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8	Correction Number CP-2618	
9	Log Summary: Numeric Value Qualifier in Content Item Macro	
10	Name of Standard	
11	PS3.3, PS3.16	
12	Rationale for Correction:	
13	CP 260 added a Numeric Value Qualifier Code Sequence to the SR Numeric Measurement Macro Attributes, but did not add it to	
14	the Content Item Macro.	
15	Unlike in the Numeric Measurement Macro, which contains a potentially empty (Type 2) Measured Value Sequence, the Numeric	
16	Value attribute is Type 1C in the Content Item Macro, so the presence of the qualifier as an alternative to the value requires changes	
17	to the conditions.	
18	Allowing the value to be empty is a potentially breaking change, but since the (lack of) a value signalled by the qualifier could not	
19	otherwise be encoded at all, seems acceptable.	
20	See also the extensive discussion in the rationale of CP 2023, which, inter alia, changed the Type of the Numeric Value Qualifier	
21	Code Sequence from 3 to 1C in the SR usage.	
22	Template requirements for mandatory content items are expanded to include the use in Content Items, since those may be described	
23	in Acquisition Context Module, Protocol and Workflow Context Templates.	
24	Correction Wording:	

Amend DICOM PS3.3 as follows (changes to existing text are bold and underlined for additions and ~~struckthrough~~ for removals):

10.2 Content Item Macro

...

Note

1. The NUMERIC Value Type of this Macro differs from the NUM Value Type defined in Section C.17.3, since the encoding of the Concept Value is different, **the content is not nested in a Measured Value Sequence (0040,A300), and the conditions for inclusion of a Numeric Value Qualifier Code Sequence (0040,A301) are different. The Numeric Value (0040,A30A) may be empty to convey the concept of a measurement whose Value is unknown or missing, or a measurement or calculation failure. Even if the Value is empty, the units will still be sent.**

2. ...

...

Table 10-2. Content Item Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Value Type	(0040,A040)	1	The type of the value encoded in this name-value Item. Enumerated Values: ... NUMERIC ...
...			...
Numeric Value	(0040,A30A)	4 C	Numeric value for this name-value Item. <u>Only a single Zero or one</u> Values shall be present. <u>May only be zero length if Numeric Value Qualifier Code Sequence (0040,A301) is present.</u> Required if Value Type (0040,A040) is NUMERIC.
Floating Point Value	(0040,A161)	1C	The floating point representation of Numeric Value (0040,A30A). The same number of Values as Numeric Value (0040,A30A) shall be present. Required if Numeric Value (0040,A30A) has insufficient precision to represent the value as a string. May be present otherwise.
Rational Numerator Value	(0040,A162)	1C	The integer numerator of a rational representation of Numeric Value (0040,A30A), encoded as a signed integer value. The same number of Values as Numeric Value (0040,A30A) shall be present. Required if Numeric Value (0040,A30A) has insufficient precision to represent a rational value as a string. May be present otherwise.
Rational Denominator Value	(0040,A163)	1C	The integer denominator of a rational representation of Numeric Value (0040,A30A), encoded as a non-zero unsigned integer value. The same number of Values as Numeric Value (0040,A30A) shall be present. Required if Rational Numerator Value (0040,A162) is present.

Attribute Name	Tag	Type	Attribute Description
Measurement Units Code Sequence	(0040,08EA)	1C	Units of measurement for a numeric value in this name-value Item. Only a single Item shall be included in this Sequence. Required if Value Type (0040,A040) is NUMERIC.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			BCID 82 "Measurement Unit".
Numeric Value Qualifier Code Sequence	(0040,A301)	1C	Qualification of Numeric Value (0040,A30A), or reason for absence of a value in Numeric Value (0040,A30A). Only a single Item is permitted in this Sequence. Required if Numeric Value (0040,A30A) is zero length.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			DCID 42 "Numeric Value Qualifier".
Referenced SOP Sequence	(0008,1199)	1C	Composite SOP Instance Reference value for this name-value Item. Only a single Item shall be included in this Sequence. Required if Value Type (0040,A040) is COMPOSITE or IMAGE or WAVEFORM.
...			

For reference DICOM PS3.3:

C.18.1 Numeric Measurement Macro

Table C.18.1-1 specifies the Attributes of the Numeric Measurement Macro, which convey a NUM (numeric measurement) Value.

Note

The Measured Value Sequence (0040,A300) may be empty to convey the concept of a measurement whose value is unknown or missing, or a measurement or calculation failure. Whether or not an Item is required may be controlled by the Template that defines the use of this Content Item. See Section 6.1.7 in PS3.16. If the Sequence is empty, neither the value nor the units will be sent.

Table C.18.1-1. Numeric Measurement Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Measured Value Sequence	(0040,A300)	2	This is the value of the Content Item. Shall consist of a Sequence of Items conveying the measured value(s), which represent integers or real numbers and units of measurement. Zero or one Item shall be included in this Sequence.
>Numeric Value	(0040,A30A)	1	Numeric measurement value. Only a single Value shall be present.
>Floating Point Value	(0040,A161)	1C	The floating point representation of Numeric Value (0040,A30A). Only a single Value shall be present. Required if Numeric Value (0040,A30A) has insufficient precision to represent the value as a string. May be present otherwise.

Attribute Name	Tag	Type	Attribute Description
>Rational Numerator Value	(0040,A162)	1C	The integer numerator of a rational representation of Numeric Value (0040,A30A), encoded as a signed integer value. Only a single Value shall be present. Required if Numeric Value (0040,A30A) has insufficient precision to represent a rational value as a string. May be present otherwise.
>Rational Denominator Value	(0040,A163)	1C	The integer denominator of a rational representation of Numeric Value (0040,A30A), encoded as a non-zero unsigned integer value. Only a single Value shall be present. Required if Rational Numerator Value (0040,A162) is present.
>Measurement Units Code Sequence	(0040,08EA)	1	Units of measurement. Only a single Item shall be included in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			DCID 82 "Measurement Unit".
Numeric Value Qualifier Code Sequence	(0040,A301)	1C	Qualification of Numeric Value (0040,A30A) in Measured Value Sequence (0040,A300), or reason for absence of Measured Value Sequence (0040,A300) Item. Only a single Item is permitted in this Sequence. Required if Measured Value Sequence (0040,A300) is empty.
>Include Table 8.8-1 "Code Sequence Macro Attributes"			DCID 42 "Numeric Value Qualifier".

8.8 Standard Attribute Sets for Code Sequence Attributes

Table 8.8-1. Code Sequence Macro Attributes

C.17.3 SR Document Content Module

Amend DICOM PS3.16 as follows (changes to existing text are bold and underlined for additions and ~~struckthrough~~ for removals):

6.1.7.1 Requirement Type for Numeric Content Items in Structured Reports

Section C.18.1 Numeric Measurement Macro in PS3.3 permits the Measured Value Sequence (0040,A300), which contains the Numeric Value (0040,A30A) and Measurement Units Code Sequence (0040,08EA) to be zero length.

Note

~~This does not apply to the Section 10.2 Content Item Macro, which does not permit an empty Measured Value Sequence (0040,A300) nor does it include a Numeric Value Qualifier Code Sequence (0040,A301).~~

The Section 10.2 Content Item Macro permits an empty Numeric Value (0040,A30A) when Numeric Value Qualifier Code Sequence (0040,A301) is present.

The unknown state shall be distinguished from valid arithmetic or device or algorithm failure related states (in which cases a numeric string that complies with the PS3.5 Value Representation for DS cannot be created).

If the Template Requirement Type is M or MC, then:

- A zero length Measured Value Sequence (0040,A300) or Content Item Macro Numeric Value (0040,A30A) is permitted for any of the reasons listed in CID 43 "Numeric Value Failure Qualifier"
- A zero length Measured Value Sequence (0040,A300) or Content Item Macro Numeric Value (0040,A30A) is not permitted for any of the reasons listed in CID 44 "Numeric Value Unknown Qualifier", or any other semantically equivalent reason

Note

The intent of the foregoing is to discourage an implementer from thwarting the requirements of the Template. Sending meaningless values, such as a value of zero, when zero is not a realistic value, is also not encouraged.

For reference DICOM PS3.16:

CID 42 Numeric Value Qualifier

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: NumericValueQualifier
FHIR Keyword: dicom-cid-42-NumericValueQualifier
Type: Extensible
Version: 20020114
UID: 1.2.840.10008.6.1.22

Table CID 42. Numeric Value Qualifier

Coding Scheme Designator	Code Value	Code Meaning
<i>Include CID 43 "Numeric Value Failure Qualifier"</i>		
<i>Include CID 44 "Numeric Value Unknown Qualifier"</i>		

CID 43 Numeric Value Failure Qualifier

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: NumericValueFailureQualifier
FHIR Keyword: dicom-cid-43-NumericValueFailureQualifier
Type: Extensible
Version: 20210120
UID: 1.2.840.10008.6.1.1356

Table CID 43. Numeric Value Failure Qualifier

Coding Scheme Designator	Code Value	Code Meaning
DCM	114000	Not a number
DCM	114001	Negative Infinity
DCM	114002	Positive Infinity
DCM	114003	Divide by zero
DCM	114004	Underflow
DCM	114005	Overflow
DCM	114006	Measurement failure
DCM	114008	Calculation failure
DCM	114009	Value out of range

CID 44 Numeric Value Unknown Qualifier

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML
Keyword: NumericValueUnknownQualifier
FHIR Keyword: dicom-cid-44-NumericValueUnknownQualifier
Type: Extensible
Version: 20210120
UID: 1.2.840.10008.6.1.1357

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Table CID 44. Numeric Value Unknown Qualifier

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Coding Scheme Designator	Code Value	Code Meaning
DCM	114007	Measurement not attempted
DCM	114010	Value unknown
DCM	114011	Value indeterminate