



Picture archive and communication system contract specification – for teaching archive contribution

This document is also include as an appendix
in The Royal College of Radiologists' *Setting up
a regional or national radiology digital teaching
archive*¹

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Introduction

This document is a picture archive and communication system (PACS) specification to support the creation of teaching files. Key criteria include seamless connection between any vendor's PACS systems to a regional or national teaching or research archive and ability to undertake complete anonymisation/de-identification by the sending institution, particularly cognisant to the requirements for treatment of personal data under the General Data Protection Regulations (GDPR) and other similar legislation.²

It should be read in conjunction with *Setting up a regional or national radiology digital teaching archive*.¹

Teaching files and clinical trials export profile specification

1. Digital imaging and communications in medicine (DICOM) destination configuration:

Picture archive and communication systems (PACS) system administrators must be able to configure one or more teaching archives as DICOM destinations within their PACS.

2. DICOM objects:

PACS must use the DICOM C-STORE or STOW mechanisms to send the following to the **teaching archive destination**:

- The de-identified images
- Associated non-image objects such as DICOM presentation states
- A DICOM manifest – also called key object selection document (KOS object) to define the list of images and some basic information about the submission
- A DICOM structured report (conforming to the additional teaching file information [ATFI] template) to describe the teaching aspects of the case for teaching cases (may be used for research cases as well).

3. Image selection on PACS display

User must be able to select images from one or more series, full study or images from one or more studies for that patient from the PACS display and send it to a teaching/research archive with ease (for example one to two mouse clicks). This functionality must be directly supported by the PACS. In Integrating the Healthcare Enterprise (IHE) terms, this means that the image display actor must be grouped with an export selector.

4. Additional teaching information (DICOM SR) added:

An important function of the export selector is the creation of the **ATFI** document which allows users to add information to the teaching archive along with the selected images as defined above, and this too must be easily populated by the user from their normal PACS workstation (viewer).

The IHE specification for teaching files and clinical trials export profile (TCE) provides a template for the ATFI, but makes it clear that the specifiers of a system should define their own exact rules for its content. The RCR proposes the following template for a teaching archive template (NB: a different template may be required for a research project).

- Sender/author information – name of the sender which is transmitted to the receiving system. This would allow the case to go directly to the author’s personal folder within the teaching archive. This must be a mandatory field (TCE 101 IHERADTF ‘Author’).
- Subject heading or title or abstract – must be **free text** so that users are not restricted and can use subject matters as they wish – for example ‘missed lung cancer’ (if wishing to contribute to an learning from discrepancies meeting [LDM] folder), ‘Interesting case of pneumoconiosis’ (if contributing to an interesting cases folder) and so on. This must be a **mandatory field** (TCE 104 IHERADTF ‘Abstract’).
- Free-text information (these are **optional fields**)
 1. Clinical history (121060 DCM ‘History’)
 2. Findings (121071 DCM ‘Findings’)
 3. Diagnosis/conclusion/impression (111023DCM ‘Differential diagnosis/impression’)
 4. Discussion/learning points (TCE106 IHERADTF ‘Discussion’)
 5. Keywords (TCE 105 ‘Keywords’)

Table 1: Additional teaching file information TCE template (UK) (DICOM SR TEMPLATE FOR TCE ATFI)

	NL	Rel with parent	Value type	Concept name	VM	Req type
1			CONTAINER	EV (TCE006, IHERADTF, “Additional Teaching File Information”)	1	M
2	>	CONTAINS	TEXT	EV (TCE101, IHERADTF, “Author”) ** see note	1	M
3	>>	HAS PROPERTIES	TEXT	EV (TCE102, IHERADTF, “Affiliation”)	1	U
4	>>	HAS PROPERTIES	TEXT	EV (TCE103, IHERADTF, “Contact”)	1	U
5	>	CONTAINS	TEXT	EV (TCE104, IHERADTF, “Abstract”)	1	M
6	>	CONTAINS	TEXT	EV (TCE105, IHERADTF, “Keywords”)	1-n	U
7	>	CONTAINS	TEXT	EV (121060, DCM, “History”)	1-n	U
8	>	CONTAINS	TEXT	EV (121071, DCM, “Finding”)	1-n	U

	NL	Rel with parent	Value type	Concept name	VM	Req type
9	>	CONTAINS	TEXT	EV (TCE106, IHERADTF, "Discussion")	1-n	U
10	>	CONTAINS	TEXT	(111023, DCM, "Differential Diagnosis/ Impression")	1-n	U
11	>	CONTAINS	TEXT	EV (TCE107, IHERADTF, "Diagnosis")	1-n	U

**Note: The fifth (final suffix) component of the name should be a unique identifier for the author. For doctors this should be their General Medical Council (GMC) number in the form GMCxxxxxx.

5. De-identification or anonymisation of images:

This is very important and must happen within the firewall of the sending institution before data is transferred to the teaching archive.

- **Export manager actor of TCE:** Patient-identifiable data, visit and institutional data, physician-identifiable data and equipment data within DICOM headers must be fully anonymised. Users must have confidence that data transferred will be anonymised by the **source institution**, before it leaves the trust firewalls. *Before sending images to a teaching archive, users must be able to preview the images to ensure that patient demographics are not embedded in the pixel data – possibly using a user prompt.* The export manager actor in IHE performs the de-identification function. The export manager actor function could be fulfilled by an image manager actor (which can either be a PACS or even a vendor-neutral archive [VNA]), but could be a stand-alone system if the PACS/VNA are not able to support this functionality. This will ensure that anonymisation/de-identification of DICOM data happens at source (within the firewall) – **before** it reaches the teaching archive.
- **Basic application level confidentiality profile:** For proper de-identification of data, the IHE export manager actor must comply with DICOM PS3.15 Annex E.2 basic application level confidentiality profile.³ 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 and 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 in the non-pixel data attributes, including graphics or overlays 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 organisations involved in ordering or performing the procedure

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- Additional information that could be used to match instances if given access to the originals, such as user identification numbers (UIDs), dates and times
 - Unsafe private attributes.
 - **Retain patient characteristics option**
This retains age, sex and weight information in a way which is extremely unlikely to compromise anonymity and which is useful for teaching purposes (for example age of patient at the time of study acquisition may be useful for teaching).
 - **Retain longitudinal temporal information with modified dates option**
This retains relationships between dates of images in study in a way which is extremely unlikely to compromise anonymity and which is useful for teaching purposes.
 - **Clean pixel data option support**
The basic application level confidentiality profile on its own would not require any changes to the pixel data, even when that contains ‘burnt-in’ patient information as is common in ultrasound and so on. It is important that the export manager must be specified to support the ‘clean pixel data option’ of the basic confidentiality profile, which requires it to ensure that such information is also removed from the pixel data. The mechanisms by which this is achieved are not specified in the standard and could include combinations of heuristics, optical character recognition or even human intervention/checking.
 - **Pseudo-anonymisation log-file**
The export manager must keep a log-file of all study UIDs of the examination sent and also the unique ID assigned by it on its outward journey to the teaching archive. This is important especially if there is a need to re-identify the patient in exceptional circumstances and also when the archive is used for research.
 - **Retain safe private option**
This allows a restricted set of private attributes which are important for research use to be maintained without risking leakage of personal information.

References

1. The Royal College of Radiologists. *Setting up a regional or national radiology digital teaching archive*. London: The Royal College of Radiologists, 2017.
 2. <https://www.eugdpr.org/> (last accessed 26/6/2018)
 3. <http://dicom.nema.org/medical/dicom/current/output/html/part15.html> (last accessed 26/6/18)
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