DICOM Correction Proposal

STATUS	Letter Ballot
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Correction Number CP-1814
Log Summary: Add corneal measurement values sequence to Intraocular Lens Calculations IOD (IOL)
Name of Standard PS3.3, PS3.6, PS3.16
Rationale for Correction: Intraocular Lens Calculations IOD (IOL) defines several attributes for those ophthalmic measurement values which has been used as input data for IOL calculation such as Corneal Size, Anterior Chamber Depth, Lens Thickness, Axial Length, Keratometry, or Refractive State. However, for newer IOL calculation formulas it's necessary to describe the cornea of a patient's eye not only by the curvature of its anterior surface (Keratometry) but by more detailed parameters like the curvature of its posterior surface (PCS) or the Total Corneal Power (determines both anterior and posterior surfaces). Using such detailed corneal input values leads to much higher precision of the IOL calculation results and better post-operative vision of the patient. These measurement data is currently not covered by the IOL IOD definition. The scope of this proposal is to add attribute definitions for more detailed corneal measurement values used for IOL calculations.
Correction Wording:

In PS3.3, section C.8.25.16.2 Intraocular Lens Calculations Macro add following attributes

C.8.25.16.2 Intraocular Lens Calculations Macro

Table C.8.25.16-2. Intraocular Lens Calculations Macro Attributes

Attribute Name	Tag	Type	Attribute Description
…	…	…	…
Include Table C.8.25.16-3 "Keratometry Macro Attributes"			
Cornea Measurements Sequence	**(aaaa,aaaa)**	**3**	**Cornea measurement values and source.** **One or more Items are permitted in this Sequence.**
>Include Table C.8.25.16-x "Cornea Measurement Macro Attributes"			
>Source of Cornea Measurement Data Code Sequence	**(bbbb,bbbb)**	**1**	**Source of the values of Steep Corneal Axis Sequence (cccc,cccc) and Flat Corneal Axis Sequence (dddd,dddd).**

			Only a single Item shall be included in this Sequence.
>>Include Table 8.8-1 "Code Sequence Macro Attributes"			**Defined CID 4240 "Ophthalmic Measurement or Calculation Data Source"**
>Referenced SOP Sequence	**(0008,1199)**	**1C**	**SOP Instance that is relevant to the interpretation of this SOP Instance.** **Only a single Item shall be included in this Sequence.** **See Section C.8.25.16.1.1 for further explanation.** **Required if Source of Cornea Measurement Data Code Sequence (bbbb,bbbb) contains an item with the value (aaaaaa, DCM, "Keratometry Measurements SOP Instance").**
>>Include Table 10-11 "SOP Instance Reference Macro Attributes"			
IOL Formula Code Sequence	(0022,1028)	1	Formula used to calculate IOL power. Only a single Item shall be included in this Sequence.
…	…	…	…

In PS3.3, section C.8.25.16 add section C.8.25.16.n Cornea Measurement Macro

C.8.25.16.n Cornea Measurement Macro

Table C.8.25.16-n specifies and describes the attributes for the Cornea Measurement Macro used in IOL calculation.

Table C.8.25.16-n. Cornea Measurement Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Steep Corneal Axis Sequence	**(cccc,cccc)**	**1**	**Steepest meridian as defined by the greatest power of curvature and shortest radius of curvature.** **Only a single Item shall be included in this Sequence.**
>Radius of Curvature	**(0046,0075)**	**1**	**The radius of curvature of the principal meridians of the cornea, measured in mm.**
>Corneal Power	**(eeee,eeee)**	**2**	**The refractive power of the cornea at the principal meridians, measured in diopters.**
>Corneal Axis	**(ffff,ffff)**	**2**	**The meridian where the radius of curvature or corneal power is measured, in degrees.**
Flat Corneal Axis Sequence	**(dddd,dddd)**	**1**	**Flattest meridian as defined by the least power of curvature and longest radius of curvature.**

			Only a single Item shall be included in this Sequence.
>Radius of Curvature	**(0046,0075)**	**1**	**The radius of curvature of the principal meridians of the cornea, measured in mm.**
>Corneal Power	**(eeee,eeee)**	**2**	**The refractive power of the cornea at the principal meridians, measured in diopters.**
>Corneal Axis	**(ffff,ffff)**	**2**	**The meridian where the radius of curvature or corneal power is measured, in degrees.**
Cornea Measurement Method Code Sequence	**(gggg,gggg)**	**1**	**Method of the cornea measurement.** **Only a single Item shall be included in this Sequence.**
>Include Table 8.8-1 "Code Sequence Macro Attributes"			**Defined CID xxxx "Cornea Measurement Method Descriptors"**
Keratometer Index	**(0022,1033)**	**2**	**The translation factor specific to each keratometer that derives a number for power from the measured radius of curvature of the cornea.**
Refractive Index of Cornea	**(hhhh,hhhh)**	**1C**	**The refractive translation factor specific for the cornea when deriving a number of power from the measured radius of curvature of the posterior surface of cornea.** **Required if Cornea Measurement Type Code Sequence (gggg,gggg) contains an item with the value (DCM, cccccc, Posterior Cornea Surface Measurement)**
Refractive Index of Aqueous Humor	**(iiii,iiii)**	**1C**	**The refractive translation factor specific for the aqueous humor when deriving a number of power from the measured radius of curvature of the posterior surface of cornea.** **Required if Cornea Measurement Type Code Sequence (gggg,gggg) contains an item with the value (DCM, cccccc, Posterior Cornea Surface Measurement)**

In PS 3.6, Section 6 add following attributes to Table 6-1. Registry of DICOM Data Elements

Tag	Name	Keyword	VR	VM
(aaaa,aaaa)	**Cornea Measurements Sequence**	**CorneaMeasurementsSequence**	**SQ**	**1**
(bbbb,bbbb)	**Source of Cornea Measurement Data Code Sequence**	**SourceOfCorneaMeasurementDataCodeSequence**	**SQ**	**1**
(cccc,cccc)	**Steep Corneal Axis Sequence**	**SteepCornealAxisSequence**	**SQ**	**1**
(dddd,dddd)	**Flat Corneal Axis Sequence**	**FlatCornealAxisSequence**	**SQ**	**1**

(eeee,eeee)	**Corneal Power**	**CornealPower**	**FD**	**1**
(ffff,ffff)	**Corneal Axis**	**CornealAxis**	**FD**	**1**
(gggg,gggg)	**Cornea Measurement Method Code Sequence**	**CorneaMeasurementMethodCodeSequence**	**SQ**	**1**
(hhhh,hhhh)	**Refractive Index of Cornea**	**RefractiveIndexOfCornea**	**FL**	**1**
(iiii,iiii)	**Refractive Index of Aqueous Humor**	**RefractiveIndexOfAqueousHumor**	**FL**	**1**

In PS3.16, Annex B.1 add codes for Keratometry Measurements to CID 4240

CID 4240 Ophthalmic Measurement or Calculation Data Source

Resources:

HTML | FHIR JSON | FHIR XML | IHE SVS XML

Type:

Extensible

Version:

~~20100623~~2018mmdd

UID:

1.2.840.10008.6.1.886

Table CID 4240. Ophthalmic Measurement or Calculation Data Source

Coding Scheme Designator	Code Value	Code Meaning
DCM	111780	Measurement From This Device
DCM	113857	Manual Entry
DCM	111781	External Data Source
DCM	111782	Axial Measurements SOP Instance
DCM	111783	Refractive Measurements SOP Instance
DCM	**aaaaaa**	**Keratometry Measurements SOP Instance**

In PS3.16, Annex B.1 add CID xxxx to define codes for Cornea Measurement Types

CID xxxx Cornea Measurement Types

Resources:

HTML I FHIR JSON I FHIR XML I IHE SVS XML

Type:

Extensible

Version:

2018mmdd

UID:

1.2.840.10008.6.1.yyy

Table CID xxxx. Cornea Measurement Method Descriptors

Coding Scheme Designator	Code Value	Code Meaning
DCM	**bbbbbb**	**Total Cornea Power Measurement Method**
DCM	**cccccc**	**Posterior Cornea Surface Measurement Method**
Include Table CID 4235. Keratometry Descriptors		

In PS 3.16, Annex D add to Table D-1

Code Value	Code Meaning	Definition	Notes
aaaaaa	**Keratometry Measurements SOP Instance**	**Keratometry Measurements DICOM SOP Instance.**	
bbbbbb	**Total Cornea Power Measurement Method**	**Method of determining the total cornea power from measuring the curvature of both anterior and posterior surface of the cornea.**	
cccccc	**Posterior Cornea Surface Measurement Method**	**Method of measuring the curvature of posterior surface of the cornea and determining its refractive power.**	