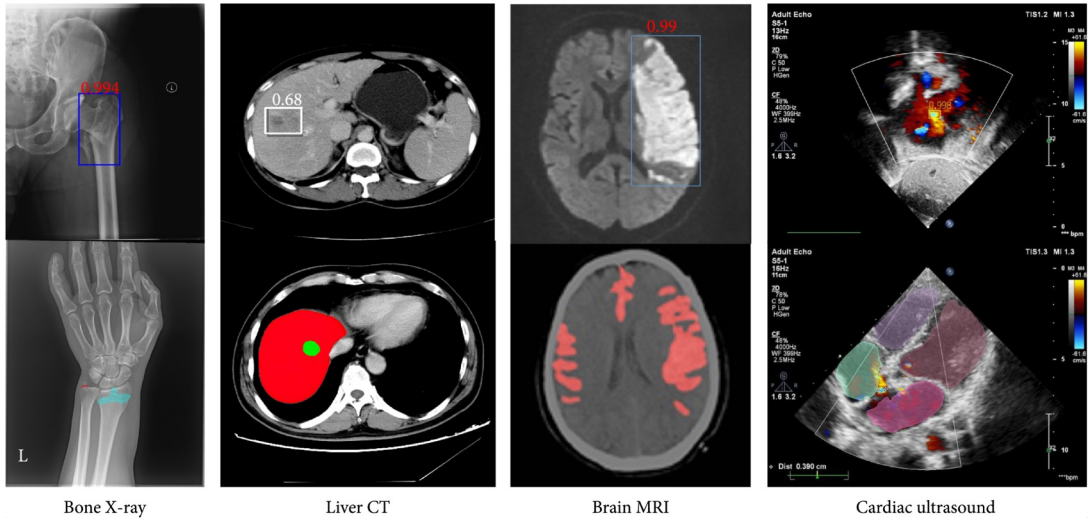

Bone X-ray | Liver CT | Brain MRI | Cardiac ultrasound

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Development of Medical Imaging Data Standardization for Imaging-based Observational Research: *OMOP CDM Extension*

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Open access | Published: 05 February 2024

(2024) Cite this article

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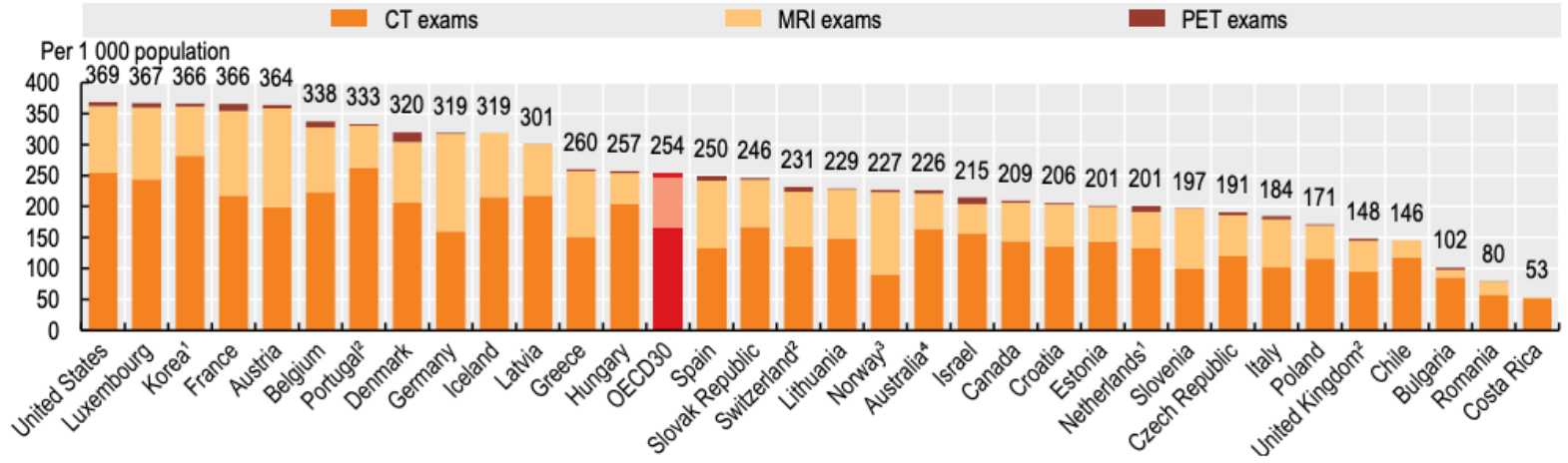
https://link-springer-com.proxy1.library.jhu.edu/article/10.1007/s10278-024-00982-6

Medical Imaging

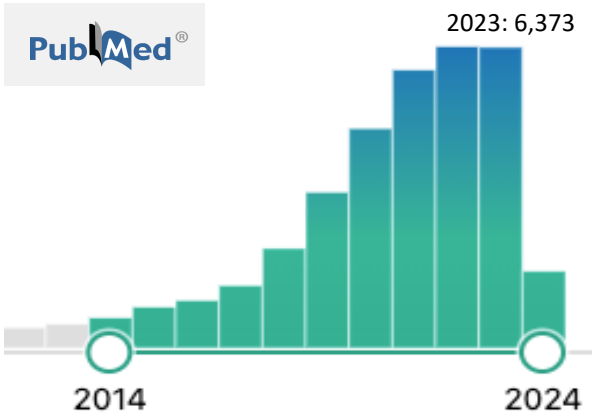
- Advancement in equipment, data storage, artificial intelligence and machine learning further pushes greater use of medical images in clinical and research settings.

Figure 5.24. CT, MRI and PET exams, 2021 (or nearest year)



1. Data exclude privately funded exams. 2. Data exclude exams outside hospital. 3. Data include only exams outside hospital. 4. Data exclude exams on public patients.
Source: OECD Health Statistics 2023.

StatLink https://stat.link/nw56u4



PubMed results of "Medical Imaging Machine Learning"
(as of March 2024)

DICOM

DICOM Digital Imaging and Communications in Medicine

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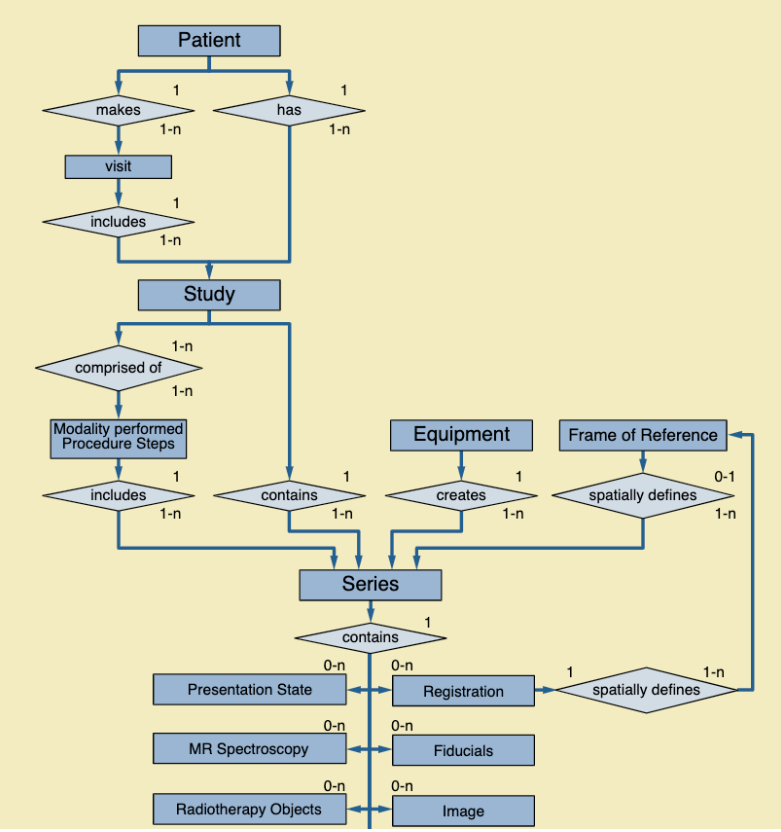
- DICOM is a ubiquitous international standard to transmit, store, retrieve, print, process and display medical imaging information.

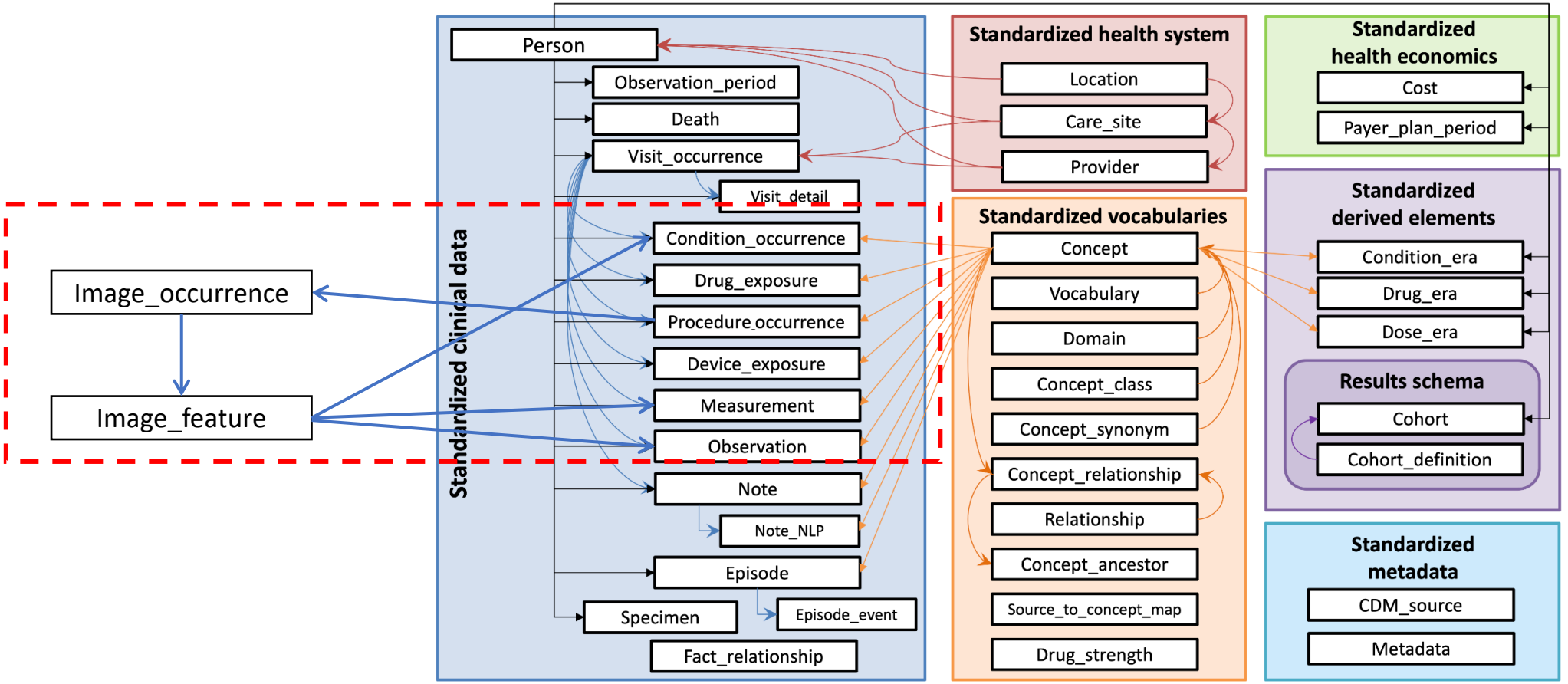


Tag	Name	Value
(0008, 1030)	Study Description	'CT_ABDOMEN_W_IV_CONTRAST'
(0008, 103e)	Series Description	'ABD'
(0010, 0010)	Patient's Name	'SIMPSON_HOMER_J'
(0010, 0020)	Patient ID	'5553226'
(0020, 000d)	Study Instance UID	1.2.826.0.1.3680043.2.1125.1.383818548712163363859780620442189 57
(0020, 000e)	Series Instance UID	1.2.826.0.1.3680043.2.1125.1.688789599848377264479167075513996 67
(0020, 0013)	Instance Number	"20"
(7fe0, 0010)	Pixel Data	Array of 524288 elements

Study Aims

- Combine imaging data with clinical data in a standardized model
- Enable detailed phenotype definition with imaging features
- Expand OMOP CDM usage for imaging research

OMOP CDM Medical Imaging Extension (MI-CDM)



http://ohdsi.github.io/CommonDataModel/background.html

MI-CDM tables (a case study)

- Person
- Visit Occurrence
- Procedure Occurrence
- Image Occurrence
- Image Feature
- Measurement

Image's **DICOM attributes**:
modality, acquired dates, study UID, series UID, local path, DICOMweb URI, gross anatomic site

Image's **acquisition parameters and imaging findings**:
slice thickness, kVp, a solid nodule, specific anatomical site, algorithm information

Seamless Integration with OHDSI Tools

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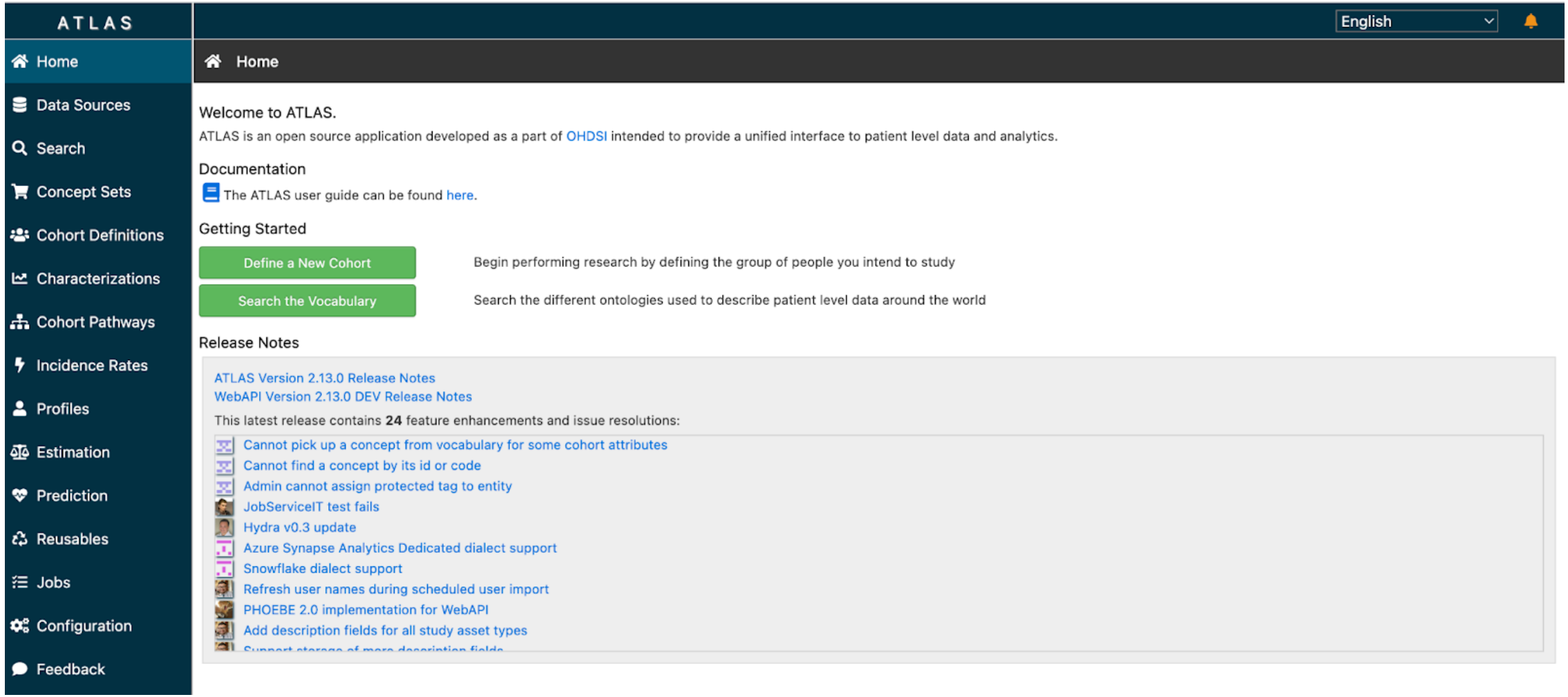
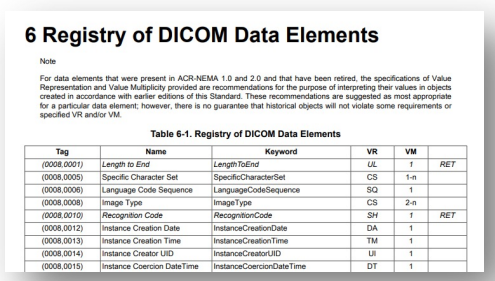


Summary & Next steps

- OMOP CDM Medical Imaging extension creates a standardized multimodal dataset with clinical and imaging data to conduct outcome research.

Next steps

- Vocabulary integration of DICOM and RadLex (Radiology Lexicon) terminology to OMOP CDM vocabulary



6 Registry of DICOM Data Elements

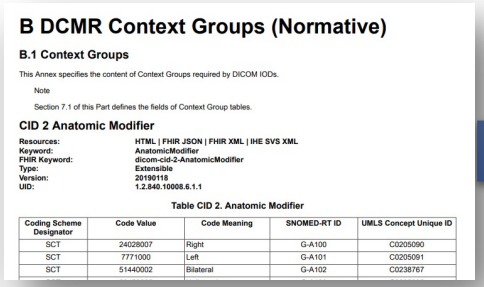
Note

For data elements that were present in ACR-NEMA 1.0 and 2.0 and that have been retired, the specifications of Value Representation and Value Multiplicity provided are recommendations for the purpose of interpreting their values in objects created in accordance with earlier editions of this Standard. These recommendations are suggested as most appropriate for a particular data element; however, there is no guarantee that historical objects will not violate some requirements or specified VR and/or VM.

Table 6-1. Registry of DICOM Data Elements

Tag	Name	Keyword	VR	VM	
(0008,0001)	*Length to End*	*LengthToEnd*	*UL*	*1*	*RET*
(0008,0005)	Specific Character Set	SpecificCharacterSet	CS	1-n	
(0008,0006)	Language Code Sequence	LanguageCodeSequence	SQ	1	
(0008,0008)	Image Type	ImageType	CS	2-n	
(0008,0010)	*Recognition Code*	*RecognitionCode*	*SH*	*1*	*RET*
(0008,0012)	Instance Creation Date	InstanceCreationDate	DA	1	
(0008,0013)	Instance Creation Time	InstanceCreationTime	TM	1	
(0008,0014)	Instance Creator UID	InstanceCreatorUID	UI	1	
(0008,0015)	Instance Coercion DateTime	InstanceCoercionDateTime	DT	1	

+



B DCMR Context Groups (Normative)

B.1 Context Groups

This Annex specifies the content of Context Groups required by DICOM IODs.

Note

Section 7.1 of this Part defines the fields of Context Group tables.

CID 2 Anatomic Modifier

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: AnatomicModifier
FHIR Keyword: dicom-cid-2-AnatomicModifier
Type: Extensible
Version: 20190118
UID: 1.2.840.10008.6.1.1

Table CID 2. Anatomic Modifier

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	24028007	Right	G-A100	C0205090
SCT	7771000	Left	G-A101	C0205091
SCT	51440002	Bilateral	G-A102	C0238767

concept_id	concept_name	domain_id	vocabulary_id	concept_class_id	standard_concept	concept_code	valid_start_date	valid_end_date	invalid_reason
2128000010	Length to End	Measurement	DICOM	DICOM Attributes	NaN	(0008,0001)	19930101	20991231	NaN
2128000011	Specific Character Set	Measurement	DICOM	DICOM Attributes	NaN	(0008,0005)	19930101	20991231	NaN
2128000012	Image Type	Measurement	DICOM	DICOM Attributes	NaN	(0008,0008)	19930101	20991231	NaN
2128000013	Instance Creation Date	Measurement	DICOM	DICOM Attributes	NaN	(0008,0012)	19930101	20991231	NaN
2128000014	Instance Creation Time	Measurement	DICOM	DICOM Attributes	NaN	(0008,0013)	19930101	20991231	NaN
...	...	...	...	...	...	...	...	...	...
2128011218	Plane through Posterior Extent	Measurement	DICOM	DICOM Value Sets	NaN	128129	19930101	20991231	NaN
2128011219	Plane through Anterior Extent	Measurement	DICOM	DICOM Value Sets	NaN	128128	19930101	20991231	NaN
2128011220	Plane through Center	Measurement	DICOM	DICOM Value Sets	NaN	128130	19930101	20991231	NaN
2128011221	Plane through Inferior Extent	Measurement	DICOM	DICOM Value Sets	NaN	128121	19930101	20991231	NaN
2128011222	Plane through Superior Extent	Measurement	DICOM	DICOM Value Sets	NaN	128120	19930101	20991231	NaN

- Reference implementation