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8 # Digital Imaging and Communications in Medicine (DICOM)

9 *Supplement 221: Dermoscopy*

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13 *Prepared by:*

14

15 **DICOM Standards Committee, Working Group 19**

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18 VERSION: Public Comment

19 Developed pursuant to DICOM Work Item: 2019-04-C

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21
22

To Do
• Dermoscopy Skin Cancer Acquisition Context - SNOMED-RT ID columns
Open issues
• How do we link/relate these multiple partial images of a skin lesion? It is sometimes necessary to take multiple dermoscopy images to get full coverage of a skin lesion (mole). Could Referenced Image Sequence (0008,1140) be a method for doing this? Could Tracking UID be used?

• Is optical magnification factor the best way to describe magnification? Are alternatives such as nominal power, optical power, or zoom more appropriate?

• Is a DICOM Structured Report object the best method to encode lesion tracking information? Is an alternative to embed tracking information into the image metadata? |
| **Closed issues** |
| • How do we encode digital zoom? [Response: The EXIF digital zoom ratio attribute which is encoded to the DICOM attribute (0016,0044) Digital Zoom Ratio. Digital Zoom Ratio is a Type 3 element of the VL Photographic Acquisition Module]

• Should *(0028,0302) Recognizable Visual Feature* be set to true if image contains a tattoo? If yes, add to Content constraint. [A dermoscopy image due to small field of view is unlikely to contain enough of a tattoo to be recognizable. However, this may be a question for clinical images/VL Photographic objects]
• Will multi-frame ever be used? [Response: No dermoscopy is single frame only]
• Due to field of view for dermoscopy it unlikely to include enough area (e.g. of face) to be recognizable. Should *(0028,0302) Recognizable Visual Feature* be deleted if not need for tattoo? [Response: Need to consider dermoscopy of fingerprints to be a recognizable visual feature, therefore need to include].

• Do we group images of the same lesion acquired via different techniques (e.g. contact / non-contact polarized /non-polarized light) to be in the one series or multiple series?[Response: All images of a lesion will be in one series.]

• Are dermoscopes calibrated? If yes, General Equipment module attributes Date Of Last Calibration, Time Of Last Calibration (Type 3 attributes) can be used.[Response: Lens is calibrated but camera (eg. iPhone, DSLR) is not.]

• Do we want Burned in Annotation, Lossy Image Compression and Lossy Image Compression Ratio and Lossy Compression Method to be mandatory attributes?[Response: Only Lossy Image Compression is Type 1]

• What (if any) EXIF tags do we want included in the Dermoscopic Image module? [Response: Include VL Photographic Acquisition Module in Dermoscopy Photography IOD to encode EXIF tags if required]

• Should we make date and time mandatory to aid in sequential dermoscopic imaging review? [Response: Study Date (0008,0020) and Study Time (0008,0030) are Type 2 attributes in the General Study Module]

• Do we need a Frame of Reference IE? [Response: Include in Dermoscopy Photography IOD as Type U for when multiple exposures of the same lesion are taking during the same acquisition. |

Note: Some dermoscopes "automatically" acquire multiple images under different lighting modes.]

- Do we need a Dermoscopy Photography Equipment Module? As an example, the VL Photographic Equipment Module contains description of the lens (e.g. Lens Specification, Lens Make, Lens Model and Lens Serial Number). Alternatively, can we use Software Versions (0018,1020) which is a multi-valued attribute. For equipment that is composed of several components, it may be used to identify the name and version for each of those components. This may also include the identifier and version of libraries or configuration files that significantly affect the production of the SOP Instance. [Add VL Photographic Equipment as a U for devices with interchangeable lenses]

Notes

- The attributes Manufacturer (0008,0070), Manufacturer's Model Name (0008,1090) and Device Serial Number (0018,1000) are intended to be a primary identification of the system

- Patient Orientation (0020,0020) Type 2C in General Image Module (required if Image Orientation (0020,0037) or Image Position (Patient) (0020,0032). These later two attributes will not be encoded for a dermoscopy image and therefor 0020,0020 will be required.

- Body Part Examined (0018,0015) Type 3 in General Series Module. Can be used for more generic anatomical region. Text description of the part of body examined.

- Laterality (0020,0060) Type 2C in General Series Module (Required if the body part examined is a paired structure and Image Laterality (0020,0062) … not present.

- VL Photographic Acquisition Module can be used to encode EXIF values.

- Convention: Type 1 Data Elements that shall be included and are mandatory elements; Type 2 Data Elements that shall be included and are mandatory Data Elements. However, it is permissible that if a Value for a Type 2 element is unknown it can be encoded with zero; Type 3 Data Elements that are optional Data Elements.

23

Table of Contents

81

82 **Scope and Field of Application**

83 This Supplement to the DICOM Standard introduces a new IOD and a new storage SOP for
84 encoding and storing dermoscopic images.

85 Dermoscopy is a diagnostic technique that enables visualization of the morphological structures
86 of the skin. Dermoscopy (also known as dermatoscopy and epiluminescence microscopy) is a
87 non-invasive, in vivo skin examination that has demonstrated to be an important aid in the early
88 recognition of malignant melanoma and other skin tumors. Dermoscopy is also used for non-skin
89 cancer disease conditions (e.g. inflammatory disease).

90 A dermoscope is hand-held device that consists of magnifier and light source. Emitted light can
91 be polarized light or non-polarized. Dermoscopic examination can be by direct contact with skin
92 or non-contact. Dermoscopy using non-polarized light require direct contact between the skin and
93 the device. For direct contact dermoscopy an immersion medium is placed on the skin surface
94 and a glass plate on the dermoscope is placed directly against the skin. Non-contact dermoscopy
95 does not require the dermoscope to be in contact with the skin surface. Three techniques are
96 used in dermoscopy: polarized non-contact dermoscopy, polarized contact dermoscopy, and non-
97 polarized contact dermoscopy.

98

99

100 **Changes to NEMA Standards Publication PS 3.2**

101 **Digital Imaging and Communications in Medicine (DICOM)**

102 **Part 2: Conformance**

103 **Item: Add to table A.1-2 categorizing SOP Classes:**

104 The SOP Classes are categorized as follows:

105 **Table A.1-2**
106 **UID VALUES**

UID Value	UID NAME	Category
1.2.840.10008.xxx	Dermoscopic Photography Image Storage	Transfer

107

108

109   **Changes to NEMA Standards Publication PS 3.3**

110   **Digital Imaging and Communications in Medicine (DICOM)**

111   **Part 3: Information Object Definitions**
112   **Part 3 Additions**

113   *Modify PS3.3*
114

115   *Modify PS3.3 Annex A*
116

117   **A.XX   Dermoscopic Photography Image Information Object Definition**

118   **A.XX.1   Dermoscopic Photography Image IOD Description**
119   The Dermoscopic Photography Image Information Object Definition (IOD) specifies an image that
120   has been created using a dermoscope. The dermoscope may a dedicated dermoscopic device,
121   or a camera-attached or smart device-attached dermoscope.

122   **A.XX.2   Dermoscopic Photography Image IOD Description Entity-**
123   **Relationship Model**
124   The Dermoscopic Photography Image IOD uses the DICOM Composite Instance IOD Entity-
125   Relationship Information Model defined in Section A.1.2, with only the Image IE below the Series
126   IE.

127   **A.XX.3   Dermoscopic Photography Image IOD Modules**
128   Table A.XX-1 specifies the Modules of the Dermoscopic Photography Image IOD.

129   **Table A.XX-1**
130   **DERMOSCOPIC PHOTOGRAPHY IMAGE IOD MODULES**

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
	Clinical Trial Subject	C.7.1.3	U
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
	Clinical Trial Study	C.7.2.3	U
Series	General Series	C.7.3.1	M
	Clinical Trial Series	C.7.3.2	U
Frame of Reference	Frame of Reference	C.7.4.1	U
Equipment	General Equipment	C.7.5.1	M
	Enhanced General Equipment	C.7.5.2	M
	VL Photographic Equipment	C.8.12.10	U
Image	General Image	C.7.6.1	M
	Image Pixel	C.7.6.3	M
	Acquisition Context	C.7.6.14	U

Dermoscopic Image	C.8.xx.1	M
VL Photographic Acquisition Module	C.8.12.11	U
ICC Profile	C.11.15	U
SOP Common	C.12.1	M
Common Instance Reference	C.12.2	U

131

A.XX.4 Dermoscopic Photography Image IOD Content Constraints

A.XX.4.1 Modality
The value of Modality (0008,0060) will be DMS.

A.XX.4.2 Recognizable Visual Features
The value of Recognizable Visual Features (0028,0302) will be YES if the image contains the patient's fingerprints.

A.XX4.3 Frame of Reference Module
The frame of reference module may be used if multiple successive images are acquired during a single acquisition. All images of a skin lesion in an imaging study are encoded as the same Series. All images in a Series that share the same Frame of Reference UID will be spatially related to each other.

A.XX4.4 Acquistion Context Module
For Acquisition Context Sequence (0040,0555) the Defined TID is TID xxx "Dermoscopy Skin Cancer Acquisition Context, which encodes patient level and lesion level information related to skin cancer.

A.XX4.5 VL Photographic Equipment Module
The VL Photographic Equipment Module may be used to encode Lens attributes. Some dermoscopes have interchangeable lenses.

A.XX4.6 VL Photographic Acquisition Module
The VL Photographic Acquisition Module may be used to encode acquisition parameters.

A.XX4.7 Digital Zoom Ratio
The Digital Zoom Ratio (0016,0044) attribute may be used to encode the digital zoom ratio of the dermoscope when the image was acquired.

A.XX.4.8 ICC Profile Module
The ICC Profile Module may be present for color images. If the color space to be used is not calibrated (i.e., a device-specific ICC Input Profile is not available), then an ICC Input Profile specifying a well-known space (such as sRGB) may be specified.

A.XX.4.9 Series Organization
It is desirable that:

-All images of the same lesion within an imaging study are in the same series.

-Images of different lesions within the same imaging study are in in different series.

-Regional images within an imaging study containing dermoscopy images are in a different series. This will not always be possible.

166

167 | *Add to PS3.3 C.7.3.1.1.1 Modality* |

168

C.7.3.1.1 General Series Attribute Descriptions

C.7.3.1.1.1 Modality

171

172 Defined Terms:

173 …..

174 **DMS   Dermoscopy**

175 **…….**

176

177

178 | *Modify PS3.3 C.8 Modality Specific Modules* |

179

C.8.XX   Dermoscopic Photography Modules

C.8.XX.2   Dermoscopic Image Module

182 This section describes the Dermoscopic Image Module. This module contains Attributes that are
183 specific to Dermoscopic Photography images.

184 Table C.8-x contains IOD Attributes that describe dermoscopic images.

185

186 **Table C.8-x. Dermoscopic Image Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Recognizable Visual Features	(0028,0302)	2	Indicates whether or not the image contains sufficiently recognizable visual features to allow the image or a reconstruction from a set of images to identify the Patient. Enumerated Values: YES NO If this Attribute is empty, then the image may or may not contain recognizable visual features.

Lossy Image Compression	(0028,2110)	1	Specifies whether an Image has undergone lossy compression (at a pointin its lifetime).
			Enumerated Values:
			00 Image has NOT been subjected to lossy compression.
			01 Image has been subjected to lossy compression.
			Once this value has been set to 01 it shall not be reset.
			See Section C.7.6.1.1.5.
Polarization	(gggg,eee1)	2	Polarization of the dermoscope light source.
			Enumerated Values:
			POLARIZED
			NON-POLARIZED
Emitter Color Temperature	(gggg,eee2)	2	Color temperature of dermoscope light source in Kelvin.
Contact Method	(gggg,eee3)	2	Whether or not the image was acquired with the dermoscope in direct contact with the skin
			Enumerated Values:
			CONTACT
			NON-CONTACT
Immersion Media	(gggg,eee4)	2C	The interface between the dermoscope and the skin surface for images acquired with contact dermoscopy.
			Enumerated Values:
			ULTRASOUND GEL
			ALCOHOL
			WATER
			MINERAL OIL
			PLASTIC CAP
			Conditional on (gggg,eee3) Contact Method is CONTACT
Pixel Spacing	(0028,0030)	2	Physical distance in the imaging target (patient or specimen) between the center of each pixel, specified as a numeric pair - adjacent row spacing \ adjacent column spacing, in mm. See Section 10.7.1.3.

Optical Magnification Factor	(gggg,eee5)	2	Optical magnification factor when the image was acquired. Optical magnification is achieved using the optics of the dermoscope. The number indicates the magnification factor in times (X). The size of an object (e.g. a skin lesion) would appear *n* times larger than the object when imaged with a dermoscope using *n* X optical magnification.
Lesion Coverage	(gggg,eee6)	3	Whether or not the acquired image covers the entire skin lesion or part of the lesion. Enumerated Values: PARTIAL FULL
Tracking ID	(0062,0020)	2C	A text label used for tracking a finding or feature, potentially across multiple reporting objects, over time. This label shall be unique within the domain in which it is used. Required if Tracking UID (0062,0021) is present. Note: This Attribute allows linkage to Content Items in SR instances with observation context (112039, DCM, "Tracking Identifier") having the same value.
Tracking UID	(0062,0021)	2C	A unique identifier used for tracking a finding or feature, potentially across multiple reporting objects, over time. Required if Tracking ID (0062,0020) is present. Note: This Attribute allows linkage to Content Items in SR instances with observation context (112040, DCM, "Tracking Unique Identifier") having the same value.
Include Table 10-6 "General Anatomy Required Macro Attributes"			*Baseline CID for Anatomic Region Sequence is CID 4029 "Dermatology Anatomic Sites"*

187

188

189

190 **Changes to NEMA Standards Publication PS 3.4**

191 **Digital Imaging and Communications in Medicine (DICOM)**

192 **Part 4: Service Class Specifications**

193

194 | *Add to PS3.4 Annex B.5.* |
|---|

B.5 Standard SOP Classes

195

196 **Table B.5-1**
197 **STANDARD SOP CLASSES**

SOP Class Name	SOP Class UID	IOD (See PS 3.3)
Dermoscopic Photography Image Storage	1.2.840.10008.XXXX	Dermoscopic Photography Image IOD

198

199

200 | *Add to PS3.4 Annex I.4.* |
|---|

I.4 Media Standard Storage SOP Classes

201

202 **Table I.4-1**
203 **Media Storage Standard SOP Classes**

SOP Class Name	SOP Class UID	IOD (See PS 3.3)
Dermoscopic Photography Image Storage	1.2.840.10008.XXXX	Dermoscopic Photography Image IOD

204

205

206

207   **Changes to NEMA Standards Publication PS 3.6**

208   **Digital Imaging and Communications in Medicine (DICOM)**

209   **Part 6: Data Dictionary**

210   *Add to PS3.6 Annex A*

211

UID Value	UID NAME	UID TYPE	Part
1.2.840.10008.xxx	Dermoscopic Photography Image Storage	SOP Class	PS 3.4

212

213

214   *Add to PS3.6 the following Data Elements to Section 6, Registry of DICOM data elements:*

215

Tag	Name	Keyword	VR	VM
(gggg,eee1)	Polarization	Polarization	CS	1
(gggg,eee2)	Emitter Color Temperature	EmitterColorTemperature	DS	1
(gggg,eee3)	Contact Method	ContactMethod	CS	1
(gggg,eee4)	Immersion Media	ImmersionMedia	CS	1-n
(gggg,eee5)	Optical Magnification Factor	OpticalMagnificationFactor	DS	1
(gggg,eee6)	Lesion Coverage	LesionCoverage	CS	1

216

217

218

219   **Changes to NEMA Standards Publication PS 3.16**

220   **Digital Imaging and Communications in Medicine (DICOM)**

221   **Part 16 Content Mapping Resource**

222   *Add to PS3.16 Annex B*
223

224   Annex B DCMR Context Groups (Normative)

225

226   **CID XXX1 Skin type Fitzpatrick**
227   **Resources: HTML| FHIR JSON|FHIR XML|IHE SVS XML**
228   **Type: Extensible**
229   **Version: 2020xxxx**
230   **UID: 1.2.840.10008.xxx**
231

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
LN	LA15337-1	Skin-type I: very fair skin, blond or red hair, light eyes (blue or green), never tan and always sunburn after sun exposure		C2700185
LN	LA15338-9	Skin-type II: fair skin, blond or light-brown hair, light eyes (blue or green), usual sunburn		C2700186
LN	LA15339-7	Skin-type III: deep skin, brown hair, light to medium eye color		C2700187
LN	LA15340-5	Skin-type IV: olive skin, dark-brown hair, brown eyes		C2700188
	LA15341-3	Skin-type V: brown skin, black hair, black eyes		C2700189
LN	LA15342-1	Skin-type VI: black skin, black hair, black eyes		C2700190

232
233

234

235

CID XXX2 History of Malignant Melanoma
236
237 **Resources:**   **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
238 **Type:**   **Extensible**
239 **Version:**   **2020xxxx**
240 **UID:**   **1.2.840.10008.xxx**
241

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	161432005	History of malignant melanoma		C0457969
SCT	321000119108	History of malignant melanoma of the skin		C3266389

242

CID XXX3 History of Melanoma in Situ
243
244 **Resources:**   **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
245 **Type:**   **Extensible**
246 **Version:**   **2020xxxx**
247 **UID:**   **1.2.840.10008.xxx**
248

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	1251000119106	History of melanoma in situ of the skin		C3266774

249
250

CID XXX4 History of Non-Melanoma Skin Cancer
251
252 **Resources:**   **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
253 **Type:**   **Extensible**
254 **Version:**   **2020xxxx**
255 **UID:**   **1.2.840.10008.xxx**
256

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	428053000	History of malignant basal cell neoplasm of skin		C1997258
SCT	429024007	History of squamous cell carcinoma of skin		C1998384

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	443895001	History of malignant neoplasm of skin excluding melanoma		C2732359

257
258

259 CID XXX5 Skin Disorders
260 Resources: HTML| FHIR JSON|FHIR XML|IHE SVS XML
261 Type: Extensible
262 Version: 2020xxxx
263 UID: 1.2.840.10008.xxx
264

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	43982006	Solar degeneration		C0546380
SCT	254819008,	Atypical mole syndrome		C0013403
SCT	782823001	Familial cutaneous telangiectasia and oropharyngeal cancer predisposition syndrome		C5190630
SCT	69408002	Gorlin syndrome		C0004779
SCT	722859001	PTEN hamartoma tumor syndrome		C1959582
SCT	721904001	Rombo syndrome		C1867147

265

266 CID XXX6 Patient Reported Lesion Characteristics
267 Resources: HTML| FHIR JSON|FHIR XML|IHE SVS XML
268 Type: Extensible
269 Version: 2020xxxx
270 UID: 1.2.840.10008.xxx
271

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	418290006	Itching		C0033774
SCT	247441003	Erythema		C4552417
SCT	263703002	Changed		C0443172

272

273   Note:

274   (263703002, SCT, "Change") is used to identify evolution and/or morphological changes
275   in lesion

276

277 CID XXX7 Lesion Palpation Findings
278 Resources: HTML| FHIR JSON|FHIR XML|IHE SVS XML
279 Type: Extensible
280 Version: 2020xxxx

281 **UID:** **1.2.840.10008.xxx**
282

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	20583004	Firm		C0205233
SCT	260399008	Raised		C0442818

283

284 CID XXX8 Lesion Visual Findings
285 **Resources:** **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
286 **Type:** **Extensible**
287 **Version:** **2020xxxx**
288 **UID:** **1.2.840.10008.xxx**
289

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	297968009	Bleeding skin		C0574741
SCT	247441003	Erythema		C4552417

290

291

292

293 CID XXX9 Topical Skin Treatments
294 **Resources:** **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
295 **Type:** **Extensible**
296 **Version:** **2020xxxx**
297 **UID:** **1.2.840.10008.xxx**
298

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	386439008	Skin care: topical treatments		C0150349

299

300 CID XXX10 Skin Procedures
301 **Resources:** **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
302 **Type:** **Extensible**
303 **Version:** **2020xxxx**
304 **UID:** **1.2.840.10008.xxx**
305

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	302396003	Cryotherapy to skin lesion		C0411410
SCT	240977001	Biopsy of skin		C0150866
SCT	428604001	Photodynamic therapy of skin		C1998192

306

307

308 | *Modify tables in PS3.16 Annex B*

309

310 **CID 6099   Racial Group**
311 **Resources:**   **HTML| FHIR JSON|FHIR XML|IHE SVS XML**
312 **Type:**   **Extensible**
313 **Version:**   **2020xxxx**
314 **UID:**   **1.2.840.10008.6.1.1278**

315

316 | *Add new rows* |

317

318

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	413464008	African race	S-0004E	C0027567
SCT	413582008	Asian race	S-00051	C0078988
SCT	413773004	Caucasian race	S-0003D	C0007457
SCT	413490006	American Indian or Alaska native	S-0004B	C1515945
NCIt	C41219	Native Hawaiian or other Pacific Islander		C1513907
SCT	**413581001**	**Asian or Pacific islander race**		**C1531604**
SCT	**413600007**	**Australian aborigine race**		**C0337948**
SCT	**414481008**	**Indian race**		**C1524069**

319

320 | *Add to PS3.16 Annex C* |

321

322 Annex C Acquisition Context Module, Protocol and Workflow Context
323 Templates (Normative)

324

325 This section defines an Acquisition Context Template for Skin Cancer. The attributes in this
326 template represent values known at the time of image acquisition. Hence, these values may
327 subsequently change.

328
329

330 **TID XXXX Dermoscopy Skin Cancer Acquisition Context**

331
332 **Type:**   **Extensible**
333 **Order:**   **Non-Significant**
334 **Root:**   **No**

335
336 **Table TID <#>. Skin Cancer Acquisition Context**
337

Row Number	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint

1	CODE	DT (66555-4, LN, "Skin type Fitzpatrick ")	1	U		BCID XXX1 Skin type Fitzpatrick
2	CODE	DT (415229000, SCT " Racial group")	1	U		BCID 6099 Racial Group
3	CODE	DT (161432005, SCT, "History of malignant melanoma")	1	U		BCID XXX2 History of Malignant Melanoma
4	NUMERIC	DT (NMM, DCM, "Number of Malignant Melanomas")	1	UC	IIF Row 3 is present	
5	CODE	DT (1251000119106, SCT, "History of melanoma in situ of skin")	1	U		BCID XXX3 History of Melanoma in Situ
6	NUMERIC	DT (NMIS, DCM, "Number of Melanoma in Situ")	1	UC	IIF Row 5 is present	
7	CODE	DT (HNMSC, DCM, "History of Non-Melanoma Skin Cancer ")	1-n	U		BCID XXX4 History of Non-Melanoma Skin Cancer
8	CODE	DT (64572001, SCT, "Disease")	1-n	U		BCID XXX5 Skin Disorders
9	CODE	DT(427858005, SCT, "Family history of malignant melanoma")	1	U		BCID XXX2 History of Malignant Melanoma
10	NUMERIC	(C19767,NCIt, "Number of First Degree Relatives (Affected)")	1	UC	IIF Row 9 is present	
11	CODE	DT(FHMIS, DCM, "Family history of melanoma in situ")	1	U		BCID XXX3 History of Melanoma in Situ

12	CODE	DT(FHNSC, DCM, "Family history of non-melanoma skin cancer")	1	U		BCID XXX4 History of Non-Melanoma Skin Cancer
13	CODE	DT (418799008, SCT, "Findings reported by patient/informant")	1-n	U		BCID XXX6 Patient Reported Lesion Characteristics
14	CODE	DT (113011001, SCT, "Palpation")	1-n	U		BCID XXX7 Lesion Palpation Findings
15	CODE	DT (32750006 , SCT, "Inspection")	1-n	U		BCID XXX8 Lesion Visual Findings
16	CODE	DT (225360001, SCT, "Skin care")	1-n	U		BCID XXX9 Topical Skin Treatments
17	CODE	LN (55114-3, LN, "Prior Procedure Descriptions")	1-n	U		BCID XXX10 Skin Procedures

338
339

340 *Add the following definitions to Part 16 Annex D DICOM Controlled Terminology Definitions*
341 *(Normative) – Modify Table D-1 and Modify Table CID 29. Acquisition Modality*
342
343

344 **Annex D   DICOM Controlled Terminology Definitions (Normative)**

345

346 **Table D-1. DICOM Controlled Terminology Definitions (Coding Scheme Designator**
347 **"DCM" Coding Scheme Version "01")**

Code Value	Code meaning	Definition	Notes
…			
DMS	Dermoscopy	An image acquired using a dermoscope	
FHNSC	Family history of non-melanoma skin cancer	A person in the family of the subject has a past medical history of a non-melanoma skin cancer	
FHMIS	Family history of melanoma in situ	A person in the family of the subject has a	

		past medical history of melanoma in situ	
HNMSC	History of non-melanoma skin cancer	A persons past medical history of non-melanoma skin cancer	
NMM	Number of malignant melanomas	The number of malignant melanoma a person has had diagnosed	
NMIS	Number of melanoma in situ	The number of in situ melanoma a person has had diagnosed	

348

349

350 **CID 29 Acquisition Modality**

351 **Table CID 29. Acquisition Modality**

Coding Scheme Designator	Code Value	Code Meaning
…		
DCM	DMS	Dermoscopy

352

353

354

355   **Changes to NEMA Standards Publication PS 3.17**

356

357   **Digital Imaging and Communications in Medicine (DICOM)**

358   **Part 17: Explanatory Information**

359

360   *Add to PS3.17 Annex XXX*

361

362   **Annex XXX Dermoscopy (Informative)**

363   **X.1 Measurements**
364   Dermoscopic images can be acquired with the dermoscope in direct contact with the patient's
365   skin or not. Contact dermoscopes have a glass plate which contacts the skin via a liquid interface
366   (immersion media). Some vendors include a millimeter measurement scale which is etched or
367   imprinted onto the glass contact plate. Resultant images include the scale as shown in Figure
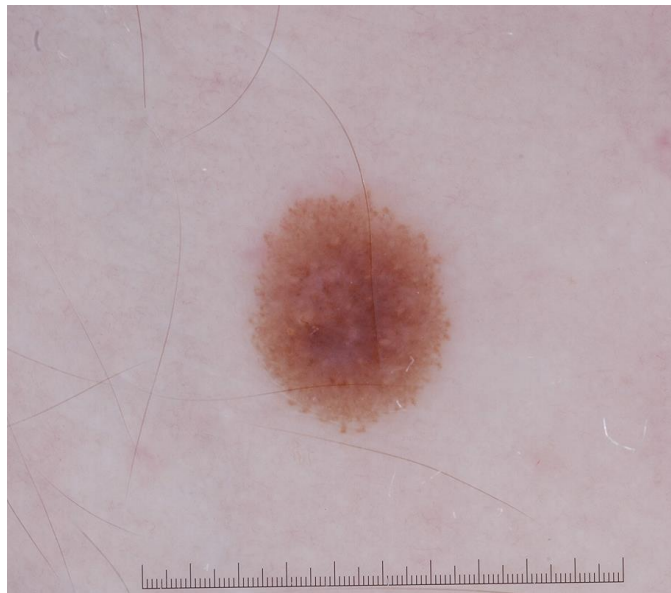368   X.1-1. This scale can be used to calibrate measurement tools in display software.

369

370
371   **Figure X.1-1 Dermoscopy image including scale**.

372   An alternative way to support distance measurements is when the vendor encodes the Pixel
373   Spacing (0028,0030) attribute with the physical distance between the center of adjacent pixels as
374   defined in PS3.3 10.7.1.3. If Pixel Spacing contains a value then measurements tools in the
375   display software do not need to calibrate against an object of known size (e.g. millimeter
376   measurement scale) to be able to provide a distance measurement. Pixel Spacing can be
377   geometrically calculated when there is a known source-to-object distance as would occur with
378   contact dermoscopy. Some non-contact dermoscopes also have fixed distance lens cones which
379   also make it possible to geometrically calculate pixel spacing. It is difficult to accurately calculate
380   pixel spacing when the source-to-object distance is not fixed.

381 **X.2 Frame of Reference**
382 Some dermoscopes record multiple images during a single acquisition with each acquisition using
383 a different lighting mode. The dermoscope does not move during acquisition therefore the
384 corresponding pixel in each image is of the exactly the same region of skin. In this scenario a
385 vendor generated unique identifier will be encoded in the (0020,0052) Frame of Reference UID
386 attribute for all images acquired during the acquisition.

387

388 **X.3 Use Cases**

389 **Use Case 1: Linking dermoscopic images to a regional image**
390 A regional or contextual image is a clinical photograph that includes anatomic reference points
391 (e.g. joint or navel) in the field of view. Dermoscopic images are typically of a single skin lesion
392 (e.g. mole). Linking dermoscopic images to a regional image can give the anatomical location of
393 skin lesion. Further, the linkage may help with the consistent identification of individual skin
394 lesions in sequential dermoscopy.

395 A regional image may include one or more skin lesions. A skin lesion may be seen in one or more
396 regional images. Therefore the relationship between the regional image and the linked
397 dermoscopy images is many-to-many.

398

399 **Figure X.3-1 Regional image**

400 **Potential acquisition workflow**. The aim of this workflow is to create a link between the regional
401 image/s and the dermoscopic image/s.

402 Steps:

403   1. A regional image is acquired and displayed on the acquisition modality.

404   2. A skin lesion requiring dermoscopy is identified (e.g. by mouse click).

405   3. The user is prompted to input a skin lesion label (e.g. Lesion 1) or the acquisition
406   modality actor automatically generates a label. The mouse click generates X and Y co-
407   ordinates to encode in the metadata of the regional image.

408   4. A dermoscopy image is acquired and linked to the lesion identified in Step 2.

409 **Considerations:**

410   • The skin lesion identifier could be used as the series descriptor for the dermoscopic
411   images of this skin lesion.
412   • The metadata of the regional images contains all referenced dermoscopy images (SOP
413   Instance UID) (see Figure X.3-2).
414   • The metadata of the dermoscopy image contains a referenced regional images (SOP
415   Instance UID) (see Figure X.3-2).
416   • The metadata of the regional image contains the X and Y co-ordinate of the lesion(see
417   Figure X.3-2).
418   • The metadata of the regional image optionally contains the skin lesion identifier.
419   • The dermatology imaging study consists one or more regional images and one or more
420   dermoscopic images.
421   • (0062,0020) Tracking Identifier attribute is used to store the skin lesion label.
422   • (0062,0021) Tracking Unique Identifier is used to store a vendor generated skin lesion
423   UID.
424   • Do you need a new regional image for each dermatology imaging study or could it be
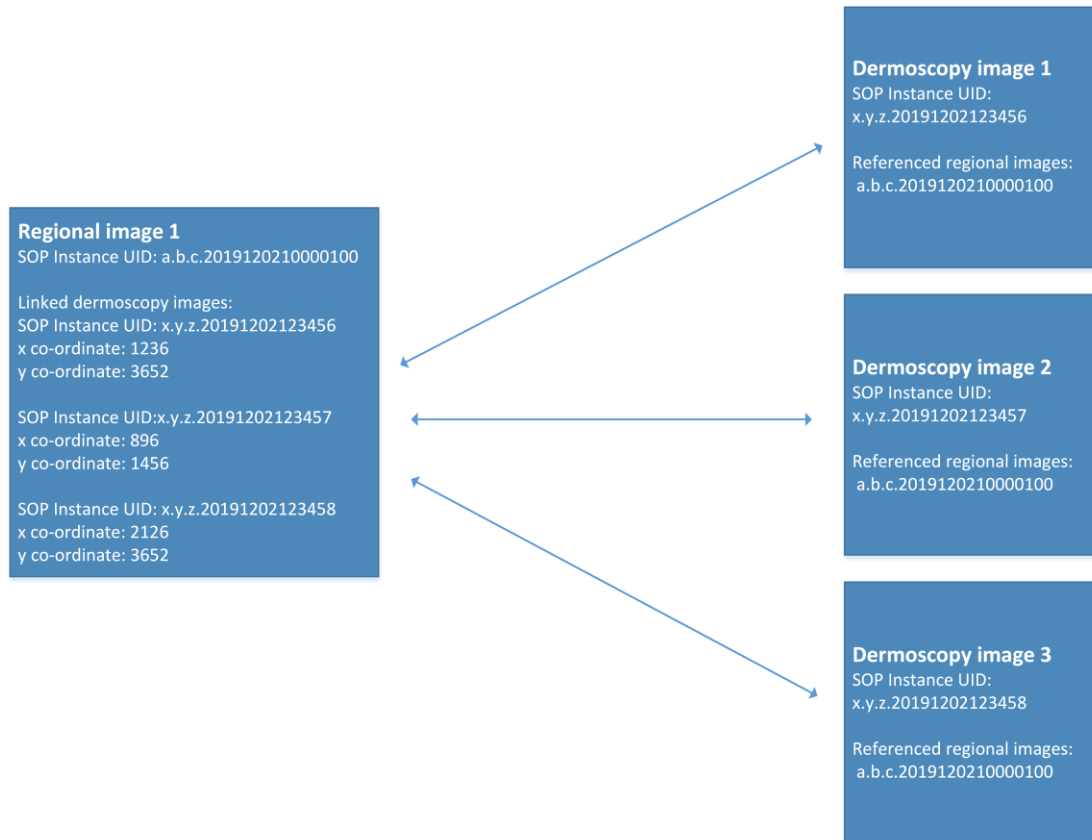425   possible to re-use the original image (from a different imaging study)?
426

428   **Figure X.3-2 Linkage between regional image/s and dermoscopy image/s within a**
429   **dermatology imaging study**

430

431   **Potential display functionality.** When displaying a dermatology imaging study a user can click
432   a skin lesion in a regional images which hyperlinks to display the appropriate dermoscopic image.

433

434   Notes:

435   The Referenced Image Sequence (0008,1140) may provide a method for relating
436   dermoscopy and regional images.

437   A DICOM Structured Report object may be used to retrospectively encode the link
438   between skin lesion on a regional image and a dermoscopic image. The use of a DICOM
439   Structured Report object could be extended for Longitudinal lesion tracking see Use
440   Case 2.

441   **Use Case 2: Longitudinal lesion tracking**
442   This use case proposes a workflow, and the use of a DICOM Structured Report for longitudinal
443   lesion tracking of dermoscopic images.

444   In dermatology, successive images of a skin lesion at different time points are compared to detect
445   suspicious lesions. Monitoring of lesions may be short-term or long-term. Clinical photography
446   and dermoscopy can both be used for longitudinal lesion. However, comparison requires images
447   from the same modality. The longitudinal tracking of images using dermoscopy is often termed
448   *sequential digital dermoscopy*.

449   **Potential workflow for the acquisition of lesion tracking information**

450   Steps:

451   1. The user displays a dermoscopic image that requires longitudinal tracking on an image
452   display / evidence creator actor and invokes a lesion tracking reporting window (see
453   Figure X.3-4).
454   2. The user invoke a lesion tracking dialogue box (e.g. by right mouse click) and selects:
455   a. *New Lesion w*hen there is no existing skin lesion label and will input a unique
456   skin lesion label (e.g. Lesion_1, L1) for the patient.
457   b. *New reporting on existing lesion* when there is an existing skin lesion label from a
458   previous imaging study or a skin lesion label has been assigned when linking
459   dermoscopic images to regional image. The lesion tracking dialogue box will
460   contain a list of software generated list of skin lesion labels (e.g. New report on
461   Lesion 1, New report on Lesion 2, New report on Lesion 3, etc.)
462   3. The user inputs information via the lesion tracking reporting window (see Figure X.3-4)
463   for the currently displayed dermoscopic image. This information may include time point
464   descriptor (e.g. baseline/follow-up), long diameter of lesion, and short diameter lesion.
465   Other information may be derived (e.g. sum of diameters). Other information may auto
466   populate (e.g. study date).
467   4. The user inputs information for one or more lesions (Steps 2 and 3).
468   5. After completion of data entry the user will save the data entry which will invoke the
469   creation of DICOM Structured Report object for the study.

470
471 **Figure X.3-4 Potential Lesion Tracking Reporting Window**

472 **Considerations**

473 • (0062,0020) Tracking Identifier attribute is used to store the skin lesion label.
474 • (0062,0021) Tracking Unique Identifier is used to store a vendor generated skin lesion UID.
475 • Lesion identifier label is auto-generated image display / evidence creator actor.
476 • Measurements in the lesion tracking reporting windows are auto-populated from
477 measurement tools in the image display /evidence creator actor.
478 • Procedure reported is auto-populated e.g. (121058,DCM,"Procedure reported") =
479 (446078004,SCT,"Dermoscopic photograph")
480 • There is potential to use the DICOM Structured Report TID 1500 Measurement Report for
481 skin lesion tracking.
482 • The DICOM Structured Report object would contains the SOP instance UID of the
483 dermoscopic image as it is unlikely a segmentation object would be required as dermoscopy
484 field of view is a single lesion.

485

486 **Potential workflow for the display of lesion tracking**

487 Steps:

488 1. A user displays a dermoscopic study on image display / evidence creator actor and
489 invokes the opening of lesion tracking reporting window which invokes a DICOM query /
490 retrieve of all individual DICOM Structured Report Measurement Reports for that patient
491 that meet a criteria (e.g. (121058,DCM,"Procedure reported") =
492 (446078004,SCT,"Dermoscopic photograph"))
493 2. The lesion tracking reporting windows displays images and measurements and derived
494 measurements from one or more DICOM Structured Report objects in the lesion tracking
495 reporting window. (see Figure X.3.5)
496 3. The lesion tracking reporting windows may display summary information (e.g. change in
497 size tables or graphs)

ID	Name		Gender		DOB	
12345	CITIZEN, John		M		2000/01/01	

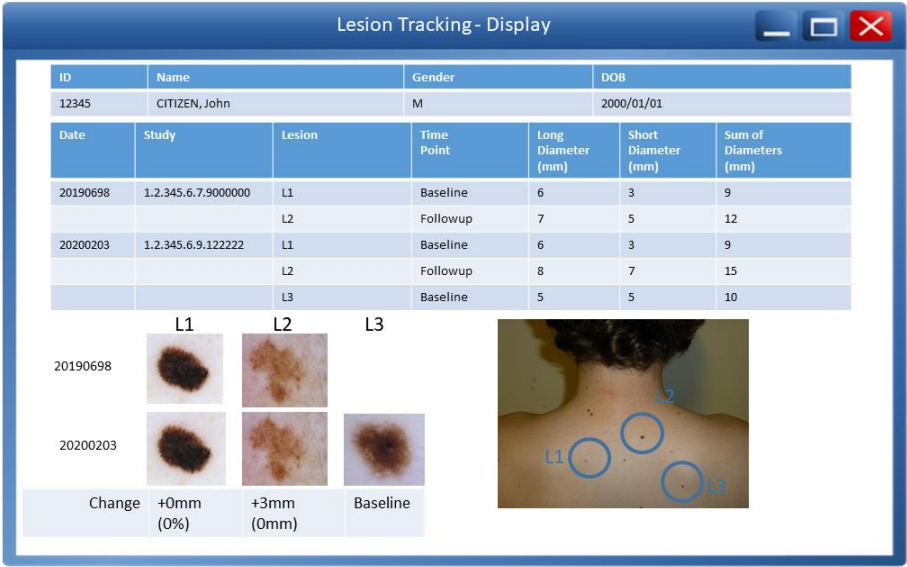| Date	Study	Lesion	Time Point	Long Diameter (mm)	Short Diameter (mm)	Sum of Diameters (mm)
20190698	1.2.345.6.7.9000000	L1	Baseline	6	3	9
		L2	Followup	7	5	12
20200203	1.2.345.6.9.122222	L1	Baseline	6	3	9
		L2	Followup	8	7	15
		L3	Baseline	5	5	10

498

Figure X.3-5 Potential Lesion Tracking Reporting Window Display

499

500