

DICOM 3.0 Conformance Statement

for

DICOM Anonymization



LAUREL BRIDGE

Orchestrating Medical Imaging Workflow

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1. Conformance Statement Overview

1.1 Purpose

This document outlines the DICOM Anonymization Filter conformance claims to the Basic Application Level Confidentiality Profile for patient anonymization for version 2019a of the DICOM standard. Also outlined are the various methods the DICOM Anonymization Filter uses to add replacement “dummy values” for the original values. A description of the process used to anonymize any burned in annotations is also included.

Table 1-1 provides an overview of the Basic Application Level Confidentiality Options supported.

Table 1-1

Basic Application Level Confidentiality Option	Supported
Clean Pixel Data Option	Yes
Clean Recognizable Visual Features Option	No
Clean Graphics Option	No
Clean Structured Content Option	No
Clean Descriptors Option	No
Retain Longitudinal Temporal Information with Full Dates Option	Yes
Retain Longitudinal Temporal Information with Modified Dates Option	No
Retain Patient Characteristics Option	Yes*
Retain Device Identity Option	Yes*
Retain Institution Identity Option	Yes*
Retain UIDs	Yes*
Retain Safe Private Option	No**

***Indicates option is supported via user configuration of the De-Identify filter.**

****Private tags may be either all anonymized, all removed, or all ignored. The Retain Safe Private Option requires the De-Identify filter identify those private attributes deemed safe to be excluded from the anonymization filter.**

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3. Revision History

Document Version	Date of Issue	Author	Description
1.0	04/14/2011	Chris Hoffman	Initial Revision
1.1	10/12/2011	Chris Hoffman	Updates to De-Identify and Re-Identify process
1.2	10/25/2011	Chris Hoffman	Updated Conformance claim for 2011 spec.
1.3	12/9/2011	Chris Hoffman	Updates to DANon to use certificates in lieu of xml files. Updated functionality of DANon
1.4	05/31/2013	Chris Hoffman	Updated anonymization functionality to include support for multi-frame images.
1.5	02/12/2015	Chris Hoffman	Updated list of supported transfer syntaxes
1.6	11/18/2015	Chris Hoffman	Updated list of supported transfer syntaxes and fixed issue with Encrypted Attributes SQ.
1.7	11/7/2016	Chris Hoffman	Update verbiage for one-way anonymization
1.8	11/9/2016	Chris Hoffman	Update process of retaining the original data to reflect recent changes in DCF.
1.9	06/12/2019	Chris Hoffman	Update format to match recommended CNF document format. Update table of De-Identified Attribute Tag list to 2019a.
2.0	09/25/2019	Chris Hoffman	Update supported Re-Identification encryption algorithm.

4. Basic Application Level Confidentiality Profile

4.1 De-Identifier

4.1.1 Attributes Removed During Anonymization

See Table E.1.1 in Appendix C: Analysis Models for the full list of Attributes anonymized during the De-Identification Process.

NOTE: The DICOM Anonymization Filter supports the ability for the user to add, remove, or alter the provided list of DICOM Attributes. This application only adheres to the Basic Application Level Confidentiality Profile using the default configuration file provided.

The ability to alter the default anonymization attributes list was added to support full customization of the de-identification process by the user. The full list of customization options available to the user are described in more detail later in this section.

4.1.2 Attributes Inserted During Anonymization

NOTE: The private group in this list (0317) is configurable by the user to allow for the most flexibility; therefore, the value indicated is subject to change.

Encrypted Attributes Sequence (0400, 0500)
>Encrypted Content Transfer Syntax UID (0400, 0510)

>Encrypted Content (0400, 0520)
 >> Modified Attributes Sequence (0400, 0550)

Patient Identify Removed (0012, 0062)
 De-Identification Method (0012, 0063)
 De-Identification Method Code Sequence (0012, 0064)
 Burned In Annotation (0028, 0301)
 Longitudinal Temporal Information Modified (0028, 0303)
 Private Creator (0317, 0010)
 Version (0317, 1000)
 Pixel Data Rectangles Anonymized (0317, 1001) (SQ)
 >Private Creator (0319,0010)
 >Original Pixel Data Encrypted (0319, 1000)
 >Byte Order (0319,1002)
 >Frame (0319,1003)
 >Rectangle Coordinates (0319, 1004)

4.1.3 De-Identification Replacement Values

All attributes listed in Table E.1.1 have a default removal action that determines how to treat the given attribute if it appears in the DICOM data set to be anonymized.

4.1.3.1 Lookup for 'Dummy Value' Based on VR

Attributes that require a dummy replacement value when removed from the original DICOM data set may specify 'autofill' to perform a lookup of valid replacement values based on the VR of the attribute. The following list shows the default replacement value for each VR type.

AE - Value Anonymized
 AS - 000D
 AT - *N/A*
 CS - VALUE_ANONYMIZED
 DA - 99990101
 DS - 00000000
 DT - 99990101000000.000000
 FD - 00000000
 FL - 0000
 IS - 00000000
 LO - Value Anonymized
 LT - Value Anonymized
 OB - *N/A*
 OD - 00000000
 OF - 00000000
 OL - 0000000000000000
 OV - 0000000000000000
 OW - *N/A*
 PN - Doe^John
 SH - Value Anonymized
 SL - 00000000
 SQ - **
 SS - 0000
 ST - Value Anonymized
 SV - 0000000000000000
 TM - 000000.0000
 UC - Value Anonymized
 UI - ***
 UL - 00000000
 UN - Value Anonymized
 UR - URLAnonymized

US - 0000
 UT - Value Anonymized
 UV - 0000000000000000

Legend:

N/A - Not applicable, elements with these VR's are not anonymized in this context

** - Sequence elements are anonymized by using this same table for each element in the sequence: **Note:** See Section 2.1.3.6 for Sequence anonymization

*** Unique Identifiers are uniquely generated: **Note:** See Section 2.1.4.3 for UID integrity

4.1.3.2 *Specifying a Custom Replacement Value*

Instead of using the default value for the dummy replacement value, the DICOM Anonymization Filter supports specifying a replacement value for each attribute in Table E.1.1.

This replacement value is not validated with respect to the attributes VR, so invalid replacement values may have an adverse effect on the resultant anonymized data set. Specifying a replacement value does not work for sequence elements.

4.1.3.3 *Generating and Transforming UIDs*

The DICOM Anonymization Filter supplies two methods for automatically creating unique UIDs for UI elements: Generating a new UID or Transforming an existing UID.

4.1.3.3.1 *Generating a new UID*

A new UID is generated using the makeUID utility provided in the DCF library. This helps mitigate the potential for collisions by helping ensure uniqueness. By default, UID generation is not used for Study or Series UID's due to the lack of a consistent one to one mapping for these UIDs.

4.1.3.3.2 *Transforming Existing UID*

The transformation function takes an existing UID and applies a transformation algorithm that produces a unique replacement value. This transformation function allows for consistent UID creation without the need for a dictionary that maps the old and new UID values. Also, the transformation function was designed in a way that is reversible, removing the need to store the original UID value in a private tag. It is worth noting that the transformation function attempts to append a prefix before the hashed UID if the resulting UID is under 64 characters in length. This prefix helps identify UIDs hashed using this transformation function. This transformation function is only reversible if the Encrypted Attributes Sequence is present and intact.

4.1.3.4 *One-Way Hash Function for PN, SH, and LO Elements*

In lieu of looking up a replacement value or providing a replacement value, a one-way hash function can be used. Using the **first value** of an original PN, SH, or LO element, this one-way hash function provides the ability to safely generate a replacement value using a SHA hash algorithm that is both consistent and repeatable. The one-way hash function has been added to address concerns that various PN, SH, or LO elements will map to the same value for all images in a study/series hierarchy where uniqueness or consistency is required.

4.1.3.5 *Accession Number Anonymization*

Accession numbers, like UIDs, are anonymized differently to provide a consistent one to one mapping for various anonymized accession numbers. In other words, a given accession number will be anonymized to one and only one value, helping mitigate collisions. This one to one mapping is accomplished using a SHA512 hash function, encoding the resultant hash in Base64, using a subset of the resultant hash for the accession number. A user defined prefix can also be defined to help identify anonymized data sets.

4.1.3.6 *Sequence Elements*

The DICOM Anonymization Filter handles sequence elements in a different fashion than typical elements. When a given sequence element contains any one of the listed attributes to be anonymized, the entire sequence is copied into the encrypted data set, and the entire sequence

element is anonymized, meaning each element in the sequence is handled the same way as the header data.

Additionally, if an element contained within a sequence is marked for removal, only the indicated element will be removed from the sequence. Note that this still means the entire sequence element will be copied to the encrypted data set if re-identification is enabled.

4.1.4 De-Identification Information

4.1.4.1 Encryption Algorithm

AES (by default) is used to encrypt the encrypted attributes data set. Encoding is performed per the specifications in AES Content Encryption in RFC3565.

The AES algorithm is applied automatically using a key length of 256 and is enveloped using a provided X509 Certificate. The resulting PKCS#7 enveloped message is then added to the de-identified data set as an array of bytes.

Triple DES is still supported by the De-Identification Filter, but is currently included for legacy support.

4.1.4.2 Public Certificate

The De-Identification process requires that a valid PKCS#7 RSA certificate be supplied to handle the AES and RSA encryption needed for the enveloped data. The following configuration is expected for a given public certificate (at least):

Signature algorithm: SHA 256
 Public key: RSA (2048 Bits)
 Key Usage: Digital Signature, Data Encipherment, Key Agreement

4.1.4.3 Self-Signed Certificates

It is recommended that customers who wish to Re-Identify an anonymized DICOM instance purchase a Code Signing Certificate from a reputable company such as DigiCert, Comodo, or Symantec to name a few.

Self-signed certificates are generally considered less secure than Code Signing Certificates from reputable certificate authorities mainly because the same entity that created and signed the certificate is the same identity that the certificate was created to identify. In other words, anyone can create and sign a self-signed certificate without validating their identity.

A self-signed certificate may be used in lieu of purchasing a Code Signing Certificate if the following clauses can be guaranteed:

1. The computer the DICOM Anonymization Filter is running on is behind a firewall and not in a DMZ zone.
2. The computer the DICOM Anonymization Filter is running on is not wide open, e.g. password protected via a secure password that isn't common knowledge.
3. The customer can guarantee safe transport of the private certificate. This means, specifically, that the private certificate has never been transmitted over a non-encrypted channel over the internet. For example, a test self-signed certificate that has been e-mailed over a non-encrypted channel to a test site cannot be used for commercial purposes because no guarantee can be made that the private key has not been compromised.

4.1.4.4 Study Instance UID, Series Instance UID, and Frame of Reference UID Integrity

The Study Instance UID and Series Instance UID hierarchy are retained through use of a transformation function that uniquely alters a given 64 bit UID in a non-reversible one to one mapping. The transformation function attempts to mitigate the potential for collisions with pre-existing UID's by appending a user configurable prefix to the transformed UID if the length of the resultant UID allows.

4.1.4.5 Transfer Syntax

Explicit VR Little Endian is used to encode / decode the Encrypted Attributes Data Sequence (0400, 0500). This is independent of the DICOM data set's transfer syntax and is only used for the given Attribute.

The byte order of the original DICOM data set's pixel data is stored with the original pixel data in the configured private tag to determine if byte swapping is needed upon re-identification.

4.1.5 De-Identify Pixel Data

Pixel data de-identification is done in line, using specified rectangles (x, y, width, height) that indicate sub regions within the original pixel data that need to be blacked out. For each rectangle specified, the following sequence of events occurs:

- a. The rectangle is located within the original pixel data and each pixel located within this sub-region is copied into a separate buffer.
- b. The buffer is enveloped using the same public certificate defined in section 4.1.4.2. This ensures the original pixel data anonymized is encrypted with the same level of protection as the rest of the DICOM data set header data that was anonymized.
- c. The following data is stored in a preconfigured private tag of the users choosing (for the group number):
 - i. Private Creator (0319, 0010) – The private creator ID
 - ii. Encrypted Buffer (0319, 1000) – The original pixel data encrypted using the provided public certificate.
 - iii. Byte Order (0319, 1002) – The byte order of the original pixel data contained in the encrypted buffer.
 - iv. Frame (0319, 1003) – The current frame index the given rectangle was pulled from.
 - v. Rectangle Coordinates (0319, 1004) – The coordinates with respect to the original DICOM data set's pixel data where the rectangle was removed.

4.1.5.1 Supported DICOM Image Formats for De-Identification

The following list indicates the various supported image formats: including the photometric interpretation, the bit depth, and samples per pixel.

RGB / YBR

Bits Stored: 8
 Bits Allocated: 8
 Samples per Pixel: 3
 Planar Configuration: Interleaved | Planar

MONOCHROME 1

Bits Stored: 8 | 10 | 12 | 14 | 16
 Bits Allocated: 8 | 16
 Samples per Pixel: 1

MONOCHROME 2

Bits Stored: 8 | 10 | 12 | 14 | 16
 Bits Allocated: 8 | 16
 Samples per Pixel: 1

PALETTE COLOR

Bits Stored: 8
 Bits Allocated: 8
 Samples per Pixel: 3

In addition, the following is a list of supported transfer syntaxes. Support refers to the anonymization filter's ability to de-identify and re-identify an image's pixel data written in the given transfer syntax.

Transfer Syntax	Description
1.2.840.10008.1.2	Implicit Little Endian
1.2.840.10008.1.2.1	Explicit Little Endian
1.2.840.10008.1.2.2	Explicit Big Endian
1.2.840.10008.1.2.5	RLE Lossless
1.2.840.10008.1.2.4.50*	Jpeg Baseline Process 1
1.2.840.10008.1.2.4.51*	Jpeg Extended Process 2 4
1.2.840.10008.1.2.4.57	Jpeg Lossless NH Process 14
1.2.840.10008.1.2.4.70	Jpeg Lossless NH, FOP Process 14 SV 1 +
1.2.840.10008.1.2.4.90	Jpeg 2000 Lossless
1.2.840.10008.1.2.4.91*	Jpeg 2000 (Lossy)

NH: Nonhierarchical

+ Jpeg Lossless, Nonhierarchical, First-Order Prediction (Process 14 [Selection Value 1])

* See **NOTE** below regarding Lossy compressed images for anonymization

4.1.5.1.1 Transfer Syntaxes **NOT** supported for anonymization:

Any transfer syntax not listed in the table above but is supported by DICOM is not supported for anonymization.

4.1.5.1.2 **NOTE** regarding lossy compressed images when anonymizing

When de-identifying a lossy compressed image's pixel data, the data is first decompressed and subsequently de-identified as per the rules indicated in section 4.1.5. When writing the de-identified pixel data back out to disk using the same lossy transfer syntax, the pixel data must then be recompressed. This action of decompressing and recompressing the pixel data using a lossy compression transfer syntax will yield varying results, thus ensuring the original pixel data **cannot** be restored exactly when re-identifying.

It is recommended a lossless-compressed or uncompressed transfer syntax be used when requiring an image's pixel data be able to be re-identified/restored to its original state.

4.1.5.1.3 **NOTE** regarding 16 bit palette color images

For 16 bit palette color images, an 8 bit palette color index is used for the designated replacement color. This 8 bit palette color index calculated from the RGB replacement color is duplicated for the low and high byte. As such, masking the low byte for a given palette color index will yield the 8 bit replacement value.

4.2 Re-Identifier

4.2.1 Attributes Removed/Changed During Re-Identification

Patient Identity Removed (0012, 0062) – Changed to 'No'

De-Identification Method (0012, 0063) - Removed

Image Type (0008, 0008) – Marked as Derived

Source Image Sequence (0008, 2112)

>Referenced Sop Instance UID (0008, 1155) – Original Image SOP Instance UID Referenced

>Referenced Sop Class UID (0008, 1150) – Original SOP Class UID Referenced

Sop Instance UID (0008, 0018) – Uniquely Generated for New Image

Encrypted Attributes Sequence (0400, 0500) – Removed

***NOTE:** If the resulting data set still contains the Encrypted Attributes Sequence, it signifies there was an error during the re-identification process and the DICOM file header does not contain diagnostically accurate information.

Burned In Annotation (0028, 0301) - Removed

Longitudinal Temporal Information Modified (0028, 0303) – “REMOVED”

Private Creator (0317, xxxx) – Removed

***NOTE:** The private group in this list (0317) is configurable by the user to allow for the most flexibility; therefore, the value indicated is subject to change.

4.2.2 Re-Identification Information

4.2.2.1 Private Certificate

The Re-Identification process requires a valid private PKCS#12 certificate be specified to decrypt the enveloped data contained in the anonymized DICOM header file. To correctly use the provided private certificate, the current DICOM Anonymization Filter needs to be properly configured to use the private certificate password that is specified in the private certificate. This can be done by specifying the correct password in the ConfigurationSettings object the DICOM Anonymization Filter uses during the re-identification process.

4.2.2.2 Transfer Syntax

Explicit VR Little Endian is used during the decoding process of the data set. However, the application is designed to use the indicated transfer syntax specified in the Encrypted Content Transfer Syntax UID Attribute, if the transfer syntax specified here was the same transfer syntax used to encode the Encrypted Content.

If the transfer syntax of the de-identified DICOM data set was changed in a manner that requires byte swapping for short pixel data, the appropriate byte swap will occur prior to the restoration of the original pixel data.

4.2.2.3 Supported Encryption Algorithms

The DICOM Anonymization Filter supports the re-identification of data sets encrypted using the following algorithms:

- AES (256-bit)
- Triple DES (168-bit) (Legacy)

All other encryption algorithms for re-identification are not supported.

4.2.3 Re-Identify Pixel Data

For each rectangle specified in the Pixel Data Rectangles Anonymized (0317, 1001) sequence, the following occurs:

1. The encrypted pixel data (0319, 1000) is decrypted by using the provided private certificate and password to open the enveloped byte array. The library used to envelope and open a given CMS message handles the checksum validation automatically. This opening of the encrypted pixel data envelope will fail if the provided byte array has changed in any manner that is not consistent with the provided certificates.
2. Using the associated rectangle (0319, 1004), the decrypted pixel data is placed back into the pixel data to reform the original image.

NOTE: In certain circumstances, such as the case with a lossy transfer syntax, data loss can occur when restoring the original pixel data that was once anonymized. Because of this possibility, it is recommended that the re-identified instance still be considered a new instance (e.g. the re-identified instance has a new SOP Instance UID). The original

instance may still be referenced via the Source Image Sequence (0008,2112) to allow the user to access the original SOP instance.

5. Additional Information

Appendix A: Glossary

Triple-DES – Triple Data Encryption Standard used in the encryption of the anonymized DICOM attributes specified in Appendix B.

AES – Advanced Encryption Standard is the default encryption algorithm used in the encryption of the anonymized DICOM attributes specified in Appendix B. This is widely considered to be more secure than Triple DES.

DICOM – Digital Imaging and Communications in Medicine standard for distributing and viewing medical images.

De-Identification – The process of removing attributes from a DICOM dataset that may be used to identify the patient of the DICOM image. The removed attributes are encrypted and stored in the resulting DICOM dataset for re-identification.

Re-Identification – The process of decrypting and repopulating the anonymized tags with the original patient information.

Appendix B: References

Digital Imaging and Communications in Medicine (DICOM) PS 3.1-3.18, 2019a
<ftp://medical.nema.org/medical/dicom/2019a/>

Appendix C: Analysis Models

Table E.1-1 shows the full list of DICOM attributes that need to be anonymized in order for the DICOM Anonymization Filter to conform to the Basic Application Level Confidentiality Profile in 2019a of the DICOM standard.

The table shows the name of the attribute, the group element tag, and the appropriate action needed to take for the given attribute tag.

The following list dictates the meaning of each value as it appears in the Action column of the table:

Z – Replace with a non-zero length value that may be a dummy value and consistent with the VR

X – Remove the specified element

U – Replace with a non-zero length UID that is consistent within a set of Instances

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

Attribute Name	Tag	Operation
Accession Number	0008,0050	hash
Acquisition Comments	0018,4000	autofill
Acquisition Context Sequence	0040,0555	delete
Acquisition Date	0008,0022	autofill
Acquisition DateTime	0008,002A	autofill
Acquisition Device Processing Description	0018,1400	autofill
Acquisition Protocol Description	0018,9424	autofill
Acquisition Time	0008,0032	autofill
Actual Human Performers Sequence	0040,4035	delete
Additional Patient's History	0010,21B0	autofill
Address (Trial)	0040,A353	autofill
Admission ID	0038,0010	hash
Admitting Date	0038,0020	autofill
Admitting Diagnoses Code Sequence	0008,1084	delete
Admitting Diagnoses Description	0008,1080	autofill
Admitting Time	0038,0021	autofill
Affected SOP Instance UID	0000,1000	GenerateUID
Allergies	0010,2110	autofill
Arbitrary	4000,0010	autofill
Author Observer Sequence	0040,A078	delete
Barcode Value	2200,0005	autofill
Beam Description	300A,00C3	autofill
Bolus Description	300A,00DD	autofill
Branch of Service	0010,1081	autofill
Camera Owner Name	0016,004D	autofill
Cassette ID	0018,1007	hash
Comments on the Performed Procedure Step	0040,0280	autofill
Compensator Description	300A,02EB	autofill
Concatenation UID	0020,9161	TransformUID
Confidentiality Constraint on Patient Data Description	0040,3001	autofill
Consulting Physician's Name	0008,009C	autofill
Consulting Physician Identification Sequence	0008,009D	delete
Container Component ID	0050,001B	hash
Container Description	0040,051A	autofill
Container Identifier	0040,0512	autofill
Content Creator's Identification Code Sequence	0070,0086	delete
Content Creator's Name	0070,0084	autofill
Content Date	0008,0023	autofill
Content Sequence	0040,A730	delete
Content Time	0008,0033	autofill

Attribute Name	Tag	Operation
Contrast Bolus Agent	0018,0010	autofill
Contribution Description	0018,A003	autofill
Country of Residence	0010,2150	autofill
Current Observer (Trial)	0040,A307	autofill
Current Patient Location	0038,0300	autofill
Curve Data	50xx,xxxx	autofill
Curve Date	0008,0025	autofill
Curve Time	0008,0035	autofill
Custodial Organization Sequence	0040,A07C	delete
Data Set Trailing Padding	FFFC,FFFC	autofill
Derivation Description	0008,2111	autofill
Detector ID	0018,700A	hash
Device Serial Number	0018,1000	autofill
Device Setting Description	0016,004B	autofill
Device UID	0018,1002	TransformUID
Digital Signatures Sequence	FFFA,FFFA	delete
Digital Signature UID	0400,0100	TransformUID
Dimension Organization UID	0020,9164	TransformUID
Discharge Diagnosis Description	0038,0040	autofill
Distribution Address	4008,011A	autofill
Distribution Name	4008,0119	autofill
Dose Reference Description	300A,0016	autofill
Dose Reference UID	300A,0013	TransformUID
End Acquisition DateTime	0018,9517	autofill
Ethnic Group	0010,2160	autofill
Expected Completion DateTime	0040,4011	autofill
Failed SOP Instance UID List	0008,0058	TransformUID
Fiducial UID	0070,031A	TransformUID
Filler Order Number / Imaging Service Request	0040,2017	autofill
First Treatment Date	3008,0054	autofill
Fixation Device Description	300A,0196	autofill
Fraction Group Description	300A,0072	autofill
Frame Comments	0020,9158	autofill
Frame of Reference UID	0020,0052	TransformUID
Gantry ID	0018,1008	hash
Generator ID	0018,1005	hash
GPS Altitude	0016,0076	autofill
GPS Altitude Ref	0016,0075	autofill
GPS Area Information	0016,008C	autofill
GPS Date Stamp	0016,008D	autofill
GPS Dest Bearing	0016,0088	autofill
GPS Dest Bearing Ref	0016,0087	autofill
GPS Dest Distance	0016,008A	autofill
GPS Dest Distance Ref	0016,0089	autofill

Attribute Name	Tag	Operation
GPS Dest Latitude	0016,0084	autofill
GPS Dest Latitude Ref	0016,0083	autofill
GPS Dest Longitude	0016,0086	autofill
GPS Dest Longitude Ref	0016,0085	autofill
GPS Differential	0016,008E	autofill
GPS DOP	0016,007B	autofill
GPS Img Direction	0016,0081	autofill
GPS Img Direction Ref	0016,0080	autofill
GPS Latitude	0016,0072	autofill
GPS Latitude Ref	0016,0071	autofill
GPS Longitude	0016,0074	autofill
GPS Longitude Ref	0016,0073	autofill
GPS Map Datum	0016,0082	autofill
GPS Measure Mode	0016,007A	autofill
GPS Processing Method	0016,008B	autofill
GPS Satellites	0016,0078	autofill
GPS Speed	0016,007D	autofill
GPS Speed Ref	0016,007C	autofill
GPS Status	0016,0079	autofill
GPS Time Stamp	0016,0077	autofill
GPS Track	0016,007F	autofill
GPS Track Ref	0016,007E	autofill
GPS Version ID	0016,0070	hash
Graphic Annotation Sequence	0070,0001	delete
Human Performers Name	0040,4037	autofill
Human Performers Organization	0040,4036	autofill
Icon Image Sequence(see Note 12)	0088,0200	delete
Identifying Comments	0008,4000	autofill
Image Comments	0020,4000	autofill
Image Presentation Comments	0028,4000	autofill
Imaging Service Request Comments	0040,2400	autofill
Impressions	4008,0300	autofill
Instance Coercion DateTime	0008,0015	autofill
Instance Creator UID	0008,0014	TransformUID
Instance Origin Status	0400,0600	autofill
Institution Address	0008,0081	autofill
Institutional Department Name	0008,1040	autofill
Institutional Department Type Code Sequence	0008,1041	delete
Institution Code Sequence	0008,0082	delete
Institution Name	0008,0080	autofill
Insurance Plan Identification	0010,1050	autofill
Intended Recipients of Results Identification Sequence	0040,1011	delete
Interpretation Approver Sequence	4008,0111	delete
Interpretation Author	4008,010C	autofill

Attribute Name	Tag	Operation
Interpretation Diagnosis Description	4008,0115	autofill
Interpretation ID Issuer	4008,0202	autofill
Interpretation Recorder	4008,0102	autofill
Interpretation Text	4008,010B	autofill
Interpretation Transcriber	4008,010A	autofill
Irradiation Event UID	0008,3010	TransformUID
Issuer of Admission ID	0038,0011	hash
Issuer of Admission ID Sequence	0038,0014	delete
Issuer of Patient ID	0010,0021	hash
Issuer of Service Episode ID	0038,0061	hash
Issuer of Service Episode ID Sequence	0038,0064	delete
Issuer of the Container Identifier Sequence	0040,0513	delete
Issuer of the Specimen Identifier Sequence	0040,0562	delete
Label Text	2200,0002	autofill
Large Palette Color Lookup Table UID	0028,1214	TransformUID
Last Menstrual Date	0010,21D0	autofill
Lens Make	0016,004F	autofill
Lens Model	0016,0050	autofill
Lens Serial Number	0016,0051	autofill
Lens Specification	0016,004E	autofill
MAC	0400,0404	autofill
Maker Note	0016,002B	autofill
Media Storage SOP Instance UID	0002,0003	TransformUID
Medical Alerts	0010,2000	autofill
Medical Record Locator	0010,1090	autofill
Military Rank	0010,1080	autofill
Modified Attributes Sequence	0400,0550	delete
Modified Image Description	0020,3406	autofill
Modifying Device ID	0020,3401	autofill
Most Recent Treatment Date	3008,0056	autofill
Name of Physician(s) Reading Study	0008,1060	autofill
Names of Intended Recipient of Results	0040,1010	autofill
Observation Date (Trial)	0040,A192	autofill
Observation Subject UID (Trial)	0040,A402	TransformUID
Observation Time (Trial)	0040,A193	autofill
Observation UID	0040,A171	TransformUID
Occupation	0010,2180	autofill
Operators' Identification Sequence	0008,1072	delete
Operators' Name	0008,1070	autofill
Order Callback Phone Number	0040,2010	autofill
Order Callback Telecom Information	0040,2011	autofill
Order Entered By	0040,2008	autofill
Order Enterer Location	0040,2009	autofill
Original Attributes Sequence	0400,0561	delete
Other Patient IDs	0010,1000	hash

Attribute Name	Tag	Operation
Other Patient IDs Sequence	0010,1002	delete
Other Patient Names	0010,1001	autofill
Overlay Comments	60xx,4000	autofill
Overlay Data	60xx,3000	autofill
Overlay Date	0008,0024	autofill
Overlay Time	0008,0034	autofill
Palette Color Lookup Table UID	0028,1199	TransformUID
Participant Sequence	0040,A07A	delete
Patient's Age	0010,1010	autofill
Patient's Birth Date	0010,0030	autofill
Patient's Birth Name	0010,1005	autofill
Patient's Birth Time	0010,0032	autofill
Patient's Institution Residence	0038,0400	autofill
Patient's Insurance Plan Code Sequence	0010,0050	delete
Patient's Mother's Birth Name	0010,1060	autofill
Patient's Name	0010,0010	hash
Patient's Primary Language Code Sequence	0010,0101	delete
Patient's Primary Language Modifier Code Sequence	0010,0102	delete
Patient's Religious Preference	0010,21F0	autofill
Patient's Sex	0010,0040	autofill
Patient's Size	0010,1020	autofill
Patient's Telecom Information	0010,2155	autofill
Patient's Telephone Numbers	0010,2154	autofill
Patient's Weight	0010,1030	autofill
Patient Address	0010,1040	autofill
Patient Comments	0010,4000	autofill
Patient ID	0010,0020	hash
Patient Sex Neutered	0010,2203	autofill
Patient State	0038,0500	autofill
Patient Transport Arrangements	0040,1004	autofill
Performed Location	0040,0243	autofill
Performed Procedure Step Description	0040,0254	autofill
Performed Procedure Step End Date	0040,0250	autofill
Performed Procedure Step End DateTime	0040,4051	autofill
Performed Procedure Step End Time	0040,0251	autofill
Performed Procedure Step ID	0040,0253	hash
Performed Procedure Step Start Date	0040,0244	autofill
Performed Procedure Step Start DateTime	0040,4050	autofill
Performed Procedure Step Start Time	0040,0245	autofill
Performed Station AE Title	0040,0241	autofill
Performed Station Geographic Location Code Sequence	0040,4030	delete
Performed Station Name	0040,0242	autofill
Performed Station Name Code Sequence	0040,4028	delete
Performing Physician Identification Sequence	0008,1052	delete

Attribute Name	Tag	Operation
Performing Physicians' Name	0008,1050	autofill
Person's Telecom Information	0040,1104	autofill
Person's Telephone Numbers	0040,1103	autofill
Person Address	0040,1102	autofill
Person Identification Code Sequence	0040,1101	delete
Person Name	0040,A123	autofill
Physician(s) of Record	0008,1048	autofill
Physician(s) of Record Identification Sequence	0008,1049	delete
Physician(s) Reading Study Identification Sequence	0008,1062	delete
Physician Approving Interpretation	4008,0114	autofill
Placer Order Number / Imaging Service Request	0040,2016	autofill
Plate ID	0018,1004	hash
Pregnancy Status	0010,21C0	autofill
Pre-Medication	0040,0012	autofill
Prescription Description	300A,000E	autofill
Presentation Display Collection UID	0070,1101	TransformUID
Presentation Sequence Collection UID	0070,1102	TransformUID
Private attributes	gggg,eeee	autofill
Procedure Step Cancellation DateTime	0040,4052	autofill
Protocol Name	0018,1030	autofill
Reason for Omission Description	300C,0113	autofill
Reason for Study	0032,1030	autofill
Reason for the Imaging Service Request	0040,2001	autofill
Reason for the Requested Procedure	0040,1002	autofill
Reason for Requested Procedure Code Sequence	0040,100A	delete
Reason for Visit	0032,1066	autofill
Reason for Visit Code Sequence	0032,1067	delete
Referenced Digital Signature Sequence	0400,0402	delete
Referenced Dose Reference UID	300A,0083	TransformUID
Referenced Frame of Reference UID	3006,0024	TransformUID
Referenced General Purpose Scheduled Procedure Step Transaction UID	0040,4023	TransformUID
Referenced Image Sequence	0008,1140	delete
Referenced Observation UID (Trial)	0040,A172	TransformUID
Referenced Patient Alias Sequence	0038,0004	delete
Referenced Patient Photo Sequence	0010,1100	delete
Referenced Patient Sequence	0008,1120	delete
Referenced Performed Procedure Step Sequence	0008,1111	delete
Referenced SOP Instance MAC Sequence	0400,0403	delete
Referenced SOP Instance UID	0008,1155	TransformUID
Referenced SOP Instance UID in File	0004,1511	TransformUID
Referenced Study Sequence	0008,1110	delete
Referring Physician's Address	0008,0092	autofill

Attribute Name	Tag	Operation
Referring Physician's Name	0008,0090	hash
Referring Physician's Telephone Numbers	0008,0094	autofill
Referring Physician Identification Sequence	0008,0096	delete
Region of Residence	0010,2152	autofill
Related Frame of Reference UID	3006,00C2	TransformUID
Request Attributes Sequence	0040,0275	delete
Requested Contrast Agent	0032,1070	autofill
Requested Procedure Comments	0040,1400	autofill
Requested Procedure Description	0032,1060	autofill
Requested Procedure ID	0040,1001	hash
Requested Procedure Location	0040,1005	autofill
Requested SOP Instance UID	0000,1001	TransformUID
Requesting Physician	0032,1032	autofill
Requesting Service	0032,1033	autofill
Respiratory Motion Compensation Technique Description	0018,9185	autofill
Responsible Organization	0010,2299	autofill
Responsible Person	0010,2297	autofill
Results Comments	4008,4000	autofill
Results Distribution List Sequence	4008,0118	delete
Results ID Issuer	4008,0042	autofill
Reviewer Name	300E,0008	autofill
RT Plan Date	300A,0006	autofill
RT Plan Description	300A,0004	autofill
RT Plan Label	300A,0002	autofill
RT Plan Name	300A,0003	autofill
RT Plan Time	300A,0007	autofill
Scheduled Human Performers Sequence	0040,4034	delete
Scheduled Patient Institution Residence	0038,001E	autofill
Scheduled Performing Physician Identification Sequence	0040,000B	delete
Scheduled Performing Physician Name	0040,0006	autofill
Scheduled Procedure Step Description	0040,0007	autofill
Scheduled Procedure Step End Date	0040,0004	autofill
Scheduled Procedure Step End Time	0040,0005	autofill
Scheduled Procedure Step Expiration DateTime	0040,4008	autofill
Scheduled Procedure Step Location	0040,0011	autofill
Scheduled Procedure Step Modification DateTime	0040,4010	autofill
Scheduled Procedure Step Start Date	0040,0002	autofill
Scheduled Procedure Step Start DateTime	0040,4005	autofill
Scheduled Procedure Step Start Time	0040,0003	autofill
Scheduled Station AE Title	0040,0001	autofill
Scheduled Station Geographic Location Code Sequence	0040,4027	delete
Scheduled Station Name	0040,0010	autofill

Attribute Name	Tag	Operation
Scheduled Station Name Code Sequence	0040,4025	delete
Scheduled Study Location	0032,1020	autofill
Scheduled Study Location AE Title	0032,1021	autofill
Series Date	0008,0021	autofill
Series Description	0008,103E	autofill
Series Instance UID	0020,000E	TransformUID
Series Time	0008,0031	autofill
Service Episode Description	0038,0062	autofill
Service Episode ID	0038,0060	hash
Setup- Technique Description	300A,01B2	autofill
Shielding Device Description	300A,01A6	autofill
Slide Identifier	0040,06FA	autofill
Smoking Status	0010,21A0	autofill
SOP Instance UID	0008,0018	GenerateUID
Source Image Sequence	0008,2112	delete
Source Manufacturer	300A,0216	autofill
Source Serial Number	3008,0105	autofill
Special Needs	0038,0050	autofill
Specimen Accession Number	0040,050A	autofill
Specimen Detailed Description	0040,0602	autofill
Specimen Identifier	0040,0551	autofill
Specimen Preparation Sequence	0040,0610	delete
Specimen Short Description	0040,0600	autofill
Specimen UID	0040,0554	TransformUID
Start Acquisition DateTime	0018,9516	autofill
Station Name	0008,1010	autofill
Storage Media File-set UID	0088,0140	TransformUID
Study Comments	0032,4000	autofill
Study Date	0008,0020	autofill
Study Description	0008,1030	autofill
Study ID	0020,0010	hash
Study ID Issuer	0032,0012	autofill
Study Instance UID	0020,000D	TransformUID
Study Time	0008,0030	autofill
Synchronization Frame of Reference UID	0020,0200	TransformUID
Target UID	0018,2042	TransformUID
Telephone Number (Trial)	0040,A354	autofill
Template Extension Creator UID	0040,DB0D	TransformUID
Template Extension Organization UID	0040,DB0C	TransformUID
Text Comments	4000,4000	autofill
Text String	2030,0020	autofill
Timezone Offset From UTC	0008,0201	autofill
Topic Author	0088,0910	autofill
Topic Keywords	0088,0912	autofill
Topic Subject	0088,0906	autofill

Attribute Name	Tag	Operation
Topic Title	0088,0904	autofill
Tracking UID	0062,0021	TransformUID
Transaction UID	0008,1195	TransformUID
Treatment Date	3008,0250	autofill
Treatment Machine Name	300A,00B2	autofill
Treatment Time	3008,0251	autofill
UID	0040,A124	TransformUID
Verbal Source (Trial)	0040,A352	autofill
Verbal Source Identifier Code Sequence (Trial)	0040,A358	autofill
Verifying Observer Identification Code Sequence	0040,A088	delete
Verifying Observer Name	0040,A075	autofill
Verifying Observer Sequence	0040,A073	delete
Verifying Organization	0040,A027	autofill
Visit Comments	0038,4000	autofill