DICOM Correction Proposal

STATUS	Assigned
Date of Last Update	2025/03/36
Person Assigned	Kevin O'Donnell
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Submission Date	2024/10/29

Correction Number	CP-2467
Log Summary:	Add sub-template for UL Attenuation Imaging (ATI) measurements
Name of Standard PS 3.16	

Rationale for Correction:

ROI measurements of attenuation coefficients and associated statistics are increasingly captured and reported in ultrasound, in particular for the assessment of liver fat.

An Ultrasound Attenuation Coefficient Measurements Section is added to TID 12000 General Ultrasound Report.

Note: The existing code (112031, DCM, "Attenuation Coefficient") is specifically defined as attenuation of an X-Ray beam (and in fact retired a code for X-Ray Attenuation Coefficient) so a new Ultrasound Attenuation Coefficient code is introduced. Several other statistical codes (112183, DCM, "Standard Deviation of Attenuation Coefficient") are defined in terms of statistical relationships, but the adjective "X-Ray" also appears once in each, new codes are introduced.

Note: The codes in CID 226 are specifically with respect to a reference population.

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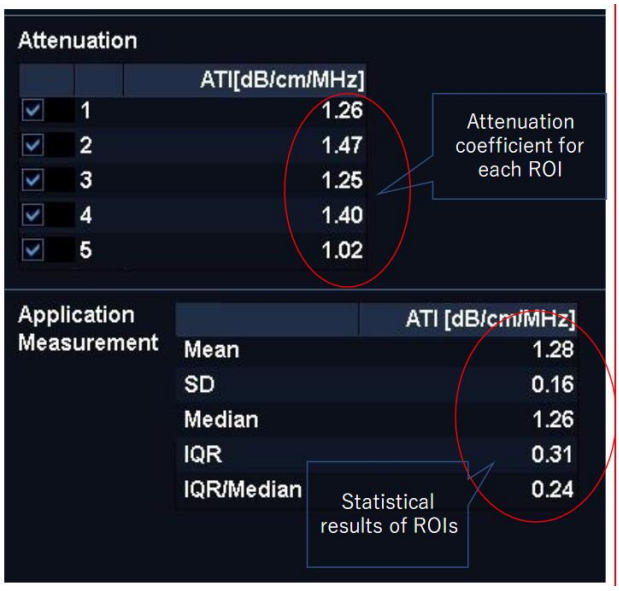

Correction Wording:

Modify PS3.16 TID 4200 as shown

TID 12000 GENERAL ULTRASOUND REPORT

This is the Template for the root of the Content Tree for a general ultrasound procedure report.

Type: Extensible

Order: Significant
Root: Yes

Table TID 12000. General Ultrasound Report

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	BCID 12320 “General Ultrasound Report Document Title”	1	M		Root node
…								
15	>	CONTAINS	INCLUDE	DTID 5401 “Ultrasound Shear Wave Elastography Section”	1-n	U		
16	**>**	**CONTAINS**	**INCLUDE**	**DTID newtid1 “Ultrasound Attenuation Coefficient Section”**	**1-n**	**U**		

Add PS3.16 TID newtid1 as shown

TID newtid1 Ultrasound Attenuation Coefficient Section

This section template incorporates a set of measurements for assessing attenuation coefficients.

Type: Extensible
Order: Significant
Root: No

Table TID newtid1. Ultrasound Attenuation Coefficient Section

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	DT (59776-5, LN, "Findings")	1	M		
2	>	HAS CONCEPT MOD	CODE	EV (121058, DCM, "Procedure Reported")	1	M		DT (newCode0, DCM, "Ultrasound attenuation imaging"
3	>	HAS CONCEPT MOD	CODE	EV (363698007, SCT, "Finding Site")	1	M		BCID newcid1 "Ultrasound Attenuation Imaging Sites"
4	>>	HAS CONCEPT MOD	CODE	EV (272741003, SCT, "Laterality")	1	U		DCID 244 “Laterality”
5	>	HAS ACQ CONTEXT	CODE	EV (399264008, SCT, "Image Mode")	1	U		BCID 12224 “Ultrasound Image Modes”
6	>	HAS ACQ CONTEXT	CODE	EV (111031, DCM, "Image View")	1	U		BCID 5 "Transducer Approach"
7	>>	HAS ACQ CONTEXT	CODE	EV (111032, DCM, "Image View Modifier")	1-n	U		BCID 6 "Transducer Orientation" BCID 7 "Ultrasound Beam Path"
8	>	CONTAINS	CONTAINER	DT (55112-7, LN, "Summary")	1	M		
9	>>	CONTAINS	NUM	EV (newcode02, DCM, "Mean UL Attenuation Coefficient")	1	U		UNITS= EV (dB/cm/MHz, UCUM, "dB/cm/MHz")
10	>>	HAS	NUM	EV (newcode03, DCM,	1	U		UNITS= EV (dB/cm/MHz,

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
		PROPERTIES		"Standard Deviation of UL Attenuation Coefficient")				UCUM, "dB/cm/MHz")
11	>>	HAS PROPERTIES	NUM	EV (newcode04, SCT, "Median UL Attenuation Coefficient")	1	U		UNITS= EV (dB/cm/MHz, UCUM, "dB/cm/MHz")
12	>>	HAS PROPERTIES	NUM	EV (newcode05, DCM, "Interquartile Range of UL Attenuation Coefficient")	1	U		UNITS= EV (dB/cm/MHz, UCUM, "dB/cm/MHz")
13	>>	HAS PROPERTIES	NUM	EV (newcode06, DCM, "Interquartile Range to Median Ratio of UL Attenuation Coefficient")	1	U		UNITS = EV ({ratio}, UCUM, "ratio")
14	>	CONTAINS	CONTAINER	DT (125007, DCM, "Measurement Group")	1-n	M		
15	>>	HAS OBS CONTEXT	TEXT	EV (125010, DCM, "Identifier")	1	M		
16	>>	CONTAINS	SCOORD	EV (111030, DCM, "Image Region")	1	M		
17	>>>	SELECTED FROM	IMAGE		1	M		
18	>>	CONTAINS	NUM	EV (newcode01, DCM, "Ultrasound Attenuation Coefficient")	1	M		UNITS= EV (dB/cm/MHz, UCUM, "dB/cm/MHz")

Content Item Descriptions

Rows 9, 10, 11, 12, 13	These values are a statistical characterization of attenuation coefficient measurements in Rows 14-18. Do Mimic TID 5402.
Row 15	The identifier is used to distinguish the different measurement ROIs. Often a sequential number.

Add a sentence to PS3.16 CID 6141 to make visible that the scope of the CID is narrower than it appears

CID 6141 ATTENUATION COEFFICIENT MEASUREMENT

Attenuation coefficient measurements related to the attenuation of an X-ray beam.

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **AttenuationCoefficientMeasurement**
FHIR Keyword: **dicom-cid-6141-AttenuationCoefficientMeasurement**
Type: **Extensible**
Version: **~~20030108~~yymmdd**
UID: **1.2.840.10008.6.1.461**

Table CID 6141. Attenuation Coefficient Measurement

Coding Scheme Designator	Code Value	Code Meaning
DCM	112031	Attenuation Coefficient
DCM	112179	Minimum Attenuation Coefficient
DCM	112180	Maximum Attenuation Coefficient
DCM	112181	Mean Attenuation Coefficient

Coding Scheme Designator	Code Value	Code Meaning
DCM	112182	Median Attenuation Coefficient
DCM	112183	Standard Deviation of Attenuation Coefficient

Add newCID1 for attenuation imaging finding sites

CID NEWCID1 ULTRASOUND ATTENUATION IMAGING SITES

Resources: **HTML | FHIR JSON | FHIR XML | IHE SVS XML**
Keyword: **UltrasoundAttenuationImagingSites**
FHIR Keyword: **dicom-cid-newCID1-UltrasoundAttenuationImagingSites**
Type: **Extensible**
Version: **yyyymmdd**
UID: **1.2.840.10008.6.1.newUID1**

Table CID newCID1. Ultrasound Attenuation Imaging Sites

Coding Scheme Designator	Code Value	Code Meaning
SCT	10200004	Liver
SCT	76752008	Breast
SCT	69748006	Thyroid

Modify definitions to PS 3.16 Annex D (several existing definitions are included for context/comparison)

Table D-1. DICOM Controlled Terminology Definitions

Code Value	Code Meaning	Definition	Notes
…			
Newcode0	**Ultrasound Attenuation Imaging**	**A type of ultrasound imaging that generates attenuation coefficient values. Sometimes abbreviated as ATI.**	
110851	*X-Ray Attenuation Coefficient*	*Coefficient that describes the fraction of a beam of X-Rays or gamma rays that is absorbed or scattered per unit thickness of the absorber. This value basically accounts for the number of atoms in a cubic cm volume of material and the probability of a photon being scattered or absorbed from the nucleus or an electron of one of these atoms.*	*Retired. Replaced by (112031, DCM, "Attenuation Coefficient").*
112031	Attenuation Coefficient	A quantitative numerical statement of the relative attenuation of the X-Ray beam at a specified point. Coefficient that describes the fraction of a beam of X-Rays or gamma rays that is absorbed or scattered per unit thickness of the absorber. This value basically accounts for the number of atoms in a cubic cm volume of material and the probability of a photon being scattered or absorbed from the nucleus or an electron of one of these atoms. Usually expressed in Hounsfield units [referred to as CT Number in Fraser and Pare].	
Newcode01	**Ultrasound Attenuation**	**A quantitative numerical statement of the relative attenuation of the ultrasound beam at a specified**	

	Coefficient	**location. Usually expressed in dB/cm/MHz.**	
112179	Minimum Attenuation Coefficient	The least quantity assignable, admissible, or possible; the least of a set of X-Ray attenuation coefficients.	
112180	Maximum Attenuation Coefficient	The greatest quantity or value attainable or attained; the largest of a set of X-Ray attenuation coefficients.	
112181	Mean Attenuation Coefficient	The value that is computed by dividing the sum of a set of X-Ray attenuation coefficients by the number of values .	
Newcode02	**Mean Ultrasound Attenuation Coefficient**	**The value that is computed by dividing the sum of a set of Ultrasound attenuation coefficients by the number of values .**	
112182	Median Attenuation Coefficient	The value in an ordered set of X-Ray attenuation coefficients, below and above which there is an equal number of values.	
Newcode04	**Median Ultrasound Attenuation Coefficient**	**The value in an ordered set of Ultrasound attenuation coefficients, below and above which there is an equal number of values.**	
112183	Standard Deviation of Attenuation Coefficient	For a set of X-Ray attenuation coefficients: 1) a measure of the dispersion of a frequency distribution that is the square root of the arithmetic mean of the squares of the deviation of each of the class frequencies from the arithmetic mean of the frequency distribution; 2) a parameter that indicates the way in which a probability function or a probability density function is centered around its mean and that is equal to the square root of the moment in which the deviation from the mean is squared.	
Newcode03	**Standard Deviation of Ultrasound Attenuation Coefficient**	**For a set of ultrasound attenuation coefficients: 1) a measure of the dispersion of a frequency distribution that is the square root of the arithmetic mean of the squares of the deviation of each of the class frequencies from the arithmetic mean of the frequency distribution; 2) a parameter that indicates the way in which a probability function or a probability density function is centered around its mean and that is equal to the square root of the moment in which the deviation from the mean is squared.**	
130614	Interquartile Range of population	The width of the center range within which 50% of the measured values in a reference population fall. The IQR may also be described as the first quartile value subtracted from the third quartile value, or equivalently the 25th percentile value subtracted from the 75th percentile value.	
newcode05	**Interquartile Range of UL Attenuation Coefficient**	**The width of the center range of a set of ultrasound attenuation coefficients within which 50% of the measured values in a reference population fall. The IQR may also be described as the first quartile value subtracted from the third quartile value, or equivalently the 25th percentile value subtracted from the 75th percentile value.**	
130615	Interquartile Range to Median Ratio of population	The interquartile range value of a population divided by the median value of the same population. IQR/M, which is one way to describe the variability of a set of measurements, is sometimes used as a metric of measurement quality.	

newcode06	**Interquartile Range to Median Ratio of UL Attenuation Coefficient**	**The interquartile range value of a set of ultrasound attenuation coefficients divided by the median value of the same set. IQR/M, which is one way to describe the variability of a set of measurements, is sometimes used as a metric of measurement quality.**	