**E Attribute Confidentiality Profiles**

This Annex describes Profiles and Options to address the removal and replacement of Attributes within a DICOM Dataset that may potentially result in leakage of Individually Identifiable Information (III) about the patient or other individuals or organizations involved in acquisition.

Profiles are provided to address the balance between the removal of information and the need to retain information so that the Datasets remain useful for their intended purpose.

Options are used in addition to profiles to prevent a combinatorial expansion of different Profiles.

**E.1 Application Level Confidentiality Profiles**

Application Level Confidentiality Profiles address the following aspects of security:

* Data Confidentiality at the application layer.

Other aspects of security not addressed by these profiles, that may be addressed elsewhere in the standard include:

* Confidentiality in other layers of the DICOM model;
* Data Integrity.

These Profiles are targeted toward creating a special purpose, de-identified version of an already-existing Data Set. It is not intended to replace the original SOP Instance from which the de-identified SOP Instance is created, nor is it intended to act as the primary representation of clinical Data Sets in image archives. The de-identified SOP Instances are useful, for example, in creating teaching or research files, performing clinical trials, or submission to registries where the identity of the patient and other individuals is required to be protected. In some cases, it is also necessary to provide a means of recovering identity by authorized personnel.

**E.1.1 De-identifier**

An Application may claim conformance to an Application Level Confidentiality Profile and Options as a De-Identifier if it protects and retains *all* Attributes as specified in the Profile and Options. Protection in this context is defined as the following process:

1. The application may create one or more instances of the Encrypted Attributes Data Set and copy Attributes to be protected into the (single) item of the Modified Attributes Sequence (0400,0550) of one or more of the Encrypted Attributes Data Set instances.

Note

1. A complete reconstruction of the original Data Set may not be possible; however, Attributes (e.g., SOP Instance UID) in the Modified Attributes Sequence of an Encrypted Attributes Data Set may refer to the original SOP Instance holding the original Data Set.
2. It is not required that the Encrypted Attributes Data Set be created; indeed, there may be circumstances where the Dataset is expected to be archived long enough that any contemporary encryption technology may be inadequate to provide long term protection against unauthorized recovery of identification.
3. Other mechanisms to assist in identity recovery or longitudinal consistency of replaced UIDs or dates and times are deprecated in favor of the Encrypted Attributes Data Set mechanism that is intended for this purpose. For example, if it is desired to include an encrypted hash of the Patient's Name, it should not be encoded in a separate private attribute implemented for that purpose, but should be included in the Encrypted Attributes Data Set and encoded using the standard mechanism. This allows for compatibility between different implementations and provides security based on the quality and control of the encryption keys. Note also, that unencrypted hashes are considerably less secure and should be avoided, since they are vulnerable to trivial dictionary based attacks.
4. Each Attribute to be protected shall then either be removed from the dataset, or have its value replaced by a different "replacement value" that does not allow identification of the patient.

Note

1. It is the responsibility of the de-identifier to ensure that this process does not negatively affect the integrity of the Information Object Definition, if. e. Dummy values may be necessary for Type 1 Attributes that are protected but may not be sent with zero length, and are to be stored or exchanged in encrypted form by applications that may not be aware of the security mechanism.
2. The standard does not mandate the use of any dummy value, and indeed it may have some meaning, for example in a data set that may be used for teaching purposes, where the real patient identifying information is encrypted for later retrieval, but a meaningful alternative form of identification is provided. For example, a dummy Patient's Name (0010,0010) may convey the type of pathology in a teaching case. It is the responsibility of the de-identifier software or human operator to ensure that the dummy values cannot be used to identify the patient.
3. It is the responsibility of the de-identifier to ensure the consistency of dummy values for Attributes such as Study Instance UID (0020,000D) or Frame of Reference UID (0020,0052) if multiple related SOP Instances are protected. Indeed, all Attributes of every entity about the Instance level should remain consistent for all Instances protected, e.g., Patient ID for the Patient entity, Study ID for the Study entity, Series Number for the Series entity.
4. Some profiles do not allow selective protection of parts of a Sequence of Items. If an Attribute to be protected is contained in a Sequence of Items, the complete Sequence of Items may need to be protected.
5. The de-identifier should ensure that no identifying information that is burned in to the image pixel data either because the modality does not generate such burned in identification in the first place, or by removing it using the Clean Pixel Data Option; see [Section E.3](#sect_E_3). If non-pixel data graphics or overlays contain identification, the de-identifier is required to remove them, or clean them if the Clean Graphics option is supported. See [Section E.3.3](#sect_E_3_3). How burned in or graphic identifying information is located and removed is outside the scope of this standard.
6. Each Attribute specified to be retained shall be retained. At the discretion of the de-identifier, Attributes may be added to the dataset to be protected.

Note

As an example, the Attribute Patient's Age (0010,1010) might be introduced as a replacement for Patient's Birth Date (0010,0030) if the patient's age is of importance, and the profile permits it.

1. If used, all instances of the Encrypted Attributes Data Set shall be encoded with a DICOM Transfer Syntax, encrypted, and stored in the dataset to be protected as an Item of the Encrypted Attributes Sequence (0400,0500). The encryption shall be done using RSA [RFC2313] for the key transport of the content-encryption keys. A de-identifier conforming to this security profile may use either AES or Triple-DES for content-encryption. The AES key length may be any length allowed by the RFCs. The Triple-DES key length is 168 bits as defined by ANSI X9.52. Encoding shall be performed according to the specifications for RSA Key Transport and Triple DES Content Encryption in RFC3370 and for AES Content Encryption in RFC3565.

Note

1. Each item of the Encrypted Attributes Sequence (0400,0500) consists of two Attributes, Encrypted Content Transfer Syntax UID (0400,0510) containing the UID of the Transfer Syntax that was used to encode the instance of the Encrypted Attributes Data Set, and Encrypted Content (0400,0520) containing the block of data resulting from the encryption of the Encrypted Attributes Data Set instance.
2. RSA key transport of the content-encryption keys is specified as a requirement in the European Prestandard ENV 13608-2: Health Informatics - Security for healthcare communication - Part 2: Secure data objects.
3. No requirements on the size of the asymmetric key pairs used for RSA key transport are defined in this confidentiality scheme. Implementations claiming conformance to the Basic Application Level Confidentiality Profile as a de-identifier shall always protect (e.g., encrypt and replace) the SOP Instance UID (0008,0018) Attribute as well as all references to other SOP Instances, whether contained in the main dataset or embedded in an Item of a Sequence of Items, that could potentially be used by unauthorized entities to identify the patient.

Note

In the case of a SOP Instance UID embedded in an item of a sequence, this means that the enclosing Attribute in the top-level data set must be encrypted in its entirety.

1. The attribute Patient Identity Removed (0012,0062) shall be replaced or added to the dataset with a value of YES, and one or more codes from [CID 7050 “De-Identification Method”](part16.pdf#sect_CID_7050) corresponding to the profile and options used shall be added to De-Identification Method Code Sequence (0012,0064). A text string describing the method used may also be inserted in or added to De-Identification Method (0012,0063), but is not required.
2. If the Dataset being de-identified is being stored within a DICOM File, then the File Meta Information including the 128-byte preamble, if present, shall be replaced with a description of the de-identifying application. Otherwise, there is a risk that identity information may leak through unmodified File Meta Information or preamble. See [PS3.10](part10.pdf#PS3.10).

The Attributes listed in [Table E.1-1](#table_E_1_1) for each profile are contained in Standard IODs, or may be contained in Standard Extended IODs. An implementation claiming conformance to an Application Level Confidentiality Profile as a de-identifier shall protect or retain all instances of the Attributes listed in [Table E.1-1](#table_E_1_1), whether contained in the main dataset or embedded in an Item of a Sequence of Items. The following action codes are used in the table:

|  |  |
| --- | --- |
| **D** | replace with a non-zero length value that may be a dummy value and consistent with the VR |
| **Z** | replace with a zero-length value, or a non-zero length value that may be a dummy value and consistent with the VR |
| **X** | remove |
| **K** | keep (unchanged for non-sequence attributes, cleaned for sequences) |
| **C** | clean, that is replace with values of similar meaning known not to contain identifying information and consistent with the VR |
| **U** | replace with a non-zero length UID that is internally consistent within a set of Instances |
| **Z/D** | Z unless D is required to maintain IOD conformance (Type 2 versus Type 1) |
| **X/Z** | X unless Z is required to maintain IOD conformance (Type 3 versus Type 2) |
| **X/D** | X unless D is required to maintain IOD conformance (Type 3 versus Type 1) |
| **X/Z/D** | X unless Z or D is required to maintain IOD conformance (Type 3 versus Type 2 versus Type 1) |
| **X/Z/U\*** | X unless Z or replacement of contained instance UIDs (U) is required to maintain IOD conformance (Type 3 versus Type 2 versus Type 1 sequences containing UID references) |

These action codes are applicable to both Sequence and non-Sequence attributes; in the case of Sequences, the action is applicable to the Sequence and all its contents. Cleaning a sequence ("C" action) may entail either changing values of attributes within that Sequence when the meaning of the Sequence within the context of its use in the IOD is understood, or recursively applying the profile rules to each Dataset in each Item of the Sequence. Keeping a Sequence ("K" action) requires recursively applying the profile rules to each Dataset in each Item of the Sequence (for example, to remap any UIDs contained within that sequence).

A requirement for an Option, when implemented, overrides any requirement for the underlying Profile.

Note

1. The Attributes listed in [Table E.1-1](#table_E_1_1) may not be sufficient to guarantee confidentiality of patient identity. Identifying information may be contained in Private Attributes, new Standard Attributes, Retired Standard Attributes and additional Standard Attributes not present in Standard Composite IODs (as defined in [PS3.3](part03.pdf#PS3.3)) but used in Standard Extended SOP Classes. [Table E.1-1](#table_E_1_1) indicates those Attributes that are used in Standard Composite IODs as well as those Attributes that are Retired. Also included in [Table E.1-1](#table_E_1_1) are some Elements that are not normally found in a Dataset, but are used in Commands, Directories and Meta Information Headers, but that could be misused within Private Sequences. Textual Content Items of Structured Reports, textual annotations of Presentation States, Curves and Overlays are specifically addressed. It is the responsibility of the de-identifier to ensure that all identifying information is removed.
2. It should be noted that conformance to an Application Level Confidentiality Profile does not necessarily guarantee confidentiality. For example, if an attacker already has access to the original images, the Pixel Data could be matched, though the probability and impact of such a threat may be deemed to be negligible. If the Encrypted Attributes Sequence is used, any encryption scheme may be vulnerable to attack. Also, an organization's Security Policy and Key Management policy are recognized to have a much greater impact on the effectiveness of protection.
3. National and local regulations, which may vary, might require that additional attributes be de-identified, though the Profiles and Options have been designed to be sufficient to satisfy known regulations without compromising the usefulness of the de-identified instances for their intended purpose.

1. [Table E.1-1](#table_E_1_1) is normative, but it is subject to extension as the DICOM Standard evolves and other similar Attributes are added to IODs. De-Identifiers may take this extensibility into account, for example, by considering handling all dates and times based on their Value Representation of DT, DA or TM, rather than just those date and time Attributes lists.
2. The Profiles and Options do not specify whether the design of a de-identifier should be to remove what is known to be a risk of identity leakage, or to retain only what is known to be safe. The former approach may fail when the standard is extended, or when a vendor adds unanticipated standard or private attributes, whilst the latter requires an extensive, if not complete, comparison of each instance with the Information Object Definitions in [PS3.3](part03.pdf#PS3.3) to avoid discarding required or useful information. [Table E.1-1](#table_E_1_1) defines the minimum actions required for conformance.
3. De-Identification of Private SOP Classes is not defined.
4. The "C" (clean) action is specified not only for string VRs, but also for Code Sequences, since the use of private or local codes and non-standard code meanings may potentially cause identity leakage.
5. The Digital Signatures Sequences needs to be removed because it contains the certificate of the signer; theoretically the signature could be verified and the object re-signed by the de-identifier itself with its own certificate, but this is not required by the Standard.
6. In general, there are no CS VR Attributes in this table, since it is usually safe to assume that code strings do not contain identifying information.
7. In general, there are no Code Sequence Attributes in this table, since it is usually safe to assume that coded sequence entries, including private codes, do not contain identifying information. Exceptions are codes for providers and staff.
8. The Clean Pixel Data and Clean Recognizable Visual Features Options are not listed in this table, since they are defined by descriptions of operations on the Pixel Data itself. The Clean Pixel Data option may be applied to the Pixel Data within the Icon Image Sequence, or more likely the Icon Image Sequence may be recreated entirely once the Pixel Data of the main Dataset has been cleaned. The Icon Image Sequence is to be removed when its Pixel Data cannot be cleaned.
9. The Original Attributes Sequence (0400,0561) (which in turn contains the Modified Attributes Sequence (0400,0550) generally needs to be removed, because it may contain unencrypted copies of other Attributes that may have been modified (e.g., coerced to use local identifiers and names during import of foreign images); an alternative approach would be to selectively modify its contents. This is distinct from the use of the Modified Attributes Sequence (0400,0550) within the Encrypted Attributes Sequence (0400,0500).

1. [Table E.1-1](#table_E_1_1) distinguishes Attributes that are in standard Composite IODs defined in [PS3.3](part03.pdf#PS3.3) from those that are not; some Attributes are defined in [PS3.3](part03.pdf#PS3.3) for other IODs, or have a specific usage other than in the top level Dataset of a Composite IOD, but are (mis-) used by implementers in instances as a Standard Extended SOP Class at other levels than as defined by the Standard. Any such Attributes encountered may be removed without compromising the conformance of the instance with the standard IOD. For example, Verifying Observer Sequence (0040,A073) is only defined in structured report IODs and hence is described in [Table E.1-1](#table_E_1_1) as D since it is Type 1C; if encountered in an image instance, it should simply be removed (treated as X).

**Table E.1-1. Application Level Confidentiality Profile Attributes**

| **Attribute** | **Tag** | **Retired** | **Std. IOD** | **Basic** |
| --- | --- | --- | --- | --- |
| Accession Number | (0008,0050) | N | Y | Z |
| Acquisition Comments | (0018,4000) | Y | N | X |
| Acquisition Context Sequence | (0040,0555) | N | Y | X |
| Acquisition Date | (0008,0022) | N | Y | X/Z |
| Acquisition DateTime | (0008,002A) | N | Y | X/D |
| Acquisition Device Processing Description | (0018,1400) | N | Y | X/D |
| Acquisition Protocol Description | (0018,9424) | N | Y | X |
| Acquisition Time | (0008,0032) | N | Y | X/Z |
| Actual Human Performers Sequence | (0040,4035) | N | N | X |
| Additional Patient's History | (0010,21B0) | N | Y | X |
| Address (Trial) | (0040,A353) | Y | N | X |
| Admission ID | (0038,0010) | N | Y | X |
| Admitting Date | (0038,0020) | N | N | X |
| Admitting Diagnoses Code Sequence | (0008,1084) | N | Y | X |
| Admitting Diagnoses Description | (0008,1080) | N | Y | X |
| Admitting Time | (0038,0021) | N | N | X |
| Affected SOP Instance UID | (0000,1000) | N | N | X |
| Allergies | (0010,2110) | N | N | X |
| Arbitrary | (4000,0010) | Y | N | X |
| Author Observer Sequence | (0040,A078) | N | Y | X |
| Branch of Service | (0010,1081) | N | N | X |
| Cassette ID | (0018,1007) | N | Y | X |
| Comments on the Performed Procedure Step | (0040,0280) | N | Y | X |
| Concatenation UID | (0020,9161) | N | Y | U |
| Confidentiality Constraint on Patient Data Description | (0040,3001) | N | N | X |
| Consulting Physician Identification Sequence | (0008,009D) | N | Y | X |
| Consulting Physician's Name | (0008,009C) | N | Y | Z |
| Content Creator's Name | (0070,0084) | N | Y | Z |
| Content Creator's Identification Code Sequence | (0070,0086) | N | Y | X |
| Content Date | (0008,0023) | N | Y | Z/D |
| Content Sequence | (0040,A730) | N | Y | X |
| Content Time | (0008,0033) | N | Y | Z/D |
| Contrast Bolus Agent | (0018,0010) | N | Y | Z/D |
| Contribution Description | (0018,A003) | N | Y | X |
| Country of Residence | (0010,2150) | N | N | X |
| Current Observer (Trial) | (0040,A307) | Y | N | X |
| Current Patient Location | (0038,0300) | N | N | X |
| Curve Data | (50xx,xxxx) | Y | N | X |
| Curve Date | (0008,0025) | Y | Y | X |
| Curve Time | (0008,0035) | Y | Y | X |
| Custodial Organization Sequence | (0040,A07C) | N | Y | X |
| Data Set Trailing Padding | (FFFC,FFFC) | N | Y | X |
| Derivation Description | (0008,2111) | N | Y | X |
| Detector ID | (0018,700A) | N | Y | X/D |
| Device Serial Number | (0018,1000) | N | Y | X/Z/D |
| Device UID | (0018,1002) | N | Y | U |
| Digital Signature UID | (0400,0100) | N | Y | X |
| Digital Signatures Sequence | (FFFA,FFFA) | N | Y | X |
| Dimension Organization UID | (0020,9164) | N | Y | U |
| Discharge Diagnosis Description | (0038,0040) | Y | N | X |
| Distribution Address | (4008,011A) | Y | N | X |
| Distribution Name | (4008,0119) | Y | N | X |
| Dose Reference UID | (300A,0013) | N | Y | U |
| End Acquisition DateTime | (0018,9517) | N | Y | X/D |
| Ethnic Group | (0010,2160) | N | Y | X |
| Expected Completion DateTime | (0040,4011) | N | N | X |
| Failed SOP Instance UID List | (0008,0058) | N | N | U |
| Fiducial UID | (0070,031A) | N | Y | U |
| Filler Order Number / Imaging Service Request | (0040,2017) | N | Y | Z |
| Frame Comments | (0020,9158) | N | Y | X |
| Frame of Reference UID | (0020,0052) | N | Y | U |
| Gantry ID | (0018,1008) | N | Y | X |
| Generator ID | (0018,1005) | N | Y | X |
| Graphic Annotation Sequence | (0070,0001) | N | Y | D |
| Human Performers Name | (0040,4037) | N | N | X |
| Human Performers Organization | (0040,4036) | N | N | X |
| Icon Image Sequence (see Note 12) | (0088,0200) | N | Y | X |
| Identifying Comments | (0008,4000) | Y | N | X |
| Image Comments | (0020,4000) | N | Y | X |
| Image Presentation Comments | (0028,4000) | Y | N | X |
| Imaging Service Request Comments | (0040,2400) | N | N | X |
| Impressions | (4008,0300) | Y | N | X |
| Instance Coercion DateTime | (0008,0015) | N | Y | X |
| Instance Creator UID | (0008,0014) | N | Y | U |
| Institution Address | (0008,0081) | N | Y | X |
| Institution Code Sequence | (0008,0082) | N | Y | X/Z/D |
| Institution Name | (0008,0080) | N | Y | X/Z/D |
| Institutional Department Name | (0008,1040) | N | Y | X |
| Insurance Plan Identification | (0010,1050) | Y | N | X |
| Intended Recipients of Results Identification Sequence | (0040,1011) | N | N | X |
| Interpretation Approver Sequence | (4008,0111) | Y | N | X |
| Interpretation Author | (4008,010C) | Y | N | X |
| Interpretation Diagnosis Description | (4008,0115) | Y | N | X |
| Interpretation ID Issuer | (4008,0202) | Y | N | X |
| Interpretation Recorder | (4008,0102) | Y | N | X |
| Interpretation Text | (4008,010B) | Y | N | X |
| Interpretation Transcriber | (4008,010A) | Y | N | X |
| Irradiation Event UID | (0008,3010) | N | Y | U |
| Issuer of Admission ID | (0038,0011) | N | Y | X |
| Issuer of Patient ID | (0010,0021) | N | Y | X |
| Issuer of Service Episode ID | (0038,0061) | N | Y | X |
| Large Palette Color Lookup Table UID | (0028,1214) | Y | N | U |
| Last Menstrual Date | (0010,21D0) | N | N | X |
| MAC | (0400,0404) | N | Y | X |
| Media Storage SOP Instance UID | (0002,0003) | N | N | U |
| Medical Alerts | (0010,2000) | N | N | X |
| Medical Record Locator | (0010,1090) | N | N | X |
| Military Rank | (0010,1080) | N | N | X |
| Modified Attributes Sequence | (0400,0550) | N | N | X |
| Modified Image Description | (0020,3406) | Y | N | X |
| Modifying Device ID | (0020,3401) | Y | N | X |
| Modifying Device Manufacturer | (0020,3404) | Y | N | X |
| Name of Physician(s) Reading Study | (0008,1060) | N | Y | X |
| Names of Intended Recipient of Results | (0040,1010) | N | N | X |
| Observation Date (Trial) | (0040,A192) | Y | N | X |
| Observation Subject UID (Trial) | (0040,A402) | Y | N | U |
| Observation Time (Trial) | (0040,A193) | Y | N | X |
| Observation UID | (0040,A171) | N | Y | U |
| Occupation | (0010,2180) | N | Y | X |
| Operators' Identification Sequence | (0008,1072) | N | Y | X/D |
| Operators' Name | (0008,1070) | N | Y | X/Z/D |
| Original Attributes Sequence | (0400,0561) | N | Y | X |
| Order Callback Phone Number | (0040,2010) | N | N | X |
| Order Callback Telecom Information | (0040,2011) | N | N | X |
| Order Entered By | (0040,2008) | N | N | X |
| Order Enterer Location | (0040,2009) | N | N | X |
| Other Patient IDs | (0010,1000) | N | Y | X |
| Other Patient IDs Sequence | (0010,1002) | N | Y | X |
| Other Patient Names | (0010,1001) | N | Y | X |
| Overlay Comments | (60xx,4000) | Y | N | X |
| Overlay Data | (60xx,3000) | N | Y | X |
| Overlay Date | (0008,0024) | Y | Y | X |
| Overlay Time | (0008,0034) | Y | Y | X |
| Palette Color Lookup Table UID | (0028,1199) | N | Y | U |
| Participant Sequence | (0040,A07A) | N | Y | X |
| Patient Address | (0010,1040) | N | N | X |
| Patient Comments | (0010,4000) | N | Y | X |
| Patient ID | (0010,0020) | N | Y | Z |
| Patient Sex Neutered | (0010,2203) | N | Y | X/Z |
| Patient State | (0038,0500) | N | N | X |
| Patient Transport Arrangements | (0040,1004) | N | N | X |
| Patient's Age | (0010,1010) | N | Y | X |
| Patient's Birth Date | (0010,0030) | N | Y | Z |
| Patient's Birth Name | (0010,1005) | N | N | X |
| Patient's Birth Time | (0010,0032) | N | Y | X |
| Patient's Institution Residence | (0038,0400) | N | N | X |
| Patient's Insurance Plan Code Sequence | (0010,0050) |  |  | X |
| Patient's Mother's Birth Name | (0010,1060) | N | N | X |
| Patient's Name | (0010,0010) | N | Y | Z |
| Patient's Primary Language Code Sequence | (0010,0101) |  |  | X |
| Patient's Primary Language Modifier Code Sequence | (0010,0102) |  |  | X |
| Patient's Religious Preference | (0010,21F0) | N | N | X |
| Patient's Sex | (0010,0040) | N | Y | Z |
| Patient's Size | (0010,1020) | N | Y | X |
| Patient's Telecom Information | (0010,2155) | N | N | X |
| Patient's Telephone Numbers | (0010,2154) | N | N | X |
| Patient's Weight | (0010,1030) | N | Y | X |
| Performed Location | (0040,0243) | N | N | X |
| Performed Procedure Step Description | (0040,0254) | N | Y | X |
| Performed Procedure Step End Date | (0040,0250) | N | Y | X |
| Performed Procedure Step End DateTime | (0040,4051) | N | N | X |
| Performed Procedure Step End Time | (0040,0251) | N | Y | X |
| Performed Procedure Step ID | (0040,0253) | N | Y | X |
| Performed Procedure Step Start Date | (0040,0244) | N | Y | X |
| Performed Procedure Step Start DateTime | (0040,4050) | N | N | X |
| Performed Procedure Step Start Time | (0040,0245) | N | Y | X |
| Performed Station AE Title | (0040,0241) | N | N | X |
| Performed Station Geographic Location Code Sequence | (0040,4030) | N | N | X |
| Performed Station Name | (0040,0242) | N | N | X |
| Performed Station Name Code Sequence | (0040, 4028) | N | N | X |
| Performing Physician Identification Sequence | (0008,1052) | N | Y | X |
| Performing Physicians' Name | (0008,1050) | N | Y | X |
| Person Address | (0040,1102) | N | Y | X |
| Person Identification Code Sequence | (0040,1101) | N | Y | D |
| Person Name | (0040,A123) | N | Y | D |
| Person's Telecom Information | (0040,1104) | N | Y | X |
| Person's Telephone Numbers | (0040,1103) | N | Y | X |
| Physician Approving Interpretation | (4008,0114) | Y | N | X |
| Physician(s) Reading Study Identification Sequence | (0008,1062) | N | Y | X |
| Physician(s) of Record | (0008,1048) | N | Y | X |
| Physician(s) of Record Identification Sequence | (0008,1049) | N | Y | X |
| Placer Order Number / Imaging Service Request | (0040,2016) | N | Y | Z |
| Plate ID | (0018,1004) | N | Y | X |
| Pre-Medication | (0040,0012) | N | N | X |
| Pregnancy Status | (0010,21C0) | N | N | X |
| Presentation Display Collection UID | (0070,1101) | N | Y | U |
| Presentation Sequence Collection UID | (0070,1102) | N | Y | U |
| Procedure Step Cancellation DateTime | (0040,4052) | N | N | X |
| *Private attributes* | *(gageites)* | N | N | X |
| Protocol Name | (0018,1030) | N | Y | X/D |
| Reason for Omission Description | (300C,0113) | N | Y | X |
| Reason for the Imaging Service Request | (0040,2001) | Y | N | X |
| Reason for Study | (0032,1030) | Y | N | X |
| Referenced Digital Signature Sequence | (0400,0402) | N | Y | X |
| Referenced Frame of Reference UID | (3006,0024) | N | Y | U |
| Referenced General Purpose Scheduled Procedure Step Transaction UID | (0040,4023) | Y | N | U |
| Referenced Image Sequence | (0008,1140) | N | Y | X/Z/U\* |
| Referenced Observation UID (Trial) | (0040,A172) | Y | N | U |
| Referenced Patient Alias Sequence | (0038, 0004) | N | N | X |
| Referenced Patient Photo Sequence | (0010,1100) | N | Y | X |
| Referenced Patient Sequence | (0008,1120) | N | Y | X |
| Referenced Performed Procedure Step Sequence | (0008,1111) | N | Y | X/Z/D |
| Referenced SOP Instance MAC Sequence | (0400,0403) | N | Y | X |
| Referenced SOP Instance UID | (0008,1155) | N | Y | U |
| Referenced SOP Instance UID in File | (0004,1511) | N | N | U |
| Referenced Study Sequence | (0008,1110) | N | Y | X/Z |
| Referring Physician's Address | (0008,0092) | N | N | X |
| Referring Physician Identification Sequence | (0008,0096) | N | Y | X |
| Referring Physician's Name | (0008,0090) | N | Y | Z |
| Referring Physician's Telephone Numbers | (0008,0094) | N | N | X |
| Region of Residence | (0010,2152) | N | N | X |
| Related Frame of Reference UID | (3006,00C2) | N | Y | U |
| Request Attributes Sequence | (0040,0275) | N | Y | X |
| Requested Contrast Agent | (0032,1070) | N | N | X |
| Requested Procedure Comments | (0040,1400) | N | N | X |
| Requested Procedure Description | (0032,1060) | N | Y | X/Z |
| Requested Procedure ID | (0040,1001) | N | N | X |
| Requested Procedure Location | (0040,1005) | N | N | X |
| Requested SOP Instance UID | (0000,1001) | N | N | U |
| Requesting Physician | (0032,1032) | N | N | X |
| Requesting Service | (0032,1033) | N | N | X |
| Responsible Organization | (0010,2299) | N | Y | X |
| Responsible Person | (0010,2297) | N | Y | X |
| Results Comments | (4008,4000) | Y | N | X |
| Results Distribution List Sequence | (4008,0118) | Y | N | X |
| Results ID Issuer | (4008,0042) | Y | N | X |
| Reviewer Name | (300E,0008) | N | Y | X/Z |
| Scheduled Human Performers Sequence | (0040,4034) | N | N | X |
| Scheduled Patient Institution Residence | (0038,001E) | Y | N | X |
| Scheduled Performing Physician Identification Sequence | (0040,000B) | N | N | X |
| Scheduled Performing Physician Name | (0040,0006) | N | N | X |
| Scheduled Procedure Step End Date | (0040,0004) | N | N | X |
| Scheduled Procedure Step End Time | (0040,0005) | N | N | X |
| Scheduled Procedure Step Description | (0040,0007) | N | Y | X |
| Scheduled Procedure Step Location | (0040,0011) | N | N | X |
| Scheduled Procedure Step Modification DateTime | (0040,4010) | N | N | X |
| Scheduled Procedure Step Start Date | (0040,0002) | N | N | X |
| Scheduled Procedure Step Start DateTime | (0040,4005) | N | N | X |
| Scheduled Procedure Step Start Time | (0040,0003) | N | N | X |
| Scheduled Station AE Title | (0040,0001) | N | N | X |
| Scheduled Station Geographic Location Code Sequence | (0040,4027) | N | N | X |
| Scheduled Station Name | (0040,0010) | N | N | X |
| Scheduled Station Name Code Sequence | (0040,4025) | N | N | X |
| Scheduled Study Location | (0032,1020) | Y | N | X |
| Scheduled Study Location AE Title | (0032,1021) | Y | N | X |
| Series Date | (0008,0021) | N | Y | X/D |
| Series Description | (0008,103E) | N | Y | X |
| Series Instance UID | (0020,000E) | N | Y | U |
| Series Time | (0008,0031) | N | Y | X/D |
| Service Episode Description | (0038,0062) | N | Y | X |
| Service Episode ID | (0038,0060) | N | Y | X |
| Smoking Status | (0010,21A0) | N | N | X |
| SOP Instance UID | (0008,0018) | N | Y | U |
| Source Image Sequence | (0008,2112) | N | Y | X/Z/U\* |
| Source Serial Number | (3008,0105) | N | Y | X |
| Special Needs | (0038,0050) | N | N | X |
| Start Acquisition DateTime | (0018,9516) | N | Y | X/D |
| Station Name | (0008,1010) | N | Y | X/Z/D |
| Storage Media File-set UID | (0088,0140) | N | Y | U |
| Study Comments | (0032,4000) | Y | N | X |
| Study Date | (0008,0020) | N | Y | Z |
| Study Description | (0008,1030) | N | Y | X |
| Study ID | (0020,0010) | N | Y | Z |
| Study ID Issuer | (0032,0012) | Y | N | X |
| Study Instance UID | (0020,000D) | N | Y | U |
| Study Time | (0008,0030) | N | Y | Z |
| Synchronization Frame of Reference UID | (0020,0200) | N | Y | U |
| Target UID | (0018,2042) | N | Y | U |
| Telephone Number (Trial) | (0040,A354) | Y | N | X |
| Template Extension Creator UID | (0040,DB0D) | Y | N | U |
| Template Extension Organization UID | (0040,DB0C) | Y | N | U |
| Text Comments | (4000,4000) | Y | N | X |
| Text String | (2030,0020) | N | N | X |
| Timezone Offset From UTC | (0008,0201) | N | Y | X |
| Topic Author | (0088,0910) | Y | N | X |
| Topic Keywords | (0088,0912) | Y | N | X |
| Topic Subject | (0088,0906) | Y | N | X |
| Topic Title | (0088,0904) | Y | N | X |
| Tracking UID | (0062,0021) | N | Y | U |
| Transaction UID | (0008,1195) | N | N | U |
| UID | (0040,A124) | N | Y | U |
| Verbal Source (Trial) | (0040,A352) | Y | N | X |
| Verbal Source Identifier Code Sequence (Trial) | (0040,A358) | Y | N | X |
| Verifying Observer Identification Code Sequence | (0040,A088) | N | Y | Z |
| Verifying Observer Name | (0040,A075) | N | Y | D |
| Verifying Observer Sequence | (0040,A073) | N | Y | D |
| Verifying Organization | (0040,A027) | N | Y | X |
| Visit Comments | (0038,4000) | N | N | X |

**E.1.2 Re-identifier**

An Application may claim conformance to an Application Level Confidentiality Profile as a re-identifier if it can remove the protection from a protected SOP instance given that the recipient keys required for the decryption of one or more of the Encrypted Content (0400,0520) Attributes within the Encrypted Attributes Sequence (0400,0500) of the SOP instance are available. Removal of protection in this context is defined as the following process:

1. The application shall decrypt, using its recipient key, one instance of the Encrypted Content (0400,0520) Attribute within the Encrypted Attributes Sequence (0400,0500) and decode the resulting block of bytes into a DICOM dataset using the Transfer Syntax specified in the Encrypted Content Transfer Syntax UID (0400,0510). Re-Identifiers claiming conformance to this profile shall can decrypt the Encrypted Content using either AES or Triple-DES in all possible key lengths specified in this profile.

Note

If the application can decode more than one instance of the Encrypted Content (0400,0520) Attribute within the Encrypted Attributes Sequence (0400,0500), it is at the discretion of the application to choose any one of them.

1. The application shall move all Attributes contained in the single item of the Modified Attributes Sequence (0400,0550) of the decoded dataset into the main dataset, replacing "dummy value" Attributes that may be present in the main dataset.

Note

1. Re-identification does not imply a complete reconstruction of the original SOP Instance, since it is not required that all Attributes being protected be part of the Encrypted Attributes Data Set. If the original UIDs are part of the Encrypted Attributes Data Set, they might be usable to gain access to the original, unprotected SOP Instance.
2. The presence of an encrypted data set that cannot be decrypted indicates that some or all the attribute values in the message may not be real (they are dummies). Therefore, the recipient must not assume that any value in the message is diagnostically relevant.
3. The attribute Patient Identity Removed (0012,0062) shall be replaced or added to the dataset with a value of NO and De-Identification Method (0012,0063) and De-Identification Method Code Sequence (0012,0064) shall be removed.

**E.1.3 Conformance Requirements**

The Conformance Statement of an application that claims conformance to an Application Level Confidentiality Profile shall describe:

* which Attributes are removed during protection;
* which Attributes are replaced by dummy values and how the dummy values are generated;
* which Attributes are included in Encrypted Attributes Data Sets for later re-identification, and any pertinent details about how keys are selected for performing the encryption;
* the scope across which the application can ensure referential integrity of replacement values for references such as SOP Instance UID, Frame of Reference UID, etc. if multiple SOP instances are protected (e.g., across multiple Studies, consistent replacement if the same Study processed more than once, etc.);
* which Attributes and Attribute values are inserted during protection of a SOP instance;
* which Transfer Syntaxes are supported for encoding/decoding of the Encrypted Attributes Data Set;
* which Options are supported;
* any additional restrictions (e. g. key sizes for public keys).

**E.2 Basic Application Level Confidentiality Profile**

This profile is intended for use in clinical trials, and other scenarios in which de-identification may be required, such as creation of teaching files, other types of publication, as well as submission of images and associated information to registries, such as oncology or radiation dose registries.

This Basic Application Level Confidentiality Profile defines an extremely conservative approach that removes all information related to:

* the identity and demographic characteristics of the patient
* the identity of any responsible parties or family members
* the identity of any personnel involved in the procedure
* the identity of the organizations involved in ordering or performing the procedure
* additional information that could be used to match instances if given access to the originals, such as UIDs, dates and times
* private attributes

when that information is present in the non-Pixel Data Attributes, including graphics or overlays, as described in [Table E.1-1](#table_E_1_1).

Note

Unless the Clean Pixel Data Option is also specified, this profile does not address information burned-in to the pixels.

The Longitudinal Temporal Information Modified (0028,0303) attribute shall be added to the Dataset with a value of "REMOVED" if none of the Retain Longitudinal Temporal Information Options is applied.

**E.3 Basic Application Level Confidentiality Options**

Various options are defined to be applicable to the Basic Application Level Confidentiality Profile. Some of these options require removal of additional information, and some of these options require retention of information that would otherwise be removed.

The following options are defined that require removal of additional information:

* Clean Pixel Data Option
* Clean Recognizable Visual Features Option
* Clean Graphics Option
* Clean Structured Content Option
* Clean Descriptors Option

The following options are defined that require retention of information that would otherwise be removed but that is needed for specific uses:

* Retain Longitudinal Temporal Information with Full Dates Option
* Retain Longitudinal Temporal Information with Modified Dates Option
* Retain Patient Characteristics Option
* Retain Device Identity Option
* Retain UIDs
* Retain Safe Private Option

**E.3.1 Clean Pixel Data Option**

When this Option is specified in addition to an Application Level Confidentiality Profile, any information burned in to the Pixel Data (7FE0,0010) corresponding to the Attribute information specified to be removed by the Profile and any other Options specified shall also be removed, as described in [Table E.1-1](#table_E_1_1).

This may require intervention of or approval by a human operator.

The Attribute Burned In Annotation (0028,0301) shall be added to the Dataset with a value of "NO".

Note

1. This capability is called out as a specific option, since it may be extremely burdensome in practice to implement and is unnecessary for most modalities that do not burn in such annotation in the first place. For example, CT images do not normally contain such burned in annotation, whereas Ultrasound images routinely do.
2. Though image processing and optical character recognition techniques can be used to detect the presence of and location of burned in text, and matching against known identifying information can be applied, deciding whether that text is identifying information or some other type of information may be non-trivial. Compliance with this option requires that identifying information is removed, regardless of how that is achieved. It is not required that information specified to be retained in the non-pixel data by other Options (e.g., physical characteristics, dates or descriptors) also be retained burned-in to the pixel data. Thus, the most conservative approach of removing all burned in text would be compliant. This may involve sacrificing additional potentially useful information such as localizer posting and manual graphic annotations.
3. The stored pixel values are to be changed (blacked out); it is not sufficient to superimpose an overlay or graphic annotation or shutter to obscure the pixel data values, since those may not be ignored by the receiving system.
4. This option is intended to apply to the Pixel Data (7FE0,0010) Attribute that occurs in the top-level Dataset of an Image Storage SOP Instance. The other standard use of Pixel Data (7FE0,0010) is within Icon Image Sequence (0088,0200), which is already described in [Table E.1-1](#table_E_1_1) and the accompanying note as requiring removal. This option does not require the ability to manually or automatically process the pixel values of Pixel Data (7FE0,0010) occurring in any other location than the top-level dataset, but it does not prohibit it. Pixel Data (7FE0,0010) occurring within private Attributes will be removed because such Attributes will not be known to be safe.

**E.3.2 Clean Recognizable Visual Features Option**

When this Option is specified in addition to an Application Level Confidentiality Profile, if there is sufficient visual information within the Pixel Data of a set of instances to allow an individual to be recognized from the instances themselves or a reconstruction of a set of instances, then sufficient removal or distortion of the Pixel Data shall be applied to prevent recognition.

This may require intervention of or approval by a human operator.

The Attribute Recognizable Visual Features (0028,0302) shall be added to the Dataset with a value of "NO".

Note

1. This capability is called out as a specific option, since it may be extremely burdensome in practice to implement and is unnecessary for most anatomic sites and modalities.
2. In the case of full-face photographs, the risk of visual identification is obvious, and numerous techniques are well established for de-identification, such as applying black rectangles over the eyes, etc.
3. In the case of high-resolution cross-sectional imaging of the entire head and neck, it has been suggested that a 3D volume or surface rendering of the pixel data may be sufficient to allow identification (or matching against a constrained subset of individuals) under some circumstances.
4. Application of this option may render the pixel data unusable for the purpose for which it has been collected, and hence its use may require a compromise between de-identification and utility based on obtaining appropriate ethical approval and informed consent. Consider for example, the case of dental images.
5. Since the Referenced Patient Photo Sequence is removed as part of the Basic Profile, support of the Clean Recognizable Visual Features option does not add requirements for that attribute.

**E.3.3 Clean Graphics Option**

Instances of various Standard and Standard Extended SOP Classes, including Images, Presentation States and other Composite SOP Instances, may contain identification information encoded as graphics, text annotations or overlays. This does not include information contained in Structured Report SOP Classes.

When this Option is specified in addition to an Application Level Confidentiality Profile, any information encoded in graphics, text annotations or overlays corresponding to the Attribute information specified to be removed by the Profile and any other Options specified shall also be removed, as described in [Table E.1-1](#table_E_1_1).

This may require intervention of a human operator.

Note

1. This capability is called out as a specific option, since it may be more practical to simply remove all such graphics, text annotations or overlays (as required by the profile without this option).
2. As with burned-in pixel data annotation, deciding whether text is identifying information or some other type of information may be non-trivial. It is not required that information specified to be retained in the non-pixel data by other Options (e.g., physical characteristics, dates or descriptors) also be retained in graphics, text annotations or overlays.

**Table E.3.3-1: Clean Graphics Option**

| **Attribute** | **Tag** | **Ret** | **Basic** | **Clean Graphics** |
| --- | --- | --- | --- | --- |
| Curve Data | (50xx,xxxx) | Y | X | C |
| Graphic Annotation Sequence | (0070,0001) | N | D | C |
| Overlay Comments | (60xx,4000) | Y | X | C |
| Overlay Data | (60xx,3000) | N | X | C |

**E.3.4 Clean Structured Content Option**

Instances of Structured Report SOP Classes may contain identifiable information in a Content Sequence (0040,A730) encoded in Content Items. Instances of other SOP Classes may contain structured content encoded in a similar manner in the Acquisition Context Sequence (0040,0555) or Specimen Preparation Sequence (0040,0610).

When this Option is specified in addition to an Application Level Confidentiality Profile, any information encoded in SR Content Items or Acquisition Context or Specimen Preparation Sequence Items corresponding to the Attribute information specified to be removed by the Profile and any other Options specified shall also be removed.

Note

1. For example, the "observer" responsible for a diagnostic imaging report may be explicitly identified in Observation Content contained Content Items in an SR.
2. A de-identifier that does not implement this option creates significant risk when attempting to de-identity a Structured Report unless it is only used to de-identify instances that are known to have no identifying information in the Content Sequence.

**Table E.3.4-1: Clean Structured Content Option**

| **Attribute** | **Tag** | **Ret** | **Basic** | **CS** |
| --- | --- | --- | --- | --- |
| Acquisition Context Sequence | (0040,0555) | N | X | C |
| Content Sequence | (0040,A730) | N | X | C |

**E.3.5 Clean Descriptors Option**

Even though many Attributes are defined in the DICOM Standard for specific purposes, such as to describe a Study or a Series, those that contain plain text over which an operator has control may contain unstructured information that includes identities.

When this Option is specified in addition to an Application Level Confidentiality Profile, any information that is embedded in text or string Attributes corresponding to the Attribute information specified to be removed by the Profile and any other Options specified shall also be removed, as described in [Table E.3.5-1](#table_E_1_1).

Note

1. For example, an operator may include a person's name or a patient's demographics or physical characteristics in the Study Description (0008,1030), perhaps because their modality user interface does not provide other fields or because other systems do not display them. E.g., the description might contain "CT chest abdomen pelvis - 55F Dr. Smith".
2. One approach to cleaning such text strings without human intervention is to extract and retain only values known to be useful and safe and discard all others. For example, in the string "CT chest abdomen pelvis - 55F Dr. Smith" are found in Study Description (0008,1030), then it would be feasible to detect and retain "CT chest abdomen pelvis" and discard the remainder. In an international setting, this may require an extensive dictionary of words that are safe to retain, e.g., to detect "Buik" for abdomen in Dutch or "λεκάνη" for pelvis in Greek. Another possibility is to extract such information and attempt to code the information in other Attributes (if otherwise absent or empty) such as Anatomic Region Sequence (0008,2218). However, the possibility of string values being both identifying and descriptive in different uses needs to be considered, e.g., "Dr. Hand" or "M. Genou".

1. [Table E.1-1](#table_E_1_1) calls out specific Attributes known to be at risk, but an implementer may want to consider any attribute that could potential contain character data, though this Option does not require that this be done. For example, all SH, LO, ST, LT and UT Value Representations could perhaps be misused. Code strings, CS, are not generally at risk, but a check against known Defined Terms and Enumerated Values could be performed. Though extremely unusual, it is conceivable that even a DS or IS string could be misused, and a check could be made that only legal numeric characters were used. Any PN Attribute is obviously at risk. The OB VR is discussed in the Retain Safe Private Option.
2. This Option specifies what needs to be removed, not what needs to be retained. Depending on the application, it may be desirable to retain some information, such as technique description, but discard other information, such as diagnosis, for example because it may bias the interpretation in a clinical trial. For example, one approach is to remove all description and comment attributes except Series Description (0008,103E), since this Attribute rarely contains identifying or diagnosis information yet is typically a reliable source of useful information about the acquisition technique populated automatically from modality device protocols, though it still could be cleaned as described in Note 2.
3. It should be recognized that if any descriptor contains information about a particularly unusual procedure or condition, then in conjunction with other demographic information it might reduce the number of possible individuals that could be the imaging subject. However, this is to some extent true also if the condition or other unusual physical features are obvious from visual examination of the images themselves. For example, how many conjoined twins born in a month in Philadelphia might there be?

The manner of cleaning shall be described in the Conformance Statement.

**Table E.3.5-1: Clean Descriptors Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **CD** |
| --- | --- | --- | --- | --- | --- |
| Acquisition Comments | (0018,4000) | Y | N | X | C |
| Acquisition Device Processing Description | (0018,1400) | N | Y | X/D | C |
| Acquisition Protocol Description | (0018,9424) | N | Y | X | C |
| Additional Patient's History | (0010,21B0) | N | Y | X | C |
| Admitting Diagnoses Code Sequence | (0008,1084) | N | Y | X | C |
| Admitting Diagnoses Description | (0008,1080) | N | Y | X | C |
| Allergies | (0010,2110) | N | N | X | C |
| Comments on the Performed Procedure Step | (0040,0280) | N | Y | X | C |
| Contrast Bolus Agent | (0018,0010) | N | Y | Z/D | C |
| Contribution Description | (0018,A003) | N | Y | X | C |
| Derivation Description | (0008,2111) | N | Y | X | C |
| Discharge Diagnosis Description | (0038,0040) | Y | N | X | C |
| Frame Comments | (0020,9158) | N | Y | X | C |
| Identifying Comments | (0008,4000) | Y | N | X | C |
| Image Comments | (0020,4000) | N | Y | X | C |
| Imaging Service Request Comments | (0040,2400) | N | N | X | C |
| Impressions | (4008,0300) | Y | N | X | C |
| Interpretation Diagnosis Description | (4008,0115) | Y | N | X | C |
| Interpretation Text | (4008,010B) | Y | N | X | C |
| Medical Alerts | (0010,2000) | N | N | X | C |
| Occupation | (0010,2180) | N | Y | X | C |
| Patient Comments | (0010,4000) | N | Y | X | C |
| Patient State | (0038,0500) | N | N | X | C |
| Performed Procedure Step Description | (0040,0254) | N | Y | X | C |
| Protocol Name | (0018,1030) | N | Y | X/D | C |
| Reason for Omission Description | (300C,0113) | N | Y | X | C |
| Reason for the Imaging Service Request | (0040,2001) | Y | N | X | C |
| Reason for Study | (0032,1030) | Y | N | X | C |
| Request Attributes Sequence | (0040,0275) | N | Y | X | C |
| Requested Contrast Agent | (0032,1070) | N | N | X | C |
| Requested Procedure Comments | (0040,1400) | N | N | X | C |
| Requested Procedure Description | (0032,1060) | N | Y | X/Z | C |
| Results Comments | (4008,4000) | Y | N | X | C |
| Scheduled Procedure Step Description | (0040,0007) | N | Y | X | C |
| Series Description | (0008,103E) | N | Y | X | C |
| Service Episode Description | (0038,0062) | N | Y | X | C |
| Study Comments | (0032,4000) | Y | N | X | C |
| Study Description | (0008,1030) | N | Y | X | C |
| Visit Comments | (0038,4000) | N | N | X | C |

**E.3.6 Retain Longitudinal Temporal Information Options**

Dates and times are recognized as having a potential for leakage of identity because they constrain the number of possible individuals that could be the imaging subject, though only if there is access to other information about the individuals concerned to match it against.

However, there are applications that require dates and times to be present to able to fulfill the objective. This is particularly true in therapeutic clinical trials in which the objective is to measure change in an outcome measure over time. Further, it is often necessary to correlate information from images with information from other sources, such as clinical and laboratory data, and dates and times need to be consistent.

Two options are specified to address these requirements:

* Retain Longitudinal Temporal Information with Full Dates Option
* Retain Longitudinal Temporal Information with Modified Dates Option

When the Retain Longitudinal Temporal Information with Full Dates Option is specified in addition to an Application Level Confidentiality Profile, any dates and times present in the Attributes shall be retained, as described in [Table E.3.6-11](#table_E_1_1). The Attribute Longitudinal Temporal Information Modified (0028,0303) shall be added to the Dataset with a value of "UNMODIFIED".

**Table E.3.6-1: Retain Longitudinal Temporal with Full Dates Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **RFD** |
| --- | --- | --- | --- | --- | --- |
| Acquisition Date | (0008,0022) | N | Y | X/Z | K |
| Acquisition DateTime | (0008,002A) | N | Y | X/D | K |
| Acquisition Time | (0008,0032) | N | Y | X/Z | K |
| Admitting Date | (0038,0020) | N | N | X | K |
| Admitting Time | (0038,0021) | N | N | X | K |
| Content Date | (0008,0023) | N | Y | Z/D | K |
| Content Time | (0008,0033) | N | Y | Z/D | K |
| Curve Date | (0008,0025) | Y | Y | X | K |
| Curve Time | (0008,0035) | Y | Y | X | K |
| End Acquisition DateTime | (0018,9517) | N | Y | X/D | K |
| Expected Completion DateTime | (0040,4011) | N | N | X | K |
| Instance Coercion DateTime | (0008,0015) | N | Y | X | K |
| Last Menstrual Date | (0010,21D0) | N | N | X | K |
| Observation Date (Trial) | (0040,A192) | Y | N | X | K |
| Observation Time (Trial) | (0040,A193) | Y | N | X | K |
| Overlay Date | (0008,0024) | Y | Y | X | K |
| Overlay Time | (0008,0034) | Y | Y | X | K |
| Performed Procedure Step End Date | (0040,0250) | N | Y | X | K |
| Performed Procedure Step End DateTime | (0040,4051) | N | N | X | K |
| Performed Procedure Step End Time | (0040,0251) | N | Y | X | K |
| Performed Procedure Step Start Date | (0040,0244) | N | Y | X | K |
| Performed Procedure Step Start DateTime | (0040,4050) | N | N | X | K |
| Performed Procedure Step Start Time | (0040,0245) | N | Y | X | K |
| Procedure Step Cancellation DateTime | (0040,4052) | N | N | X | K |
| Scheduled Procedure Step End Date | (0040,0004) | N | N | X | K |
| Scheduled Procedure Step End Time | (0040,0005) | N | N | X | K |
| Scheduled Procedure Step Modification DateTime | (0040,4010) | N | N | X | K |
| Scheduled Procedure Step Start Date | (0040,0002) | N | N | X | K |
| Scheduled Procedure Step Start DateTime | (0040,4005) | N | N | X | K |
| Scheduled Procedure Step Start Time | (0040,0003) | N | N | X | K |
| Series Date | (0008,0021) | N | Y | X/D | K |
| Series Time | (0008,0031) | N | Y | X/D | K |
| Start Acquisition DateTime | (0018,9516) | N | Y | X/D | K |
| Study Date | (0008,0020) | N | Y | Z | K |
| Study Time | (0008,0030) | N | Y | Z | K |
| Time zone Offset From UTC | (0008,0201) | N | Y | X | K |

When the Retain Longitudinal Temporal Information with Modified Dates Option is specified in addition to an Application Level Confidentiality Profile, any dates and times present in the Attributes listed in [Table E.3.6-](#table_E_1_1)2 shall be modified. The modification of the dates and times shall be performed in a manner that:

* aggregates or transforms dates to reduce the possibility of matching for re-identification
* preserves the gross longitudinal temporal relationships between images obtained on different dates to the extent necessary for the application
* preserves the fine temporal relationships between images and real-world events to the extent necessary for analysis of the images for the application

The Attribute Longitudinal Temporal Information Modified (0028,0303) shall be added to the Dataset with a value of "MODIFIED".

Note

1. Aggregation of dates may be performed by various means such as setting all dates to the first day of the month, all months to the first month of the year, etc., depending on the precision required for the application.
2. It is possible to modify all dates and times to dummy values by shifting them relative to an arbitrary epoch, and hence retain the precise longitudinal temporal relationships amongst a set of studies, when either de-identification of the entire set is performed at the same time, or some sort of mapping or database is kept for repeating this process on separate occasions.
3. Transformation of dates and times should be considered together, to address studies that span midnight.
4. Any transformation of times should be performed in such a manner as to not disrupt computations needed for analysis, such as comparison of start of injection time to the acquisition time for PET SUV, or extraction of time-intensity values from dynamic contrast enhanced studies.

The manner of date modification shall be described in the Conformance Statement.

**Table E.3.6-2: Retain Longitudinal Temporal with Modified Dates Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **RMD** |
| --- | --- | --- | --- | --- | --- |
| Acquisition Date | (0008,0022) | N | Y | X/Z | C |
| Acquisition DateTime | (0008,002A) | N | Y | X/D | C |
| Acquisition Time | (0008,0032) | N | Y | X/Z | C |
| Admitting Date | (0038,0020) | N | N | X | C |
| Admitting Time | (0038,0021) | N | N | X | C |
| Content Date | (0008,0023) | N | Y | Z/D | C |
| Content Time | (0008,0033) | N | Y | Z/D | C |
| Curve Date | (0008,0025) | Y | Y | X | C |
| Curve Time | (0008,0035) | Y | Y | X | C |
| End Acquisition DateTime | (0018,9517) | N | Y | X/D | C |
| Expected Completion DateTime | (0040,4011) | N | N | X | C |
| Instance Coercion DateTime | (0008,0015) | N | Y | X | C |
| Last Menstrual Date | (0010,21D0) | N | N | X | C |
| Observation Date (Trial) | (0040,A192) | Y | N | X | C |
| Observation Time (Trial) | (0040,A193) | Y | N | X | C |
| Overlay Date | (0008,0024) | Y | Y | X | C |
| Overlay Time | (0008,0034) | Y | Y | X | C |
| Performed Procedure Step End Date | (0040,0250) | N | Y | X | C |
| Performed Procedure Step End DateTime | (0040,4051) | N | N | X | C |
| Performed Procedure Step End Time | (0040,0251) | N | Y | X | C |
| Performed Procedure Step Start Date | (0040,0244) | N | Y | X | C |
| Performed Procedure Step Start DateTime | (0040,4050) | N | N | X | C |
| Performed Procedure Step Start Time | (0040,0245) | N | Y | X | C |
| Procedure Step Cancellation DateTime | (0040,4052) | N | N | X | C |
| Scheduled Procedure Step End Date | (0040,0004) | N | N | X | C |
| Scheduled Procedure Step End Time | (0040,0005) | N | N | X | C |
| Scheduled Procedure Step Modification DateTime | (0040,4010) | N | N | X | C |
| Scheduled Procedure Step Start Date | (0040,0002) | N | N | X | C |
| Scheduled Procedure Step Start DateTime | (0040,4005) | N | N | X | C |
| Scheduled Procedure Step Start Time | (0040,0003) | N | N | X | C |
| Series Date | (0008,0021) | N | Y | X/D | C |
| Series Time | (0008,0031) | N | Y | X/D | C |
| Start Acquisition DateTime | (0018,9516) | N | Y | X/D | C |
| Study Date | (0008,0020) | N | Y | Z | C |
| Study Time | (0008,0030) | N | Y | Z | C |
| Timezone Offset From UTC | (0008,0201) | N | Y | X | C |

**E.3.7 Retain Patient Characteristics Option**

Physical characteristics of the patient, which are descriptive rather than identifying information per se, are recognized as having a potential for leakage of identity because they constrain the number of possible individuals that could be the imaging subject, though only if there is access to other information about the individuals concerned to match it against.

However, there are applications that require such physical characteristics to perform the computations necessary to analyze the images to fulfill the objective. One such class of applications is those that are related to metabolic measures, such as computation of PET Standard Uptake Values (SUV) or DEXA or MRI measures of body composition, which are based on body weight, body surface area or lean body mass.

When this Option is specified in addition to an Application Level Confidentiality Profile, information about age, sex, height and weight and other characteristics present in the Attributes shall be retained, as described in [Table E.3.7-1](#table_E_1_1).

The manner of cleaning of retained attributes shall be described in the Conformance Statement.

**Table E.3.7-1: Retain Patient Characteristics Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **RP** |
| --- | --- | --- | --- | --- | --- |
| Allergies | (0010,2110) | N | N | X | C |
| Ethnic Group | (0010,2160) | N | Y | X | K |
| Patient Sex Neutered | (0010,2203) | N | Y | X/Z | K |
| Patient State | (0038,0500) | N | N | X | C |
| Patient's Age | (0010,1010) | N | Y | X | K |
| Patient's Sex | (0010,0040) | N | Y | Z | K |
| Patient's Size | (0010,1020) | N | Y | X | K |
| Patient's Weight | (0010,1030) | N | Y | X | K |
| Pre-Medication | (0040,0012) | N | N | X | C |
| Pregnancy Status | (0010,21C0) | N | N | X | K |
| Smoking Status | (0010,21A0) | N | N | X | K |
| Special Needs | (0038,0050) | N | N | X | C |

**E.3.8 Retain Device Identity Option**

Information about the identity of the device that was used to perform the acquisition is recognized as having a potential for leakage of identity because it may constrain the number of possible individuals that could be the imaging subject, though only if there is access to other information about the individuals concerned to match it against.

However, there are applications that require such device information to perform the analysis or interpretation. The type of correction for spatial or other inhomogeneity may require knowledge of the specific device serial number. Confirmation that specific devices that have been previously qualified (e.g., with phantoms) may be required. Further, there may be a need to maintain a record of the device used for regulatory or registry purposes, yet the acquisition site may not maintain an adequate electronic audit trail.

When this Option is specified in addition to an Application Level Confidentiality Profile, information about the identity of the device in the Attributes shall be retained, as described in [Table E.3.8-1](#table_E_1_1).

**Table E.3.8-1: Retain Device Identity Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **RD** |
| --- | --- | --- | --- | --- | --- |
| Cassette ID | (0018,1007) | N | Y | X | K |
| Detector ID | (0018,700A) | N | Y | X/D | K |
| Device Serial Number | (0018,1000) | N | Y | X/Z/D | K |
| Device UID | (0018,1002) | N | Y | U | K |
| Gantry ID | (0018,1008) | N | Y | X | K |
| Generator ID | (0018,1005) | N | Y | X | K |
| Performed Station AE Title | (0040,0241) | N | N | X | K |
| Performed Station Geographic Location Code Sequence | (0040,4030) | N | N | X | K |
| Performed Station Name | (0040,0242) | N | N | X | K |
| Performed Station Name Code Sequence | (0040, 4028) | N | N | X | K |
| Plate ID | (0018,1004) | N | Y | X | K |
| Scheduled Procedure Step Location | (0040,0011) | N | N | X | K |
| Scheduled Station AE Title | (0040,0001) | N | N | X | K |
| Scheduled Station Geographic Location Code Sequence | (0040,4027) | N | N | X | K |
| Scheduled Station Name | (0040,0010) | N | N | X | K |
| Scheduled Station Name Code Sequence | (0040,4025) | N | N | X | K |
| Scheduled Study Location | (0032,1020) | Y | N | X | K |
| Scheduled Study Location AE Title | (0032,1021) | Y | N | X | K |
| Source Serial Number | (3008,0105) | N | Y | X | K |
| Station Name | (0008,1010) | N | Y | X/Z/D | K |

**E.3.9 Retain UIDs Option**

Though individuals do not have unique identifiers themselves, studies, series, instances and other entities in the DICOM model are assigned globally unique UIDs. Whilst these UIDs cannot be mapped directly to an individual out of context, given access to the original images, or to a database of the original images containing the UIDs, it would be possible to recover the individual's identity.

However, there are applications that require the ability to maintain an audit trail back to the original images and though there are other mechanisms they may not scale well or be reliably implemented. This Option is provided for use when it is judged that the risk of gaining access to the original information via the UIDs is small relative to the benefit of retaining them.

When this Option is specified in addition to an Application Level Confidentiality Profile, UIDs shall be retained, as described in [Table E.1-1](#table_E_1_1).

Note

1. A UID of a DICOM entity is not the same as a unique identifier of an individual, such as would be proscribed by some privacy regulations.
2. UIDs are generated using a hierarchical scheme of "roots", which may be traceable by a knowledgeable person back to the original assignee of the root, typically the device manufacturer, but sometimes the organization using the device.
3. When evaluating the risk of matching UIDs with the original images or PACS database, one should consider that even if the UIDs are changed, the pixel data itself presents a similar risk. Specifically, the pixel data of the de-identified image can be matched against the pixel data of the original image. Such matching can be greatly accelerated by comparing pre-computed hash values of the pixel data. Removal of burned-in identification may change the pixel data but then matching against a sub-region of the pixel data is almost certainly possible (e.g., the central region of an image). Even addition of noise to an image is not sufficient to prevent re-identification since statistical matching techniques can be used. Ultimately, if any useable pixel data is retained during de-identification, then re-identification is nearly always possible if one has access to the original images. Ergo, replacement of UIDs should not give rise to a false confidence that the images have been more thoroughly de-identified than if the UIDs are retained.
4. Regardless of this option, implementers should take care not to remove UIDs that are structural and defined by the standard as opposed to those that are instance-related. E.g., one would never remove or replace the SOP Class UID for de-identification purposes.
5. The Implementation Class UID (0002,0012) is not included in the list of UID attributes to be retained, since it is part of the File Meta Information (see [PS3.10](part10.pdf#PS3.10)), which is entirely replaced whenever a file is stored or modified during de-identification. See [Section E.3.9-1](#sect_E_1_1).

**Table E.3.9-1: Retain UIDs Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **RUI** |
| --- | --- | --- | --- | --- | --- |
| Affected SOP Instance UID | (0000,1000) | N | N | X | K |
| Concatenation UID | (0020,9161) | N | Y | U | K |
| Device UID | (0018,1002) | N | Y | U | K |
| Dimension Organization UID | (0020,9164) | N | Y | U | K |
| Dose Reference UID | (300A,0013) | N | Y | U | K |
| Failed SOP Instance UID List | (0008,0058) | N | N | U | K |
| Fiducial UID | (0070,031A) | N | Y | U | K |
| Frame of Reference UID | (0020,0052) | N | Y | U | K |
| Instance Creator UID | (0008,0014) | N | Y | U | K |
| Interpretation Diagnosis Description | (4008,0115) | Y | N | X |  |
| Interpretation Text | (4008,010B) | Y | N | X |  |
| Irradiation Event UID | (0008,3010) | N | Y | U | K |
| Large Palette Color Lookup Table UID | (0028,1214) | Y | N | U | K |
| Last Menstrual Date | (0010,21D0) | N | N | X |  |
| Media Storage SOP Instance UID | (0002,0003) | N | N | U | K |
| Observation Subject UID (Trial) | (0040,A402) | Y | N | U | K |
| Observation UID | (0040,A171) | N | Y | U | K |
| Palette Color Lookup Table UID | (0028,1199) | N | Y | U | K |
| Presentation Display Collection UID | (0070,1101) | N | Y | U | K |
| Presentation Sequence Collection UID | (0070,1102) | N | Y | U | K |
| Referenced Frame of Reference UID | (3006,0024) | N | Y | U | K |
| Referenced General Purpose Scheduled Procedure Step Transaction UID | (0040,4023) | Y | N | U | K |
| Referenced Image Sequence | (0008,1140) | N | Y | X/Z/U\* | K |
| Referenced Observation UID (Trial) | (0040,A172) | Y | N | U | K |
| Referenced Patient Sequence | (0008,1120) | N | Y | X | X |
| Referenced Performed Procedure Step Sequence | (0008,1111) | N | Y | X/Z/D | K |
| Referenced SOP Instance UID | (0008,1155) | N | Y | U | K |
| Referenced SOP Instance UID in File | (0004,1511) | N | N | U | K |
| Referenced Study Sequence | (0008,1110) | N | Y | X/Z | K |
| Related Frame of Reference UID | (3006,00C2) | N | Y | U | K |
| Requested SOP Instance UID | (0000,1001) | N | N | U | K |
| Series Instance UID | (0020,000E) | N | Y | U | K |
| SOP Instance UID | (0008,0018) | N | Y | U | K |
| Source Image Sequence | (0008,2112) | N | Y | X/Z/U\* | K |
| Storage Media File-set UID | (0088,0140) | N | Y | U | K |
| Study Instance UID | (0020,000D) | N | Y | U | K |
| Synchronization Frame of Reference UID | (0020,0200) | N | Y | U | K |
| Target UID | (0018,2042) | N | Y | U | K |
| Template Extension Creator UID | (0040,DB0D) | Y | N | U | K |
| Template Extension Organization UID | (0040,DB0C) | Y | N | U | K |
| Tracking UID | (0062,0021) | N | Y | U | K |
| Transaction UID | (0008,1195) | N | N | U | K |

**E.3.10 Retain Safe Private Option**

Private Attributes contain proprietary information, in many cases the nature of which is known only to the vendor and not publicly documented.

**Table E.3.10-1: Retain Safe Private Option**

| **Attribute** | **Tag** | **Ret** | **IOD** | **Basic** | **RSP** |
| --- | --- | --- | --- | --- | --- |
| *Private attributes* | *(gggg,eeee)* | N | N | X | C |

However, some Private Attributes may be necessary for the desired application. For example, specific technique information such as CT helical span pitch, or pixel value transformation, such as PET SUV rescale factors, may only be available in Private Attributes since the information is either not defined in Standard Attributes, or was added to the DICOM Standard after the acquisition device was manufactured.

When this Option is specified in addition to an Application Level Confidentiality Profile, Private Attributes that are known by the de-identifier to be safe from identity leakage shall be retained, together with the Private Creator IDs that are required to fully define the retained Private Attributes; all other Private Attributes shall be removed or processed in the element-specific manner recommended by Deidentification Action (0008,0307), if present within Private Data Element Characteristics Sequence (0008,0300) (see [PS3.3 Section C.12.1](part03.pdf#sect_C.12.1)).

Whether an Attribute is known to be safe may be determined by:

* its presence in a block of Private Data Elements with a value of "SAFE" in Block Identifying Information Status (0008,0303) or individually listed in Nonidentifying Private Elements (gggg,0004) (within Private Data Element Characteristics Sequence (0008,0300); see [PS3.3 Section C.12.1](part03.pdf#sect_C.12.1))
* its presence in [Table E.3.10-1 Safe Private Attributes](#table_E_3_10_1)
* documentation in the Conformance Statement
* some other means.

When this Option is not specified, all Private Attributes shall be removed, as described in [Table E.1-1](#table_E_1_1).

Note

1. A sample list of Private Attributes thought to be safe is provided here. Vendors do not guarantee them to be safe, and do not commit to sending them in any software version (including future products).
2. One approach to retaining Private Attributes safely, either when the VR is encoded explicitly or known from a data dictionary (such as may be derived from published DICOM Conformance Statements or previously encountered instances, perhaps by adaptively extending the data dictionary as new explicit VR instances are received), is to retain those Attributes that are numeric only. For example, one might retain US, SS, UL, SS, FL and FD binary values, and IS and DS string values that contain only valid numeric characters. One might assume that other string Value Representations are unsafe in the absence of definite confirmation from the vendor to the contrary; code strings (CS) may be an exception. Bulk binary data in OB Value representations is particularly unsafe, and may often contain entire proprietary format headers in binary or text or XML form that includes the patient's name and other identifying information.

The safe private attributes that are retained shall be described in the Conformance Statement.

Table E.3.10-2: Safe Private Attributes

| **Tag** | **Private Creator** | **VR** | **VM** | **Meaning** |
| --- | --- | --- | --- | --- |
| (7053,xx00) | Philips PET Private Group | DS | 1 | SUV Factor - Multiplying stored pixel values by Rescale Slope then this factor results in SUVbw in g/l |
| (7053,xx09) | Philips PET Private Group | DS | 1 | Activity Concentration Factor - Multiplying stored pixel values by Rescale Slope then this factor results in MBq/ml. |
| (00E1,xx21) | ELSCINT1 | DS | 1 | DLP |
| (01E1,xx26) | ELSCINT1 | CS | 1 | Phantom Type |
| (01E1,xx50) | ELSCINT1 | DS | 1 | Acquisition Duration |
| (01F1,xx01) | ELSCINT1 | CS | 1 | Acquisition Type |
| (01F1,xx07) | ELSCINT1 | DS | 1 | Table Velocity |
| (01F1,xx26) | ELSCINT1 | DS | 1 | Pitch |
| (01F1,xx27) | ELSCINT1 | DS | 1 | Rotation Time |
| (0019,xx23) | GEMS\_ACQU\_01 | DS | 1 | Table Speed [mm/rotation] |
| (0019,xx24) | GEMS\_ACQU\_01 | DS | 1 | Mid Scan Time [sec] |
| (0019,xx27) | GEMS\_ACQU\_01 | DS | 1 | Rotation Speed (Gantry Period) |
| (0019,xx9E) | GEMS\_ACQU\_01 | LO | 1 | Internal Pulse Sequence Name |
| (0043,xx27) | GEMS\_PARM\_01 | SH | 1 | Scan Pitch Ratio in the form "n.nnn:1" |
| (0045,xx01) | GEMS\_HELIOS\_01 | SS | 1 | Number of Macro Rows in Detector |
| (0045,xx02) | GEMS\_HELIOS\_01 | FL | 1 | Macro width at ISO Center |
| (0903,xx10) | GEIIS PACS | US | 1 | Reject Image Flag |
| (0903,xx11) | GEIIS PACS | US | 1 | Significant Flag |
| (0903,xx12) | GEIIS PACS | US | 1 | Confidential Flag |
| (2001,xx03) | Philips Imaging DD 001 | FL | 1 | Diffusion B-Factor |
| (2001,xx04) | Philips Imaging DD 001 | CS | 1 | Diffusion Direction |
| (0019,xx0C) | SIEMENS MR HEADER | IS | 1 | B Value |
| (0019,xx0D) | SIEMENS MR HEADER | CS | 1 | Diffusion Directionality |
| (0019,xx0E) | SIEMENS MR HEADER | FD | 3 | Diffusion Gradient Direction |
| (0019,xx27) | SIEMENS MR HEADER | FD | 6 | B Matrix |
| (0043,xx39) | GEMS\_PARM\_01 | IS | 4 | 1stvalue is B Value |
| (0043,xx6F) | GEMS\_PARM\_01 | DS | 3-4 | Scanner Table Entry + Gradient Coil Selected |
| (0025,xx07) | GEMS\_SERS\_01 | SL | 1 | Images in Series |
| (7E01,xx01) | HOLOGIC, Inc. | LO | 1 | Codec Version |
| (7E01,xx02) | HOLOGIC, Inc. | SH | 1 | Codec Content Type |
| (7E01,xx10) | HOLOGIC, Inc. | SQ | 1 | High Resolution Data Sequence |
| (7E01,xx11) | HOLOGIC, Inc. | SQ | 1 | Low Resolution Data Sequence |
| (7E01,xx12) | HOLOGIC, Inc. | OB | 1 | Codec Content |
| (0099,xx01) | NQHeader | UI | 1 | Version |
| (0099,xx02) | NQHeader | UI | 1 | Analyzed Series UID |
| (0099,xx04) | NQHeader | SS | 1 | Return Code |
| (0099,xx05) | NQHeader | LT | 1 | Return Message |
| (0099,xx10) | NQHeader | FL | 1 | MI |
| (0099,xx20) | NQHeader | SH | 1 | Units |
| (0099,xx21) | NQHeader | FL | 1 | ICV |
| (0199,xx01) | NQLeft | FL | 1 | Left Cortical White Matter |
| (0199,xx02) | NQLeft | FL | 1 | Left Cortical Gray Matter |
| (0199,xx03) | NQLeft | FL | 1 | Left 3rd Ventricle |
| (0199,xx04) | NQLeft | FL | 1 | Left 4th Ventricle |
| (0199,xx05) | NQLeft | FL | 1 | Left 5th Ventricle |
| (0199,xx06) | NQLeft | FL | 1 | Left Lateral Ventricle |
| (0199,xx07) | NQLeft | FL | 1 | Left Inferior Lateral Ventricle |
| (0199,xx08) | NQLeft | FL | 1 | Left Inferior CSF |
| (0199,xx09) | NQLeft | FL | 1 | Left Cerebellar White Matter |
| (0199,xx0a) | NQLeft | FL | 1 | Left Cerebellar Gray Matter |
| (0199,xx0b) | NQLeft | FL | 1 | Left Hippocampus |
| (0199,xx0c) | NQLeft | FL | 1 | Left Amygdala |
| (0199,xx0d) | NQLeft | FL | 1 | Left Thalamus |
| (0199,xx0e) | NQLeft | FL | 1 | Left Caudate |
| (0199,xx0f) | NQLeft | FL | 1 | Left Putamen |
| (0199,xx10) | NQLeft | FL | 1 | Left Pallidum |
| (0199,xx11) | NQLeft | FL | 1 | Left Ventral Diencephalon |
| (0199,xx12) | NQLeft | FL | 1 | Left Nucleus Accumbens |
| (0199,xx13) | NQLeft | FL | 1 | Left Brain Stem |
| (0199,xx14) | NQLeft | FL | 1 | Left Exterior CSF |
| (0199,xx15) | NQLeft | FL | 1 | Left WM Hypo |
| (0199,xx16) | NQLeft | FL | 1 | Left Other |
| (0299,xx01) | NQRight | FL | 1 | Right Cortical White Matter |
| (0299,xx02) | NQRight | FL | 1 | Right Cortical Gray Matter |
| (0299,xx03) | NQRight | FL | 1 | Right 3rd Ventricle |
| (0299,xx04) | NQRight | FL | 1 | Right 4th Ventricle |
| (0299,xx05) | NQRight | FL | 1 | Right 5th Ventricle |
| (0299,xx06) | NQRight | FL | 1 | Right Lateral Ventricle |
| (0299,xx07) | NQRight | FL | 1 | Right Inferior Lateral Ventricle |
| (0299,xx08) | NQRight | FL | 1 | Right Inferior CSF |
| (0299,xx09) | NQRight | FL | 1 | Right Cerebellar White Matter |
| (0299,xx0a) | NQRight | FL | 1 | Right Cerebellar Gray Matter |
| (0299,xx0b) | NQRight | FL | 1 | Right Hippocampus |
| (0299,xx0c) | NQRight | FL | 1 | Right Amygdala |
| (0299,xx0d) | NQRight | FL | 1 | Right Thalamus |
| (0299,xx0e) | NQRight | FL | 1 | Right Caudate |
| (0299,xx0f) | NQRight | FL | 1 | Right Putamen |
| (0299,xx10) | NQRight | FL | 1 | Right Pallidum |
| (0299,xx11) | NQRight | FL | 1 | Right Ventral Diencephalon |
| (0299,xx12) | NQRight | FL | 1 | Right Nucleus Accumbens |
| (0299,xx13) | NQRight | FL | 1 | Right Brain Stem |
| (0299,xx14) | NQRight | FL | 1 | Right Exterior CSF |
| (0299,xx15) | NQRight | FL | 1 | Right WM Hypo |
| (0299,xx16) | NQRight | FL | 1 | Right Other |
| (2005,xx0D) | Philips MR Imaging DD 001 | FL | 1 | Scale Intercept |
| (2005,xx0E) | Philips MR Imaging DD 001 | FL | 1 | Scale Slope |
| (0119,xx00) | SIEMENS Ultrasound SC2000 | LO | 1 | Acoustic Meta Information Version |
| (0119,xx01) | SIEMENS Ultrasound SC2000 | OB | 1 | Common Acoustic Meta Information |
| (0119,xx02) | SIEMENS Ultrasound SC2000 | SQ | 1 | Multi Stream Sequence |
| (0119,xx03) | SIEMENS Ultrasound SC2000 | SQ | 1 | Acoustic Data Sequence |
| (0119,xx04) | SIEMENS Ultrasound SC2000 | OB | 1 | Per Transaction Acoustic Control Information |
| (0119,xx05) | SIEMENS Ultrasound SC2000 | UL | 1 | Acoustic Data Offset |
| (0119,xx06) | SIEMENS Ultrasound SC2000 | UL | 1 | Acoustic Data Length |
| (0119,xx07) | SIEMENS Ultrasound SC2000 | UL | 1 | Footer Offset |
| (0119,xx08) | SIEMENS Ultrasound SC2000 | UL | 1 | Footer Length |
| (0119,xx09) | SIEMENS Ultrasound SC2000 | SS | 1 | Acoustic Stream Number |
| (0119,xx10) | SIEMENS Ultrasound SC2000 | SH | 1 | Acoustic Stream Type |
| (0119,xx11) | SIEMENS Ultrasound SC2000 |  | 1 | Stage Timer Time |
| (0119,xx12) | SIEMENS Ultrasound SC2000 |  | 1 | Stop Watch Time |
| (0119,xx13) | SIEMENS Ultrasound SC2000 | IS | 1 | Volume Rate |
| (0119,xx21) | SIEMENS Ultrasound SC2000 | SH | 1 |  |
| (0129,xx00) | SIEMENS Ultrasound SC2000 | SQ | 1 | MPR View Sequence |
| (0129,xx02) | SIEMENS Ultrasound SC2000 | UI | 1 | Bookmark UID |
| (0129,xx03) | SIEMENS Ultrasound SC2000 |  | 1 | Plane Origin Vector |
| (0129,xx04) | SIEMENS Ultrasound SC2000 |  | 1 | Row Vector |
| (0129,xx05) | SIEMENS Ultrasound SC2000 |  | 1 | Column Vector |
| (0129,xx06) | SIEMENS Ultrasound SC2000 | SQ | 1 | Visualization Sequence |
| (0129,xx07) | SIEMENS Ultrasound SC2000 | UI | 1 | Bookmark UID |
| (0129,xx08) | SIEMENS Ultrasound SC2000 | OB | 1 | Visualization Information |
| (0129,xx09) | SIEMENS Ultrasound SC2000 | SQ | 1 | Application State Sequence |
| (0129,xx10) | SIEMENS Ultrasound SC2000 | OB | 1 | Application State Information |
| (0129,xx11) | SIEMENS Ultrasound SC2000 | SQ | 1 | Referenced Bookmark Sequence |
| (0129,xx12) | SIEMENS Ultrasound SC2000 | UI | 1 | Referenced Bookmark UID |
| (0129,xx20) | SIEMENS Ultrasound SC2000 | SQ | 1 | Cine Parameters Sequence |
| (0129,xx21) | SIEMENS Ultrasound SC2000 | OB | 1 | Cine Parameters Schema |
| (0129,xx22) | SIEMENS Ultrasound SC2000 | OB | 1 | Values of Cine Parameters |
| (0129,xx29) | SIEMENS Ultrasound SC2000 | OB | 1 |  |
| (0129,xx30) | SIEMENS Ultrasound SC2000 | CS | 1 | Raw Data Object Type |
| (0139,xx01) | SIEMENS Ultrasound SC2000 | SL | 1 | Physio Capture ROI |
| (0149,xx01) | SIEMENS Ultrasound SC2000 | FD | 1-n | Vector of BROI Points |
| (0149,xx02) | SIEMENS Ultrasound SC2000 | FD | 1-n | Start/End Timestamps of Strip Stream |
| (0149,xx03) | SIEMENS Ultrasound SC2000 | FD | 1-n | Timestamps of Visible R-waves |
| (7FD1,xx01) | SIEMENS Ultrasound SC2000 | OB | 1 | Acoustic Image and Footer Data |
| (7FD1,xx09) | SIEMENS Ultrasound SC2000 | UI | 1 | Volume Version ID |
| (7FD1,xx10) | SIEMENS Ultrasound SC2000 | OB | 1 | Volume Payload |
| (7FD1,xx11) | SIEMENS Ultrasound SC2000 | OB | 1 | After Payload |
| (7FD1,xx01) | SIEMENS SYNGO ULTRA-SOUND TOYON DATA STREAMING | OB | 1 | Padding |
| (7FD1,xx09) | SIEMENS SYNGO ULTRA-SOUND TOYON DATA STREAMING | UI | 1 | Version ID |
| (7FD1,xx10) | SIEMENS SYNGO ULTRA-SOUND TOYON DATA STREAMING | OB | 1 | Volume Payload |
| (7FD1,xx11) | SIEMENS SYNGO ULTRA-SOUND TOYON DATA STREAMING | OB | 1 | After Payload |