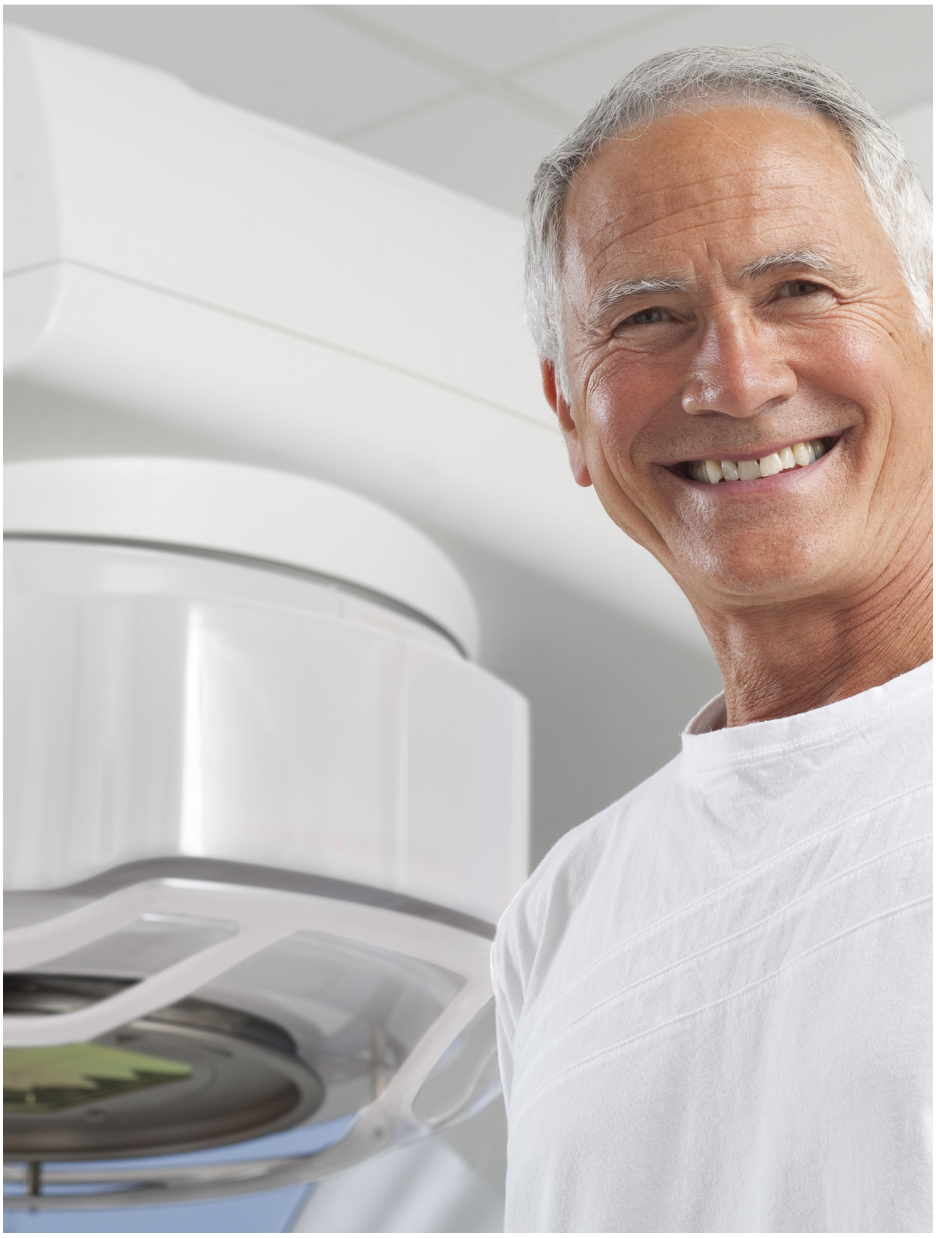
Technical Publication

ProKnow

DICOM Conformance Statement for: ProKnow DS 2.0



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DICOM Conformance Statement

1 Conformance Statement Overview

ProKnow DS is a cloud-based RT-PACS (Radiation Therapy Picture/Patient Archiving and Communication System). It enables radiotherapy professionals to archive, inspect, analyze, and interact with radiation therapy patient data for retrospective studies, prospective analysis, and clinical decision support. Although most patient data will be generated and imported from external systems, ProKnow DS also allows users to interact with patient data by performing common tasks such as structure renaming, Boolean operations, and contouring.

1.1 Warnings, Cautions, Notes and Tips

In this document warnings, cautions, notes and tips have unique symbols. The following examples describe each message type:

WARNING
Warnings are directions which, if not followed, could constitute a health hazard or cause injury, including fatal or serious personal injury, or could cause clinical mistreatment.

CAUTION
Cautions are directions which, if not followed, could cause database corruption or result in systematically erroneous data output.

Note	*Notes include important secondary context and reference information. Notes do not give instructions or related results. Notes include restrictions and other important information to pay attention to or remember that help you use the software.*

Tip	*Tips include ancillary information.*

ProKnow DS does not support any of the DICOM networking services (transfer, query/retrieve, workflow management, print management). Instead, a user interface is provided to upload and download DICOM files. In addition, ProKnow DS contains a private REST API to receive uploaded files from a client-side application and ProKnow DICOM Agent local data services. Table 1-1 identifies the standard SOP classes supported by ProKnow DS.

Table 1-1 Supported Standard SOP Classes

SOP Class Name	SOP Class UID	PS 3.3 Reference
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	A.3
MR Image Storage	1.2.840.10008.5.1.4.1.1.4	A.4
Positron Emission Tomography (PET) Image Storage	1.2.840.10008.5.1.4.1.1.128	A.21
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	A.18
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	A.19
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	A.20
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	A.49
Spatial Registration	1.2.840.10008.5.1.4.1.1.66.1	C.20

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C.7.6.3-Import	Image Pixel Module (C.7.6.3) Import
C.12.1-Import	SOP Common Module (C.12.1) Import
C.12.2-Import	Common Instance Reference Module (C.12.2) Import

3 Introduction

3.1 Revision History

Table 3-1 Revision History

Date	VID	Description
2023-06-23	01	Initial release for the ProKnow 2.0 release.
2023-11-13	02	Updates for 2.0.1 release: Updated contact information.
2024-05-06	03	Update the manufacturer address and the copyright statement.
2024-05-30	04	Updates for 2.0.2 release: Removed links to DICOM Agent documentation.
2024-10-03	05	Update the social media links and icons.

3.2 Audience

This document is written for the people that need to understand how ProKnow DS will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.3 Remarks

The scope of this DICOM conformance statement is to facilitate integration between ProKnow DS and other DICOM products. The conformance statement should be read and understood in conjunction with the DICOM standard. DICOM by itself does not guarantee interoperability. The conformance statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality. This conformance statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different conformance statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.
- Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

3.4 Terms and Definitions

Informal definitions are provided for the following terms used in this conformance statement. The DICOM standard is the authoritative source for formal definitions of these terms.

Table 3-2 Terms and Definitions

Term	Definition
Attribute	A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Information Entity (IE)	That portion of information defined by a Composite IOD which is related to one specific class of Real-World Object. There is a one-to-one correspondence between Information Entities and entities in the DICOM Application Model.
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object, does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.
Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex

Service/Object Pair (SOP) Class	The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair (SOP) Instance	An information object; a specific occurrence of information exchanged in a SOP Class. Example: a specific x-ray image.
Tag	A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]
Transfer Syntax	The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.
Unique Identifier (UID)	A globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person’s name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.5 Basics of DICOM Communication

This section describes terminology used in this conformance statement for the non-specialist. The key terms used in the conformance statement are highlighted in italics below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Since ProKnow DS does not support any DICOM networking services, these services need to be provided by other applications. ProKnow DS does provide a user interface and private REST API to upload and download files created and used by these other applications.

DICOM specifies a variety of methods for encoding data and denoting transfer syntaxes. The transfer syntax specifies endianness and whether the value representation for each attribute is explicitly provided or whether it must be determined based on the tag using a DICOM dictionary. Each unit of data is formatted in accordance with the appropriate information object definition, using the transfer syntax.

3.6 Abbreviations

Table 3-3 Abbreviations

Abbreviation	Definition
C	Conditional (Module Usage)
DICOM	Digital Imaging and Communications in Medicine
IE	Information Entity
IOD	Information Object Definition
ISO	International Organization for Standards
M	Mandatory (Module Usage)
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PS 3.2	DICOM Standard Part 2: Conformance
PS 3.3	DICOM Standard Part 3: Information Object Definitions
PS 3.15	DICOM Standard Part 15: Security and System Management Profiles
QA	Quality Assurance
RT	Radiotherapy
SOP	Service-Object Pair
SRO	Spatial Registration Object
U	User Option (Module Usage)
UID	Unique Identifier
VR	Value Representation

3.7 References

NEMA PS3: Digital Imaging and Communications in Medicine (DICOM) Standard, available free at https://www.dicomstandard.org

4 Networking

ProKnow DS does not satisfy the 7.1 DICOM Networking Conformance Requirements defined in PS3.2 Network transfer of data from on-premise clinical systems to the cloud-based ProKnow DS is achieved by utilizing the ProKnow DICOM Agent — a locally installed Windows application.

5 Media Interchange

While ProKnow DS does not fully satisfy the 7.2 DICOM Media Interchange Conformance Requirements defined in PS3.2, it does provide a user interface for uploading and downloading DICOM files. Refer to the Uploads Module and Downloading Patient Objects support articles for more information.

6 Transformation of DICOM to CDA

ProKnow DS does not support any Structured Reporting (SR) objects.

7 Support of Character Sets

ProKnow DS does not support extended character sets.

8 Security

ProKnow DS does not claim conformance to any of the Security and System Management Profiles defined in the DICOM Standard. That being said, data security is one of the most important aspects of the ProKnow DS design. All data transmission both to and from the Internet (including calls to the REST API to upload DICOM files) is encrypted using secure HTTP access (HTTPS) and all communication between servers is encrypted using HTTPS or SSL.

8.1 Security Profiles

No Security Profiles are supported.

8.2 Association Level Security

ProKnow DS does not support Association Level Security.

8.3 Application Level Security

Any users logging into ProKnow DS must identify themselves with, at a minimum, an email and password. It is also possible to utilize multi-factor authentication (enabled at a per-user or organization-wide level) to further enhance security.

9 Annexes

9.1 IOD Contents

9.1.1 Created SOP Instances

The following tables use a number of abbreviations. The abbreviations used in the “Presence of Value” column are:

- **VNAP** – Value Not Always Present (attribute saved with zero length if no value is present)
- **ANAP** – Attribute Not Always Present
- **ALWAYS** – Always Present
- **EMPTY** – Attribute is sent without a value
- **N/A** – Attribute does not have a value, e.g., a sequence (SQ)

The abbreviations used in the “Source” column are:

- **USER** – the attribute value source is from User input
- **AUTO** – the attribute value is generated automatically

9.1.1.1 RT Structure Set IOD (A.19) Export

ProKnow DS creates RT Structure Set SOP instances as either new or edited instances. The attribute values saved are the same as the values in the referenced image instances, except where noted to facilitate interoperability with external systems.

RT Structure Set IOD (A.19) Export

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Export
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Export
Series	RT Series	C.8.8.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Export
Equipment	General Equipment	C.7.5.1	See General Equipment Module (C.7.5.1) Export

Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Export
Structure Set	Structure Set	C.8.8.5	See Structure Set Module (C.8.8.5) Export
	ROI Contour	C.8.8.6	See ROI Contour Module (C.8.8.6) Export
	RT ROI Observations	C.8.8.8	See RT ROI Observations Module (C.8.8.8) Export
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Export

Structure Set Module (C.8.8.5) Export

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
Structure Set Label	(3006,0002)	SH	Copied	ALWAYS	Input SOP instance(s) or USER
Structure Set Name	(3006,0004)	LO	Copied	ALWAYS	Input SOP instance(s) or USER
Structure Set Date	(3006,0008)	DA	Date structure set was created	ALWAYS	AUTO
Structure Set Time	(3006,0009)	TM	Time structure set was created	ALWAYS	AUTO
Instance Creation Date	(0008,0012)	DA	Date structure set was created	ALWAYS	AUTO
Instance Creation Time	(0008,0013)	TM	Time structure set was created	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	"ISO_IR 192"	ALWAYS	
Frame of Reference UID	(0020,0052)	UI	Copied	ALWAYS	Referenced image set
Referenced Frame of Reference Sequence	(3006,0010)	SQ		N/A	
>Frame of Reference UID	(0020,0052)	UI	Copied	ALWAYS	Referenced image set
>RT Referenced Study Sequence	(3006,0012)	SQ		N/A	
>>Referenced SOP Class UID	(0008,1150)	UI	Copied	ALWAYS	Referenced image set
>>Referenced SOP Instance UID	(0008,1155)	UI	Copied	ALWAYS	Referenced image set

>>RT Referenced Series Sequence	(3006,0014)	SQ		N/A	
>>>Series Instance UID	(0020,000E)	UI	Copied	ALWAYS	Referenced image set
>>>Contour Image Sequence	(3006,0016)	SQ		N/A	
>>>>Referenced SOP Class UID	(0008,1150)	UI	Copied	ALWAYS	Referenced image set
>>>>Referenced SOP Instance UID	(0008,1155)	UI	Copied	ALWAYS	Referenced image set
Structure Set ROI Sequence	(3006,0020)	SQ		N/A	
>ROI Number	(3006,0022)	IS	Copied or uniquely generated	ALWAYS	Input SOP instance
>Referenced Frame of Reference UID	(3006,0024)	UI	Copied	ALWAYS	Referenced image set
>ROI Name	(3006,0026)	LO	Copied	ALWAYS	Input SOP instance or USER
>ROI Generation Algorithm	(3006,0036)	CS	“MANUAL”	ALWAYS	

ROI Contour Module (C.8.8.6) Export

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
ROI Contour Sequence	(3006,0039)	SQ			
>Referenced ROI Number	(3006,0084)	IS	Copied or the number of the new ROI	ALWAYS	Input SOP instance or AUTO
>ROI Display Color	(3006,002A)	IS	Copied or the assigned color	ALWAYS	Input SOP instance or USER
>Contour Sequence	(3006,0040)	SQ			
>>Contour Image Sequence	(3006,0016)	SQ	NOTE: Not present for existing POINT ROIs		
>>>Referenced SOP Class UID	(0008,1150)	UI	Copied or SOP class UID of image on which contour was drawn	ALWAYS	Referenced image set

>>>Referenced SOP Instance UID	(0008,1155)	UI	Copied or SOP instance UID of image on which contour was drawn	ALWAYS	Referenced image set
>>Contour Geometric Type	(3006,0042)	CS	Copied or "CLOSED_PLANAR" for new contours	ALWAYS	Input SOP instance or AUTO
>>Number of Contour Points	(3006,0046)	IS	Copied or the number of contour points drawn	ALWAYS	Input SOP instance or AUTO
>>Contour Data	(3006,0050)	DS	Copied or the contour points drawn	ALWAYS	Input SOP instance or AUTO

RT ROI Observations Module Export (C.8.8.8)

Attribute Name	**Tag**	**VR**	**Value**	**Presence of Value**	**Source**
RT ROI Observations Sequence	(3006,0080)	SQ			
>Observation Number	(3006,0082)	IS	Copied or the number of the new observation	ALWAYS	Input SOP instance or AUTO
>Referenced ROI Number	(3006,0084)	IS	Copied or the number of the new ROI	ALWAYS	Input SOP instance or AUTO
>RT ROI Interpreted Type	(3006,00A4)	CS	Copied or the user assigned value	VNAP	Input SOP instance or USER
>ROI Interpreter	(3006,00A6)	PN		EMPTY	

9.1.1.2 RT Dose IOD (A.18) Export

ProKnow DS creates RT Dose SOP instances as combinations of other RT Dose SOP instances, possibly transformed by Spatial Registration SOP instances and scaled or offset by constants. The attribute values saved are either copied from one of the input SOP instances or are user assigned values, except where noted to facilitate interoperability with external systems.

RT Dose IOD (A.18) Export

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Export
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Export
Series	RT Series	C.8.8.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Export
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Export
Equipment	General Equipment	C.7.5.1	See General Equipment Module (C.7.5.1) Export
Dose	General Image	C.7.6.1	See General Image Module (C.7.6.1) Export for RT Dose
	Image Plane	C.7.6.2	See Image Plane Module (C.7.6.2) Export
	Image Pixel	C.7.6.3	See Image Pixel Module (C.7.6.3) Export
	Multi-frame	C.7.6.6	See Multi-frame Module (C.7.6.6) Export
	RT Dose	C.8.8.3	See RT Dose Module (C.8.8.3) Export
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Export

General Image Module (C.7.6.1) Export for RT Dose

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	"1"	ALWAYS	AUTO
Image Comments	(0020,4000)	LT	Derived	ALWAYS	String formatted equation describing how the input dose entities (including scales and offsets) were composed. Please note that the indices of referenced dose entities (e.g., D0, D1, D2) refer to the indices within the Referenced Instance Sequence (0008,114A).

RT Dose Module (C.8.8.3) Export

Refer to General Image Module (C.7.6.1) Export for RT Dose for duplicate attribute Instance Number. Refer to Image Plane Module (C.7.6.2) Export for duplicate attributes Samples per Pixel, Photometric Interpretation, Bits Allocated, Bits Stored, High Bit, and Pixel Representation.

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Date	(0008,0023)	DA	creation date	ALWAYS	AUTO
Content Time	(0008,0033)	TM	creation time	ALWAYS	AUTO
Dose Units	(3004,0002)	CS	"GY"	ALWAYS	AUTO
Dose Type	(3004,0004)	CS	"PHYSICAL" or "EFFECTIVE"	ALWAYS	Input SOP instance(s) or USER
Dose Comment	(3004,0006)	LO	Derived or the user assigned value	ALWAYS	Input SOP instance(s) and composition equation or USER
Dose Summation Type	(3004,000A)	CS	Copied or derived	ALWAYS	Input SOP instance(s)
Referenced RT Plan Sequence	(300C,0002)	SQ		N/A	
>Referenced SOP Class UID	(0008,1150)	UI	Derived	ALWAYS	Input SOP instance(s)
>Referenced SOP Instance UID	(0008,1155)	UI	Derived	ALWAYS	Input SOP instance(s)
Grid Frame Offset Vector	(3004,000C)	DS	Derived	ALWAYS	Input SOP instance(s) or AUTO
Dose Grid Scaling	(3004,000E)	DS	Derived	ALWAYS	Dose composition results
Tissue Heterogeneity Correction	(3004,0014)	CS	Derived	ALWAYS	Input SOP instance(s)
Referenced Instance Sequence	(0008,114A)	SQ		N/A	References the set of RT Dose SOP Instances used to derive this RT Dose SOP Instance. One or more items will be present.
>Referenced SOP Class UID	(0008,1150)	UI	"1.2.840.10008.5.1.4.1.1.481.2"	ALWAYS	AUTO
>Referenced SOP Instance UID	(0008,1155)	UI	Derived	ALWAYS	Input SOP instance(s)

>Purpose of Reference Code Sequence	(0040,A170)	SQ		N/A	Code describing the purpose of the reference to the Instance(s). Only one item will be present.
>>Code Value	(0008,0100)	SH	"121372"	ALWAYS	AUTO
>>Coding Scheme Designator	(0008,0102)	SH	"DCM"	ALWAYS	AUTO
>>Coding Scheme Version	(0008,0103)	SH	"20140106"	ALWAYS	AUTO
>>Code Meaning	(0008,0104)	LO	"Source dose for composing current dose"	ALWAYS	AUTO

9.1.1.3 Spatial Registration IOD (A.39) Export

ProKnow DS creates Spatial Registration SOP instances. The attribute values saved are the same as the values in the referenced image instances, except where noted to facilitate interoperability with external systems.

Spatial Registration IOD (A.39) Export

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Export
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Export
Series	General Series	C.7.3.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Export
	Spatial Registration Series	C.20.1	See Spatial Registration Series Module (C.20.1) Export
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Export
Equipment	General Equipment	C.7.5.1	See General Equipment Module (C.7.5.1) Export
Spatial Registration	Spatial Registration	C.20.2	See Spatial Registration Module (C.20.2) Export
	Common Instance Reference	C.12.2	See Common Instance Reference Module (C.12.2) Export
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Export

Spatial Registration Series Module (C.20.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"REG"	ALWAYS	AUTO

Spatial Registration Module (C.20.2) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Content Date	(0008,0023)	DA	Date SRO was last updated	ALWAYS	AUTO
Content Time	(0008,0033)	TM	Time SRO was last updated	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	0	ALWAYS	AUTO
Content Label	(0070,0080)	CS	"REGISTRATION"	ALWAYS	AUTO
Content Description	(0070,0081)	LO	SRO Name	ALWAYS	USER
Content Creator's Name	(0070,0084)	PN		EMPTY	
Registration Sequence	(0070,0308)	SQ			
>Frame of Reference UID	(0020,0052)	UI	Frame of reference of source or target coordinate system	ALWAYS	AUTO
>Referenced Image Sequence	(0008,1140)	SQ			
>>Referenced SOP Class UID Sequence	(0008,1150)	UI	Class UID of referenced image set	ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of referenced image set	ALWAYS	AUTO
>Matrix Registration Sequence	(0070,0309)	SQ			
>>Registration Type Code Sequence	(0070,030D)	SQ			
>>>Code Value	(0008,0100)	SH	"125025"	ALWAYS	AUTO
>>>Coding Scheme Designator	(0008,0102)	SH	"DCM"	ALWAYS	AUTO
>>>Coding Scheme Version	(0008,0103)	SH	"20040115"	ALWAYS	AUTO
>>>Code Meaning	(0008,0104)	LO	"Visual Alignment"	ALWAYS	AUTO
>>Matrix Sequence	(0070,030A)	SQ			
>>>Frame Of Reference Transformation Matrix	(0070,030A)	DS	SRO 4x4 affine transformation matrix	ALWAYS	USER
>>>Frame Of Reference Transformation Matrix Type	(0070,030C)	CS	"RIGID"	ALWAYS	AUTO

9.1.1.4 Common Modules Export

Patient Module (C.7.1.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Copied	VNAP	Input SOP instance(s)
Patient's ID	(0010,0020)	LO	Copied	VNAP	Input SOP instance(s)
Patient's Birth Date	(0010,0030)	DA	Copied	VNAP	Input SOP instance(s)
Patient's Birth Time	(0010,0032)	TM	Copied	ANAP	Input SOP instance(s)
Patient's Sex	(0010,0040)	CS	Copied	VNAP	Input SOP instance(s)

General Study Module (C.7.2.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Copied	ALWAYS	Input SOP instance(s)
Study Date	(0008,0020)	DA	Copied	VNAP	Input SOP instance(s)
Study Time	(0008,0030)	TM	Copied	VNAP	Input SOP instance(s)
Referring Physician’s Name	(0008,0090)	PN	Copied	VNAP	Input SOP instance(s)
Study ID	(0020,0010)	SH	Copied	VNAP	Input SOP instance(s)
Accession Number	(0008,0050)	SH	Copied	VNAP	Input SOP instance(s)
Study Description	(0008,1030)	LO	Copied	ANAP	Input SOP instance(s)

General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"RTSTRUCT", "RTDOSE", or "SEG", as appropriate	ALWAYS	
Series Instance UID	(0020,000E)	UI	Copied	ALWAYS	Input SOP instance(s)
Series Number	(0020,0011)	IS	Copied	VNAP	Input SOP instance(s)
Series Date	(0008,0021)	DA	Copied	ANAP	Input SOP instance(s)
Series Time	(0008,0031)	TM	Copied	ANAP	Input SOP instance(s)

Series Description	(0008,103E)	LO	Copied	ANAP	Input SOP instance(s)
Operators' Name	(0008,1070)	PN		EMPTY	

Frame of Reference Module (C.7.4.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Frame of Reference UID	(0020,0052)	UI	Frame of reference from referenced instances	ALWAYS	AUTO
Position Reference Indicator	(0020,1040)	LO		EMPTY	

General Equipment Module (C.7.5.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	"ProKnow"	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	"ProKnow DS"	ALWAYS	AUTO

Image Plane Module (C.7.6.2) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Spacing	(0028,0030)	DS	Derived or specified	ALWAYS	Input SOP instance(s) or USER
Image Orientation (Patient)	(0020,0037)	DS	(+/-1, 0, 0, 0, +/-1, 0)	ALWAYS	Input SOP instance(s) or AUTO
Image Position (Patient)	(0020,0032)	DS	Derived	ALWAYS	Input SOP instance(s) or AUTO
Slice Thickness	(0018,0050)	DS		EMPTY	

Image Pixel Module (C.7.6.3) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per pixel	(0028,0002)	US	1	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	"MONOCHROME2"	ALWAYS	AUTO
Rows	(0028,0010)	US	Derived	ALWAYS	Input SOP instance(s) or AUTO
Columns	(0028,0011)	US	Derived	ALWAYS	Input SOP instance(s) or AUTO
Bits Allocated	(0028,0100)	US	16	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	16	ALWAYS	AUTO
High Bit	(0028,0102)	US	15	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	0	ALWAYS	AUTO
Pixel Data	(7FE0,0010)	OW	Derived	ALWAYS	Input SOP instance(s) and USER

Multi-frame Module (C.7.6.6) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames	(0028,0008)	IS	Derived	ALWAYS	Input SOP instance(s) or AUTO
Frame Increment Pointer	(0028,0009)	AT	Value of attribute (3004,000C)	ALWAYS	AUTO

SOP Common Module (C.12.1) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	Specific class UID for instance	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	SOP Instance UID	ALWAYS	AUTO

Common Instance Reference Module (C.12.2) Export

Attribute Name	Tag	VR	Value	Presence of Value	Source
Referenced Series Sequence	(0008,1115)	SQ		ANAP	
>Series Instance UID	(0020,000E)	UI	Referenced Series Instance UID	ALWAYS	AUTO
>Referenced Instance Sequence	(0008,114A)	SQ		ALWAYS	
>>Referenced SOP Class UID	(0008,1150)	UI	SOP Class UID of Referenced Instance	ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of Referenced Instance	ALWAYS	AUTO
Studies Containing Other Referenced Instances Sequence	(0008,1200)	SQ		ANAP	
>Study Instance UID	(0020,000E)	UI	Referenced Study Instance UID	ALWAYS	AUTO
>Referenced Series Sequence	(0008,1115)	SQ		ANAP	
>>Series Instance UID	(0020,000E)	UI	Referenced Series Instance UID	ALWAYS	AUTO
>>Referenced Instance Sequence	(0008,114A)	SQ		ALWAYS	
>>>Referenced SOP Class UID	(0008,1150)	UI	SOP Class UID of Referenced Instance	ALWAYS	AUTO
>>>Referenced SOP Instance UID	(0008,1155)	UI	SOP Instance UID of Referenced Instance	ALWAYS	AUTO

9.1.2 Usage of Attributes from Received IODs

The following sections list the attributes used in the ProKnow DS implementation of each information object, along with any additional attribute requirements not already specified in the DICOM Standard.

9.1.2.1 CT Image IOD (A.3) Import

CT Image IOD (A.3) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	General Series	C.7.3.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Import
Image	Image Plane	C.7.6.2	See Image Plane Module (C.7.6.2) Import
	Image Pixel	C.7.6.3	See Image Pixel Module (C.7.6.3) Import
	CT Image	C.8.2.1	See CT Image Module (C.8.2.1) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

CT Image Module (C.8.2.1) Import

Attribute Name	Tag	Type	Notes
Rescale Intercept	(0028,1052)	1	Rescale Intercept
Rescale Slope	(0028,1053)	1	Rescale Slope

9.1.2.2 MR Image IOD (A.4) Import

MR Image IOD (A.4) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	General Series	C.7.3.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Import
Image	Image Plane	C.7.6.2	See Image Plane Module (C.7.6.2) Import
	Image Pixel	C.7.6.3	See Image Pixel Module (C.7.6.3) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

9.1.2.3 PET Image IOD (A.21) Import

PET Image IOD (A.21) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	General Series	C.7.3.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
	PET Series	C.8.9.1	See PET Series Module (C.8.9.1) Import
	PET Isotope	C.8.9.2	See PET Isotope Module (C.8.9.2) Import
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Import
Image	Image Plane	C.7.6.2	See Image Plane Module (C.7.6.2) Import
	Image Pixel	C.7.6.3	See Image Pixel Module (C.7.6.3) Import
	PET Image	C.8.9.4	See PET Image Module (C.8.9.4) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

PET Series Module (C.8.9.1) Import

Attribute Name	Tag	Type	Notes
Units	(0054,1001)	1	SUV calculation requires BQML or CNTS
Counts Source	(0054,1002)	1	SUV calculation requires EMISSION
Corrected Image	(0028,0051)	2	SUV calculation requires both DECY and ATTN
Decay Correction	(0054,1102)	1	SUV calculation requires START or ADMIN

PET Isotope Module (C.8.9.2) Import

Attribute Name	Tag	Type	Notes
Radiopharmaceutical Information Sequence	(0054,0016)	2	
>Radiopharmaceutical Start Time	(0018,1072)	3	Used in SUV calculation if Radiopharmaceutical Start DateTime (0018,1078) is not present
>Radiopharmaceutical Start DateTime	(0018,1078)	3	Used in SUV calculation in preference to Radiopharmaceutical Start Time (0018,1072), when both are present
>Radionuclide Total Dose	(0018,1074)	3	Defaults to 0 if not present
>Radionuclide Half Life	(0018,1075)	3	Defaults to 0 if not present

PET Image Module (C.8.9.4) Import

Attribute Name	Tag	Type	Notes
Image Type	(0008,0008)	1	
Acquisition Date	(0008,0022)	2	Earliest value in the image series is used as start of acquisition date for SUV calculation
Acquisition Time	(0008,0032)	2	Earliest value in the image series is used as start of acquisition time for SUV calculation
Private Creator (GE)	(0009,0010)	3	If present, indicates the presence of GE (0009,1xxx) private tags for SUV calculation. Must be "GEMS_PETD_01"
PET scan_datetime	(0009,100D)	3	If present, used for the start of acquisition in preference to Acquisition Date (0008,0022) and Acquisition Time (0008,0032) if Series Date (0008,0021) and Series Time (0008,0031) are later, i.e., image series was post-processed
Private Creator (Philips)	(7053,0010)	3	If present, indicates the presence of Philips (7053,1xxx) private tags for SUV calculation. Must be "Philips PET Private Group"
SUV Scale Factor	(7053,1000)	3	If present, enables the "Philips SUV" calculation mode which applies this scale factor to convert counts to SUV
Activity Concentration Scale Factor	(7053,1009)	3	If present, enables recalculation of CNTS into BQML using this scale factor

9.1.2.4 RT Structure Set IOD (A.19) Import

RT Structure Set IOD (A.19) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	RT Series	C.8.8.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
Structure Set	Structure Set	C.8.8.5	See Structure Set Module (C.8.8.5) Import
	ROI Contour	C.8.8.6	See ROI Contour Module (C.8.8.6) Import
	RT ROI Observations	C.8.8.8	See RT ROI Observations Module (C.8.8.8) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

Structure Set Module (C.8.8.5) Import

Attribute Name	Tag	Type	Notes
Structure Set Label	(3006,0002)	1	Used as the object label, if Structure Set Name (3006,0004) is not present or is empty
Structure Set Name	(3006,0004)	3	Used as the object label
Structure Set Date	(3006,0008)	2	
Structure Set Time	(3006,0009)	2	
Referenced Frame of Reference Sequence	(3006,0010)	3	Required
>Frame of Reference UID	(0020,0052)	1	
>RT Referenced Study Sequence	(3006,0012)	3	
>>Referenced SOP Class UID	(0008,1150)	1	
>>Referenced SOP Instance UID	(0008,1155)	1	
>>RT Referenced Series Sequence	(3006,0014)	1	
>>>Series Instance UID	(0020,000E)	1	

Structure Set ROI Sequence	(3006,0020)	1	
>ROI Number	(3006,0022)	1	
>Referenced Frame of Reference UID	(3006,0024)	1	
>ROI Name	(3006,0026)	2	If not present, defaults to "Unnamed", "Unnamed (1)", etc.
>ROI Generation Algorithm	(3006,0036)	2	Displayed as "Method" for ROI in Structures tab

ROI Contour Module (C.8.8.6) Import

Attribute Name	**Tag**	**Type**	**Notes**
ROI Contour Sequence	(3006,0039)	1	
>Referenced ROI Number	(3006,0084)	1	
>ROI Display Color	(3006,002A)	3	If not present, defaults to red (255, 0, 0)
>Contour Sequence	(3006,0040)	3	
>>Contour Geometric Type	(3006,0042)	1	
>>Contour Data	(3006,0050)	1	

RT ROI Observations Module (C.8.8.8) Import

Attribute Name	**Tag**	**Type**	**Notes**
RT ROI Observations Sequence	(3006,0080)	1	
>Referenced ROI Number	(3006,0084)	1	
>RT ROI Interpreted Type	(3006,00A4)	2	If not provided, default to "UNSPECIFIED"

9.1.2.5 RT Plan IOD (A.20) / RT Ion Plan IOD (A.49) Import

RT Plan IOD (A.20) / RT Ion Plan IOD (A.49) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	RT Series	C.8.8.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Import
Equipment	General Equipment	C.7.5.1	See General Equipment Module (C.7.5.1) Import
Plan	RT General Plan	C.8.8.9	See RT General Plan Module (C.8.8.9) Import
	RT Prescription	C.8.8.10	See RT Prescription Module (C.8.8.10) Import
	RT Patient Setup	C.8.8.12	See RT Patient Setup Module (C.8.8.12) Import
	RT Fraction Scheme	C.8.8.13	See RT Fraction Scheme Module (C.8.8.13) Import
	RT Beams, RT Ion Beams	C.8.8.14, C8.8.25	See RT Beams Module (C.8.8.14) / RT Ion Beams Module (C.8.8.25) Import
	RT Brachy Application Setups	C.8.8.15	See RT Brachy Application Setups Module (C.8.8.15) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

RT General Plan Module (C.8.8.9) Import

Attribute Name	Tag	Type	Notes
RT Plan Label	(300A,0002)	1	Used as the object label if RT Plan Name (3000A,0003) is not present or is empty
RT Plan Name	(300A,0003)	3	Used as the object label
RT Plan Description	(300A,0004)	3	
Instance Number	(0020,0013)	3	
RT Plan Date	(300A,0006)	2	
RT Plan Time	(300A,0007)	2	
Plan Intent	(300A,000A)	3	
RT Plan Geometry	(300A,000C)	1	
Referenced Structure Set Sequence	(300C,0060)	1C	
>Referenced SOP Class UID	(0008,1150)	1	

>Referenced SOP Instance UID	(0008,1155)	1	
Referenced Dose Sequence	(300C,0080)	3	
>Referenced SOP Class UID	(0008,1150)	1	
>Referenced SOP Instance UID	(0008,1155)	1	
Referenced RT Plan Sequence	(300C,0002)	3	
>Referenced SOP Class UID	(0008,1150)	1	
>Referenced SOP Instance UID	(0008,1155)	1	

RT Prescription Module (C.8.8.10) Import

Attribute Name	**Tag**	**Type**	**Notes**
Prescription Description	(300A,000E)	3	
Dose Reference Sequence	(300A,0010)	3	
>Dose Reference Number	(300A,0012)	1	If not provided or a duplicate is encountered, dose reference will be ignored (omitted from prescription).
>Dose Reference UID	(300A,0013)	3	
>Dose Reference Structure Type	(300A,0014)	1	If not provided, dose reference will be ignored (omitted from prescription).
>Dose Reference Description	(300A,0016)	3	
>Dose Reference Point Coordinates	(300A,0018)	3	If not provided and Dose Reference Structure Type is "COORDINATES", dose reference will be ignored (omitted from prescription).

>Dose Reference Type	(300A,0020)	1	If not provided, dose reference will be ignored (omitted from prescription). If "TARGET", the prescribed dose will be extracted from the first provided tag in the following list of tags: Target Prescription Dose (300A,0026), Target Maximum Dose (300A,0027), Target Minimum Dose (300A,0025), Delivery Maximum Dose (300A,0023), Delivery Warning Dose (300A,0022). If "ORGAN_AT_RISK", the prescribed dose will be extracted from the first provided tag in the following list of tags: Organ at Risk Full-volume Dose (300A,002A), Organ at Risk Limit Dose (300A,002B), Organ at Risk Maximum Dose (300A,002C), Delivery Maximum Dose (300A,0023), Delivery Warning Dose (300A,0022).
>Delivery Warning Dose	(300A,0022)	3	See comment for Dose Reference Type (300A,0020)
>Delivery Maximum Dose	(300A,0023)	3	See comment for Dose Reference Type (300A,0020)
>Target Minimum Dose	(300A,0025)	3	See comment for Dose Reference Type (300A,0020)
>Target Prescription Dose	(300A,0026)	3	See comment for Dose Reference Type (300A,0020)
>Target Maximum Dose	(300A,0027)	3	See comment for Dose Reference Type (300A,0020)
>Organ at Risk Full-volume Dose	(300A,002A)	3	See comment for Dose Reference Type (300A,0020)
>Organ at Risk Limit Dose	(300A,002B)	3	See comment for Dose Reference Type (300A,0020)
>Organ at Risk Maximum Dose	(300A,002C)	3	See comment for Dose Reference Type (300A,0020)

RT Patient Setup Module (C.8.8.12) Import

Attribute Name	Tag	Type	Notes
Patient Setup Sequence	(300A,0180)	1	
>Patient Setup Number	(300A,0182)	1	
>Patient Setup Label	(300A,0183)	3	
>Patient Position	(0018,5100)	1C	Required

RT Fraction Scheme Module (C.8.8.13) Import

Attribute Name	Tag	Type	Notes
Fraction Group Sequence	(300A,0070)	1	
>Fraction Group Number	(300A,0071)	1	
>Fraction Group Description	(300A,0072)	3	
>Number of Fractions Planned	(300A,0078)	2	
>Referenced Beam Sequence	(300C,0004)	1C	
>>Referenced Beam Number	(300C,0006)	1	
>>Beam Dose Specification Point	(300A,0082)	3	
>>Beam Dose	(300A,0084)	3	
>>Beam Meterset	(300A,0086)	3	
>Referenced Brachy Application Setup Sequence	(300C,000A)	1C	
>>Referenced Brachy Application Setup Number	(300C,000C)	1	
>>Brachy Application Setup Dose Specification Point	(300A,00A2)	3	
>>Brachy Application Setup Dose	(300A,00A4)	3	

RT Beams Module (C.8.8.14) / RT Ion Beams Module (C.8.8.25) Import

Attribute Name	Tag	Type	Notes
Beam Sequence, Ion Beam Sequence	(300A,00B0), (300A,03A2)	1	RT Plan, RT Ion Plan
>Beam Number	(300A,00C0)	1	
>Beam Name	(300A,00C2)	3	
>Beam Description	(300A,00C3)	3	
>Beam Type	(300A,00C4)	1	
>Radiation Type	(300A,00C6)	2	If present, used to compute delivery Modality for Beams on Plan tab

>Primary Fluence Mode Sequence	(3002,0050)	3	RT Beams only
>>Fluence Mode	(3002,0051)	1	RT Beams only
>>Fluence Mode ID	(3002,0052)	1C	RT Beams only; if present, included in Energy for Beams on Plan tab
>High-Dose Technique Type	(300A,00C7)	1C	RT Beams only
>Scan Mode	(300A,0308)	1	RT Ion Beams only
>Treatment Machine Name	(300A,00B2)	2	
>Manufacturer	(0008,0070)	3	
>Institution Name	(0008,0080)	3	
>Institution Address	(0008,0081)	3	
>Institutional Department Name	(0008,1040)	3	
>Manufacturer's Model Name	(0008,1090)	3	
>Device Serial Number	(0018,1000)	3	
>Primary Dosimeter Unit	(300A,00B3)	1	
>Virtual Source Axis Distance	(300A,030A)	1	RT Ion Beams only
>Beam Limiting Device Sequence, Ion Beam Limiting Device Sequence	(300A,00B6), (300A,03A4)	1, 3	RT Beams, RT Ion Beams
>>RT Beam Limiting Device Type	(300A,00B8)	1	
>>Source to Beam Limiting Device Distance	(300A,00BA)	3	RT Beams only
>>Isocenter to Beam Limiting Device Distance	(300A,00BB)	2	RT Ion Beams only
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1	
>>Leaf Position Boundaries	(300A,00BE)	2C	
>Referenced Patient Setup Number	(300C,006A)	3	
>Treatment Delivery Type	(300A,00CE)	3	If present, displayed as the Type for Beams on the Plan tab
>Wedge Sequence, Ion Wedge Sequence	(300A,00D1), (300A,03AA)	1C	RT Beams, RT Ion Beams
>>Wedge Number	(300A,00D2)	1	
>>Wedge Type	(300A,00D3)	2	
>Compensator Sequence, Ion Range Compensator Sequence	(300A,00E3), (300A,02EA)	1C	RT Beams, RT Ion Beams
>>Compensator Number	(300A,00E4)	1	
>>Material ID	(300A,00E1)	2	

>>Compensator ID	(300A,00E5)	3	
>Referenced Bolus Sequence	(300C,00B0)	1C	
>>Referenced ROI Number	(3006,0084)	1	
>Block Sequence, Ion Block Sequence	(300A,00F4), (300A,03A6)	1C	RT Beams, RT Ion Beams
>>Block Type	(300A,00F8)	1	
>>Block Divergence	(300A,00FA)	1	
>>Block Mounting Position	(300A,00FB)	1	
>>Block Number	(300A,00FE)	1	
>>Material ID	(300A,00E1)	2	
>>Block Thickness	(300A,0100)	1	
>Snout Sequence	(300A,030C)	3	RT Ion Beams only
>>Snout ID	(300A,030F)	1	RT Ion Beams only
>Applicator Sequence	(300A,0107)	3	
>>Applicator ID	(300A,0108)	1	
>>Applicator Type	(300A,0109)	1	
>General Accessory Sequence	(300A,0420)	3	
>>General Accessory Number	(300A,0424)	1	
>>General Accessory ID	(300A,0421)	1	
>>General Accessory Type	(300A,0423)	3	
>Lateral Spreading Device Sequence	(300A,0332)	1C	RT Ion Beams only
>>Lateral Spreading Device Number	(300A,0334)	1	RT Ion Beams only
>>Lateral Spreading Device ID	(300A,0336)	1	RT Ion Beams only
>>Lateral Spreading Device Type	(300A,0338)	1	RT Ion Beams only
>Range Shifter Sequence	(300A,0314)	1C	RT Ion Beams only
>>Range Shifter Number	(300A,0316)	1	RT Ion Beams only
>>Range Shifter ID	(300A,0318)	1	RT Ion Beams only
>>Range Shifter Type	(300A,0320)	1	RT Ion Beams only
>Range Modulator Sequence	(300A,0342)	1C	RT Ion Beams only
>>Range Modulator Number	(300A,0344)	1	RT Ion Beams only
>>Range Modulator ID	(300A,0346)	1	RT Ion Beams only
>>Range Modulator Type	(300A,0348)	1	RT Ion Beams only
>Final Cumulative Meterset Weight	(300A,010E)	1C	

>Control Point Sequence, Ion Control Point Sequence	(300A,0111), (300A,03A8)	1	RT Beams, RT Ion Beams
>>Cumulative Meterset Weight	(300A,0134)	2	
>>Nominal Beam Energy	(300A,0114)	3, 1C	RT Beams, RT Ion Beams
>>Dose Rate Set	(300A,0115)	3	RT Beams only
>>Meterset Rate	(300A,035A)	3	RT Ion Beams only
>>Beam Limiting Device Position Sequence	(300A,011A)	1C	
>>>RT Beam Limiting Device Type	(300A,00B8)	1	
>>>Leaf/Jaw Positions	(300A,011C)	1	
>>Gantry Angle	(300A,011E)	1C	
>>Gantry Rotation Direction	(300A,011F)	1C	
>>Gantry Pitch Angle	(300A,014A)	3	
>>Gantry Pitch Rotation Direction	(300A,014C)	3	
>>Beam Limiting Device Angle	(300A,0120)	1C	
>>Beam Limiting Device Rotation Direction	(300A,0121)	1C	
>>Patient Support Angle	(300A,0122)	1C	
>>Patient Support Rotation Direction	(300A,0123)	1C	
>>Table Top Pitch Angle	(300A,0140)	1C	
>>Table Top Pitch Rotation Direction	(300A,0142)	1C	
>>Table Top Roll Angle	(300A,0144)	1C	
>>Table Top Roll Rotation Direction	(300A,0146)	1C	
>>Isocenter Position	(300A,012C)	2C	

RT Brachy Application Setups Module (C.8.8.15) Import

Attribute Name	Tag	Type	Notes
Brachy Treatment Technique	(300A,0200)	1	
Brachy Treatment Type	(300A,0202)	1	
Treatment Machine Sequence	(300A,0206)	1	
>Treatment Machine Name	(300A,00B2)	2	
>Manufacturer	(0008,0070)	3	
>Institution Name	(0008,0080)	3	
>Institution Address	(0008,0081)	3	
>Institutional Department Name	(0008,1040)	3	
>Manufacturer’s Model Name	(0008,1090)	3	
>Device Serial Number	(0018,1000)	3	
Source Sequence	(300A,0210)	1	
>Source Number	(300A,0212)	1	
>Source Type	(300A,0214)	1	
>Source Manufacturer	(300A,0216)	3	
>Active Source Diameter	(300A,0218)	3	
>Active Source Length	(300A,021A)	3	
>Source Isotope Name	(300A,0226)	1	
>Source Isotope Half Life	(300A,0228)	1	
>Source Strength Units	(300A,0229)	1C	

>Reference Air Kerma Rate	(300A,022A)	1	
>Source Strength	(300A,022B)	1C	
>Source Strength Reference Date	(300A,022C)	1	
>Source Strength Reference Time	(300A,022E)	1	
Application Setup Sequence	(300A,0230)	1	
>Application Setup Type	(300A,0232)	1	The following non-standard Application Setup Types are permitted: MAMMOSITE, VAGINAL, CERVICAL, UTERINE, BREAST, MULTICATHETER_BREAST_APPLICATOR, HEAD_AND_NECK, SKIN_AND_SURFACE, PANCREAS_AND_BILE_DUCT, GYNECOLOGY, UROLOGY, EXTREMITIES, STOMACH, INTESTINES, ORBITA, SINGLE_CATHETER, MULTI_CATHETER, UNDEFINED
>Application Setup Number	(300A,0234)	1	
>Application Setup Name	(300A,0236)	3	
>Application Setup Manufacturer	(300A,0238)	3	
>Total Reference Air Kerma	(300A,0250)	1	
>Channel Sequence	(300A,0280)	1	
>>Channel Number	(300A,0282)	1	
>>Channel Length	(300A,0284)	2	
>>Channel Total Time	(300A,0286)	1	
>>Source Movement Type	(300A,0288)	1	
>>Source Applicator Number	(300A,0290)	3	
>>Source Applicator ID	(300A,0291)	2C	

>>Source Applicator Type	(300A,0292)	1C	
>>Source Applicator Name	(300A,0294)	3	
>>Source Applicator Length	(300A,0296)	1C	
>>Source Applicator Step Size	(300A,02A0)	1C	
>>Referenced ROI Number	(3006,0084)	2C	
>>Transfer Tube Number	(300A,02A2)	2	
>>Reference Source Number	(300C,000E)	1	
>>Final Cumulative Time Weight	(300A,02C8)	1C	
>>Brachy Control Point Sequence	(300A,02D0)	1	
>>>Cumulative Time Weight	(300A,02D6)	2	
>>>Control Point Relative Position	(300A,02D2)	1	
>>>Control Point 3D Position	(300A,02D4)	3	

9.1.2.6 RT Dose IOD (A.18) Import

RT Dose IOD (A.18) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	General Series	C.7.3.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Import
	Image Plane	C.7.6.2	See Image Plane Module (C.7.6.2) Import
	Image Pixel	C.7.6.3	See Image Pixel Module (C.7.6.3) Import
	RT Dose	C.8.8.3	See RT Dose Module (C.8.8.3) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

RT Dose Module (C.8.8.3) Import

Attribute Name	Tag	Type	Notes
Dose Type	(3004,0004)	1	
Dose Summation Type	(3004,000A)	1	
Referenced RT Plan Sequence	(300C,0002)	1C	
>Referenced SOP Class UID	(0008,1150)	1	
>Referenced SOP Instance UID	(0008,1155)	1	
>Referenced Fraction Group Sequence	(300C,0020)	1C	
>>Referenced Fraction Group Number	(300C,0022)	1	
>>Referenced Beam Sequence	(300C,0004)	1C	
>>>Referenced Beam Number	(300C,0006)	1	
Grid Frame Offset Vector	(3004,000C)	1C	Dose planes must be uniformly spaced.
Dose Grid Scaling	(3004,000E)	1C	

9.1.2.7 Spatial Registration IOD (A.39) Import

Spatial Registration IOD (A.39) Import

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Patient Module (C.7.1.1) Import
Study	General Study	C.7.2.1	See General Study Module (C.7.2.1) Import
Series	General Series	C.8.8.1	See General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import
	Spatial Registration Series	C.20.1	See Spatial Registration Series Module (C.20.1) Import
Frame of Reference	Frame of Reference	C.7.4.1	See Frame of Reference Module (C.7.4.1) Import
Equipment	General Equipment	C.7.5.1	See General Equipment Module (C.7.5.1) Import
Spatial Registration	Spatial Registration	C.20.2	See Spatial Registration Module (C.20.2) Import
	Common Instance Reference	C.12.2	See Common Instance Reference Module (C.12.2) Import
	SOP Common	C.12.1	See SOP Common Module (C.12.1) Import

Spatial Registration Series Module (C.20.1) Import

Attribute Name	Tag	Type	Notes
Modality	(0008,0060)	1	Must be "REG"

Spatial Registration Module (C.20.2) Import

Attribute Name	Tag	Type	Notes
Content Date	(0008,0023)	1	Used to name SRO if Content Description is not present
Content Time	(0008,0033)	1	Used to name SRO if Content Description is not present
Content Description	(0070,0081)	2	If present, used to name SRO; otherwise, the Content Date and Time are used
Registration Sequence	(0070,0308)	1	Exactly one or two items shall be included in this Sequence

>Frame of Reference UID	(0020,0052)	1C	Required
>Referenced Image Sequence	(0008,1140)	1C	Required
>>Referenced SOP Class UID Sequence	(0008,1150)	1	
>>Referenced SOP Instance UID	(0008,1155)	1	
>Matrix Registration Sequence	(0070,0309)	1	Only a single item shall be included in this Sequence
>>Matrix Sequence	(0070,030A)	1	Only a single item shall be included in this Sequence
>>>Frame Of Reference Transformation Matrix	(0070,030A)	1	
>>>Frame Of Reference Transformation Matrix Type	(0070,030C)	1	Must be "RIGID"

9.1.2.8 Common Module Implementations

Patient Module (C.7.1.1) Import

Attribute Name	Tag	Type	Notes
Patient's Name	(0010,0010)	2	Must be non-empty and not have leading or trailing whitespace
Patient ID	(0010,0020)	2	Must be non-empty and not have leading or trailing whitespace
Patient’s Birth Date	(0010,0030)	2	Must be non-empty
Patient’s Birth Time	(0010,0032)	3	
Patient’s Sex	(0010,0040)	2	Must be non-empty
Patient’s Size	(0010,0020)	3	Used in SUV calculations, if present
Patient’s Weight	(0010,0030)	2	Used in SUV calculations, if present

General Study Module (C.7.2.1) Import

Attribute Name	Tag	Type	Notes
Study Instance UID	(0020,000D)	1	
Study Date	(0008,0020)	2	If present, is third choice for study label on Browse tab
Study Time	(0008,0030)	2	
Study ID	(0020,0010)	2	If present, is first choice for study label on Browse tab
Study Description	(0008,1030)	3	If present, is second choice for study label on Browse tab

General Series Module (C.7.3.1) / RT Series Module (C.8.8.1) Import

Attribute Name	Tag	Type	Notes
Modality	(0008,0060)	1	
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	2	
Series Date	(0008,0021)	3	
Series Time	(0008,0031)	3	
Series Description	(0008,103E)	3	Used as the object label for image sets and RT Doses

Frame of Reference Module (C.7.4.1) Import

Attribute Name	Tag	Type	Notes
Frame of Reference UID	(0020,0052)	1	

General Equipment Module (C.7.5.1) Import

Attribute Name	Tag	Type	Notes
Manufacturer	(0008,0070)	2	
Institution Name	(0008,0080)	3	
Institution Address	(0008,0081)	3	
Station Name	(0008,1010)	3	
Institutional Department Name	(0008,1040)	3	
Manufacturer’s Model Name	(0008,1090)	3	
Device Serial Number	(0018,1000)	3	
Software Versions	(0018,1020)	3	

Image Plane Module (C.7.6.2) Import

Attribute Name	Tag	Type	Notes
Pixel Spacing	(0028,0030	1	Must contain two values
Image Orientation (Patient)	(0020,0037)	1	RT Dose SOP Instances must specify direction cosines as (+/-1, 0, 0, 0, +/-1, 0) or (0, +/-1, 0, +/-1, 0, 0) with an angle tolerance of 0.01 radians, i.e., the dose grid must be orthogonal to the patient coordinate system. CT Image and MR Image SOP Instances may specify any arbitrary (i.e., oblique) direction cosines.

Image Position (Patient)	(0020,0032)	1	

Image Pixel Module (C.7.6.3) Import

Attribute Name	Tag	Type	Notes
Samples per Pixel	(0028,0002)	1	
Photometric Interpretation	(0028,0004)	1	RT Dose only
Rows	(0028,0010)	1	
Columns	(0028,0011)	1	
Bits Allocated	(0028,0100)	1	Must be 16 or 32
Bits Stored	(0028,0101)	1	Must be between 8 and the value of Bits Allocated (0028,0100), inclusive
High Bit	(0028,0102)	1	
Pixel Representation	(0028,0103)	1	
Pixel Data	(7FE0,0010)	1C	

SOP Common Module (C.12.1) Import

Attribute Name	Tag	Type	Notes
SOP Class UID	(0008,0016)	1	Must be correct value for SOP Instance
SOP Instance UID	(0008,0018)	1	

Common Instance Reference Module (C.12.2) Import

Attribute Name	Tag	Type	Notes
Referenced Series Sequence	(0008,1115)	1C	
>Series Instance UID	(0020,000E)	1	
>Referenced Instance Sequence	(0008,114A)	1	
>>Referenced SOP Class UID	(0008,1150)	1	SOP Class UID of Referenced Instance
>>Referenced SOP Instance UID	(0008,1155)	1	
Studies Containing Other Referenced Instances Sequence	(0008,1200)	1C	

>Study Instance UID	(0020,000E)	1	
>Referenced Series Sequence	(0008,1115)	1	
>>Series Instance UID	(0020,000E)	1	
>>Referenced Instance Sequence	(0008,114A)	1	
>>>Referenced SOP Class UID	(0008,1150)	1	
>>>Referenced SOP Instance UID	(0008,1155)	1	

9.1.3 Attribute Mapping

ProKnow DS does not perform any attribute mapping.

9.1.4 Coerced/Modified Fields

ProKnow DS does not coerce nor modify any of the input fields.

9.2 Data Dictionary of Private Attributes

ProKnow DS preserves imported private attributes but does not create new private attributes.

9.3 Coded Terminology Templates

ProKnow DS does not use codes or controlled terminology mechanisms (templates).

9.4 Greyscale Image Consistency

ProKnow DS does not provide support for the DICOM Grayscale Standard Display Function.

9.5 Standard Extended/Specialized/Private SOP Classes

ProKnow DS supports extensions of the standard SOP classes specified in section 1, ignoring any private attributes except where indicated. It does not support any specialized or private SOP classes.

9.6 Private Transfer Syntaxes

ProKnow DS does not support any private transfer syntaxes.

We are healthcare technology innovators, specializing in radiotherapy treatments for cancer and brain disorders.

We help clinicians to improve patients' lives through our forward-thinking treatment solutions and oncology informatics, creating focus where it matters to achieve better outcomes.

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