Study start-up
Subject	A participant in a study
UML	Unified modeling language
USDM	United Study Definitions Model
USDM-IG	USDM Implementation Guide
UUID	Universally unique identifier
WHO	World Health Organization
XML	Extensible markup language

8.3 References

1. National Cancer Institute Biomedical Research Integrated Domain Group. About BRIDG. Accessed February 27, 2025. <https://bridgmodel.nci.nih.gov/about-bridg>
2. US Food & Drug Administration. *Guidance Document. Data Standards Catalog*. September 2024. Accessed February 27, 2025. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/data-standards-catalog>
3. International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use. *Guideline for Industry. Structure and Content of Clinical Study Reports (ICH E3)*. July 1996. Accessed June 21, 2023. <https://www.fda.gov/media/71271/download>
4. International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use. *MII Clinical Electronic Structured Harmonised Protocol (CeSHarP)*. September 2022. Accessed June 21, 2023. <https://www.fda.gov/media/164112/download>
5. European Medicines Agency. *ICH E9 (R1) addendum on estimands and sensitivity analysis in clinical trials to the guideline on statistical principles for clinical trials*. February 17, 2020. Accessed January 5, 2024. https://www.ema.europa.eu/en/documents/scientific-guideline/ich-e9-r1-addendum-estimands-and-sensitivity-analysis-clinical-trials-guideline-statistical-principles-clinical-trials-step-5_en.pdf
6. Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC. Accessed February 27, 2025. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0745>
7. ClinicalTrials.gov. Protocol registration data element definitions for interventional and observational studies. National Library of Medicine. Updated June 27, 2024. Accessed February 27, 2025. <https://clinicaltrials.gov/policy/protocol-definitions>

8.4 Revision History

8.4.1 USDM Implementation Guide

This section details the changes made to the USDMIG between v3.0 and v4.0.

#	Release #	Overview	Notes
1	3.2	UML update for <u>Arms and Epochs</u> section	<ul style="list-style-type: none"> • Name of encounter attribute environmentalSetting changed to environmentalSettings • Added notes attributes to Encounter, StudyArm, StudyElement and StudyEpoch classes
2		UML update for <u>Study Timing</u> section	<ul style="list-style-type: none"> • Moved relationships timeline and timelineExit. • Name of encounter attribute environmentalSetting changed to environmentalSettings. • Added description for encounter timing - scheduledAt
3		UML and text update for <u>Populations, Cohorts, and Eligibility Criteria</u> section	<ul style="list-style-type: none"> • Added relationship criteria from StudyVersion to EligibilityCriterion.

#	Release #	Overview	Notes
			<ul style="list-style-type: none"> Changed criteria cardinality from PopulationDefinition to EligibilityCriterion from 1..* to 0..* in UML. Added notes attributes to PopulationDefinition, SyntaxTemplate, Indication, StudyArm, StudyDesign and StudyVersion classes. Updated text accordingly to specify that criteria should either be referenced from Study Population or from Study Cohort. Updated text regarding eligibility criteria: removed reference to context attribute and specify that they are defined within a study version. Added explanation of previous/next criteria
4		UML update for <u>Study, Protocols, and Amendments</u> section	<ul style="list-style-type: none"> Added notes attributes to StudyVersion and StudyDesign classes.
5		UML update for <u>Study Identifiers and Titles</u>	<ul style="list-style-type: none"> Added notes attribute to StudyVersion class.
6		UML and text update for <u>Activities</u> section	<ul style="list-style-type: none"> Added notes attribute to Activity, Procedure, BiomedicalConcept, BiomedicalConceptSurrogate, BiomedicalConceptCategory, and BiomedicalConceptProperty classes. Added ScheduleTimeline class to the UML view Explained the use of timeline attribute in the Activity class
7		UML update for <u>Study Interventions</u> section	<ul style="list-style-type: none"> Added notes attributes to StudyIntervention and AgentAdministration classes.
8		UML update for <u>Study Objectives and Endpoints</u> section	<ul style="list-style-type: none"> Added notes attributes to Estimand, AnalysisPopulation, IntercurrentEvent, StudyIntervention and SyntaxTemplate classes. Added name, description and label to Estimand class
9		UML update for <u>Syntax Templates</u> section	<ul style="list-style-type: none"> Added notes attribute to SyntaxTemplate class.
10	3.3	UML and text update for <u>Activities</u> section	<ul style="list-style-type: none"> Added children attribute to Activity class Added example to explain how SoA activities are stored in the Activity class with respect to the previous, next and children attributes.
11	3.3	UML and text update for <u>Study Timing</u> section	<ul style="list-style-type: none"> Changed cardinality for relativeFromScheduleInstance relationship Added corresponding text for anchors relativeToScheduleInstance relationship should be equal to relativeFromScheduleInstance or missing.
12	3.4	Updated <u>CPT mapping</u> section for v3.0 and further alignment	
13	3.4	Updated <u>Unstructured Content</u> section to include multiple template support	<ul style="list-style-type: none"> Added new UML view for documents. Adjusted text to include new NarrativeContentItem and reusability of text across documents.
14	3.4	Updated <u>Study, Protocols, and Amendments</u> section to include multiple template support	<ul style="list-style-type: none"> Updated UML. Adjusted text to refer to the right classes.

#	Release #	Overview	Notes
15	3.5	Updated <u>Study, Protocols, and Amendments</u> section to include abbreviations	<ul style="list-style-type: none"> • Updated UML. • Added text to explain the use of the new abbreviation class and corresponding attributes.
16	3.6	Created <u>Abbreviations</u> section to give examples of how it can be used.	<ul style="list-style-type: none"> • Created new section with examples.
17		Updated <u>Study, Protocols, and Amendments</u> section.	<ul style="list-style-type: none"> • Created cross-reference to Abbreviations section.
18		Updated <u>XHTML Attributes</u> section.	<ul style="list-style-type: none"> • Referred to NarrativeContentItem instead of NarrativeContent.
19		Updated <u>Study Identifiers and Titles</u> section.	<ul style="list-style-type: none"> • Updated UML to include inheritance of identifier class and to add reference identifiers. • Updated text to add explanation of reference identifiers.
20		Updated <u>Use of USDM for Populating Protocol Content</u> section	<ul style="list-style-type: none"> • Include mapping to pediatric investigational plan number. • Updated mappings based on changed attribute names.
21		Updated <u>Study Interventions</u> section	<ul style="list-style-type: none"> • Updated UML to include all changes for the new model version. • Updated explanation of the model and included some references to IDMP.
22		Updated <u>Controlled Terminology</u> section	<ul style="list-style-type: none"> • Small tweak to section on AliasCode to clarify that standard value sets do not have to be CDISC code lists.
23		Updated <u>Populations, Cohorts, and Eligibility Criteria</u> section	<ul style="list-style-type: none"> • Updated UML to include small change on plannedSex relationship. • Updated text to explain the use of plannedSex (use Male and/or Female).
24		Updated <u>Study Roles and Organizations</u> section	<ul style="list-style-type: none"> • Changed section name from 'Organizations' to 'Study Roles and Organizations'. • Updated UML to include significant changes in the model. • Updated text to explain this part of the model and expected use.
25	3.7	Updated <u>Study Identifiers and Titles</u> section	<ul style="list-style-type: none"> • Changed address line to lines in UML
26		Updated <u>Study Roles and Organizations</u> section	<ul style="list-style-type: none"> • Changed address line to lines in UML
27		Updated <u>Study, Protocols, and Amendments</u> section	<ul style="list-style-type: none"> • Updated UML and text to include studyAmendMentChange, StudyAmendmentImpact and changes to the studyEnrollment class • Moved abbreviation part out of UML and text to abbreviation section.
28		Updated <u>Study Design</u> section	<ul style="list-style-type: none"> • Added UML • Updated text to indicate all referenced areas not reflected in UML and explain other references
29	3.8	Updated <u>Study Design</u> section	<ul style="list-style-type: none"> • Updated UML to include studyDocumentVersions relationship • Added reference to <u>Study, Protocols, and Amendments</u>
30		Updated <u>Study Objectives and Endpoints</u> section	<ul style="list-style-type: none"> • updated UML to include new estimand changes
31		Updated <u>Study Estimands</u> section	<ul style="list-style-type: none"> • updated text to include new estimand changes

#	Release #	Overview	Notes
32		Updated <u>Principles</u> section	<ul style="list-style-type: none"> Removed "(phase 3 onwards; not true for phases 1 and 2)" from "Support the whole protocol document".
33		Updated <u>Study Identifiers and Titles</u> section	<ul style="list-style-type: none"> Updated UML view to include StudyRole class Updated text regarding new StudyRole requirements for sponsor identifiers Added instance diagrams to further explain the representation of identifiers
34		Updated <u>Study Roles and Organizations</u> section	<ul style="list-style-type: none"> Textual improvements aligning with new CT Added instance diagrams to further illustrate the representation of roles and organizations
35		Updated <u>Study, Protocols, and Amendments</u> section	<ul style="list-style-type: none"> Updated UML to include the relationship appliesTo from DocumentContentReference class to the StudyDefinitionDocument class.
36		Updated <u>Study Interventions</u> section	<ul style="list-style-type: none"> Updated UML and corresponding text for addition of medical devices to the model. Added instance diagram as an example with corresponding explanation.
37		Updated <u>Populations, Cohorts, and Eligibility Criteria</u> section	<ul style="list-style-type: none"> Updated UML for change of range unit.
38	3.10	Updated <u>Study, Protocols, and Amendments</u> section	<ul style="list-style-type: none"> Updated UML for movement of StudyPhase and StudyType to StudyDesign class.
39		Updated <u>Populations, Cohorts, and Eligibility Criteria</u> section	<ul style="list-style-type: none"> Updated UML to reflect new StudyDesign subclasses.
40		Updated <u>Study Design</u> section	<ul style="list-style-type: none"> Updated UML to reflect new StudyDesign subclasses and other changes. Updated text to align with changes and add observational study features. Added Instance diagrams to show how data can be stored in the study.
41		Updated <u>Study Objectives and Endpoints</u> section	<ul style="list-style-type: none"> Updated UML to reflect dependency on StudyDesign class and the different subclasses.
42		Updated <u>Creation of SDTM Trial Design Domains</u> section	<ul style="list-style-type: none"> Updated mappings to align with USDM updates until v3.10 and SDTM CT version 2024-09-27
43		Updated <u>Informing ClinicalTrials.gov Registry</u> section	<ul style="list-style-type: none"> Updated mappings to align with USDM updates until v3.10
44		Updated <u>Use of USDM for Populating Protocol Content</u> section	<ul style="list-style-type: none"> Updated mappings to align with USDM updates until v3.10
45		Updated <u>Arms and Epochs</u> section	<ul style="list-style-type: none"> Updated UML to reflect updated relationship cardinality between StudyCell and StudyElement classes. Updated UML to replace complex datatype relationships with attributes.
46		Updated <u>Study, Protocols, and Amendments</u> section	<ul style="list-style-type: none"> Updated UML to reflect updated subjectEnrollment appliesTo relationships. Updated UML to replace complex datatype relationships with attributes. Updated text to fully reflect all v4.0 changes.

#	Release #	Overview	Notes
			<ul style="list-style-type: none"> Added an instance diagram and corresponding text to visualize an implementation of a complex study including a master protocol with several sub-studies and corresponding protocol versions.
47		Updated <u>Study Roles and Organizations</u> section	<ul style="list-style-type: none"> Updated UML to reflect updated subjectEnrollment appliesTo relationships. Updated UML to replace complex datatype relationships with attributes. Updated UML to reflect changes in masking class.
48		Updated <u>Study Interventions</u> section	<ul style="list-style-type: none"> Updated UML to reflect the change in strength numerator to numerator range or quantity Small updates to text to reflect change in strength numerator Updated UML to replace complex datatype relationships with attributes. Updated instance diagrams to remove cross references to code class and include changes to the model. Updated UML to reflect change for administrationDuration.reasonDurationWillVary to optional
49		Updated <u>Populations, Cohorts, and Eligibility Criteria</u> section	<ul style="list-style-type: none"> Updated UML to reflect the change in <ul style="list-style-type: none"> plannedEnrollment and plannedCompletion number referential integrity for study design population (now required) eligibility criterion class to allow for reuse of criterion items across designs Updated text to reflect changes mentioned for the UML Updated UML to replace complex datatype relationships with attributes. Updated UML to correct blindingSchema datatype and align with API
50		Updated <u>Naming Conventions</u> section	<ul style="list-style-type: none"> Data Types description updated in alignment with UML simplification for complex data types.
51		Updated <u>Study Identifiers and Titles</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes. Restructured text order for readability purposes.
52		Updated <u>Study Design</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes. Updated UML to correct blindingSchema datatype and align with API
53		Updated <u>Activities</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes.
54		Updated <u>Study Timing</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes.
55		Updated <u>Study Objectives and Endpoints</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes.
56		Updated <u>Unstructured Content</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes.
57		Updated <u>Syntax Templates</u> section	<ul style="list-style-type: none"> Updated UML to replace complex datatype relationships with attributes.
58		Moved <u>Addressing Footnotes</u> section	<ul style="list-style-type: none"> Moved the section to the end of the USDM Features chapter to group the implementation sections at the end.
59		Created <u>Complex Study Designs</u> section	<ul style="list-style-type: none"> Added example of real-world data control arm study Added example of oncology multiple cohort study

#	Release #	Overview	Notes
			<ul style="list-style-type: none"> Added example of multi-step treatment schedule Added description and references for Basket/Umbrella and multi-phased studies Added description for Decentralized trials
60		Updated <u>USDM API</u> section	<ul style="list-style-type: none"> Updated text to align with version 4.0 Subdivided to allow for better document navigation Added description of extension mechanism
61		Updated <u>Overview</u> section	<ul style="list-style-type: none"> Updated text to align with version 4.0
62		Created <u>Schedule of Activity Views</u> section	<ul style="list-style-type: none"> Pictured a simple SoA in different formats Described a number of suggestions for deploying USDM SoA information.
63		Updated <u>Relationship to Other Standards and Formats</u> section	<ul style="list-style-type: none"> Added IDMP alignment text
64		Removed Indication section	<ul style="list-style-type: none"> Moved text to <u>Populations, Cohorts, and Eligibility Criteria</u> section. Added cross-referencing information from cohort to indication to this information.
65		Updated <u>Abbreviations</u> section	<ul style="list-style-type: none"> Improved textual description for readability purposes.
66		Updated <u>Addressing Footnotes</u> section	<ul style="list-style-type: none"> Adjusted description for multiple environmental settings
67		Updated the mapping to other standards sections	<ul style="list-style-type: none"> Added the new references to the EligibilityCriterionItem class.
68	3.13	Updated <u>Study, Protocols, and Amendments</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect new label and description attributes for StudyAmendment class. Replaced UML view to reflect move of children attribute from StudyDefinitionDocumentVersion to StudyDefinitionDocument
69		Updated <u>Activities</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect new name and label attributes for ResponseCode class.
70		Updated <u>Study Roles and Organizations</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect new personName attribute which points to the PersonName complex Datatype. Replaced UML to reflect new notes attribute in the StudyRole class.
71		Updated <u>Naming Conventions</u> section	<ul style="list-style-type: none"> Added description of QuantityRange complex datatype. Added description of PersonName complex datatype. Added description of Duration complex datatype
72		Updated <u>Populations, Cohorts, and Eligibility Criteria</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect new QuantityRange attributes and reverted back to plannedCompletionNumber and plannedEnrollmentNumber instead of two variants for either quantity or range. Replaced UML to reflect the eligibility criteria collection relationship from StudyDesign to the EligibilityCriteria class.
73		Updated <u>Study Interventions</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect new QuantityRange attribute for strength numerator and reverted back to the numerator attribute instead of two variants for either quantity or range.

#	Release #	Overview	Notes
			<ul style="list-style-type: none"> Replaced UML view to reflect Duration as an complex datatype instead of the AdministrationDuration class. The corresponding description attribute is also changed to text.
74		Updated <u>Study Timing</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect new plannedDuration attribute in the scheduleTimeline class. Updated text with the addition of the planned duration information that can be added.
75		Updated <u>Unstructured Content</u> section	<ul style="list-style-type: none"> Added instance diagram with corresponding explanation of how narrative content items are used. Replaced UML view to reflect move of children attribute from StudyDefinitionDocumentVersion to StudyDefinitionDocument
76		Updated <u>Study Design</u> section	<ul style="list-style-type: none"> Replaced UML view to reflect move of children attribute from StudyDefinitionDocumentVersion to StudyDefinitionDocument
77		Updated <u>Schedule of Activity Views</u> section	<ul style="list-style-type: none"> Changed 'created of patient journeys' to 'creation of patient journeys'
78		Updated <u>Fundamentals of the USDM</u> section	<ul style="list-style-type: none"> Explained the RA abbreviation in the conformance rules section.

8.5 Representations and Warranties, Limitations of Liability, and Disclaimers

CDISC Patent Disclaimers

It is possible that implementation of and compliance with this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any claim or of any patent rights in connection therewith. CDISC, including the CDISC Board of Directors, shall not be responsible for identifying patent claims for which a license may be required in order to implement this standard or for conducting inquiries into the legal validity or scope of those patents or patent claims that are brought to its attention.

Representations and Warranties

“CDISC grants open public use of this User Guide (or Final Standards) under CDISC’s copyright.”

Each Participant in the development of this standard shall be deemed to represent, warrant, and covenant, at the time of a Contribution by such Participant (or by its Representative), that to the best of its knowledge and ability: (a) it holds or has the right to grant all relevant licenses to any of its Contributions in all jurisdictions or territories in which it holds relevant intellectual property rights; (b) there are no limits to the Participant’s ability to make the grants, acknowledgments, and agreements herein; and (c) the Contribution does not subject any Contribution, Draft Standard, Final Standard, or implementations thereof, in whole or in part, to licensing obligations with additional restrictions or requirements inconsistent with those set forth in this Policy, or that would require any such Contribution, Final Standard, or implementation, in whole or in part, to be either: (i) disclosed or distributed in source code form; (ii) licensed

for the purpose of making derivative works (other than as set forth in Section 4.2 of the CDISC Intellectual Property Policy (“the Policy”)); or (iii) distributed at no charge, except as set forth in Sections 3, 5.1, and 4.2 of the Policy. If a Participant has knowledge that a Contribution made by any Participant or any other party may subject any Contribution, Draft Standard, Final Standard, or implementation, in whole or in part, to one or more of the licensing obligations listed in Section 9.3, such Participant shall give prompt notice of the same to the CDISC President who shall promptly notify all Participants.

No Other Warranties/Disclaimers. ALL PARTICIPANTS ACKNOWLEDGE THAT, EXCEPT AS PROVIDED UNDER SECTION 9.3 OF THE CDISC INTELLECTUAL PROPERTY POLICY, ALL DRAFT STANDARDS AND FINAL STANDARDS, AND ALL CONTRIBUTIONS TO FINAL STANDARDS AND DRAFT STANDARDS, ARE PROVIDED “AS IS” WITH NO WARRANTIES WHATSOEVER, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, AND THE PARTICIPANTS, REPRESENTATIVES, THE CDISC PRESIDENT, THE CDISC BOARD OF DIRECTORS, AND CDISC EXPRESSLY DISCLAIM ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR OR INTENDED PURPOSE, OR ANY OTHER WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, FINAL STANDARDS OR DRAFT STANDARDS, OR CONTRIBUTION.

Limitation of Liability

IN NO EVENT WILL CDISC OR ANY OF ITS CONSTITUENT PARTS (INCLUDING, BUT NOT LIMITED TO, THE CDISC BOARD OF DIRECTORS, THE CDISC PRESIDENT, CDISC STAFF, AND CDISC MEMBERS) BE LIABLE TO ANY OTHER PERSON OR ENTITY FOR ANY LOSS OF PROFITS, LOSS OF USE, DIRECT, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, WHETHER UNDER CONTRACT, TORT, WARRANTY, OR OTHERWISE, ARISING IN ANY WAY OUT OF THIS POLICY OR ANY RELATED AGREEMENT, WHETHER OR NOT SUCH PARTY HAD ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Note: The CDISC Intellectual Property Policy can be found at: https://www.cdisc.org/sites/default/files/2020-09/cdisc_policy_003_intellectual_property_v2019.pdf