

DICOM Correction Proposal

STATUS	Final Text
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Correction Number	CP-2144
Log Summary:	Cleanup PS3.17 section AA to refer to IHE REM profile and figures
Name of Standard	PS3.17 2022b
Rationale for Correction:	<p>The current content of PS3.17 Annex AA: Radiation Dose Reporting Use Cases (Informative) was created by Supplement 94 in 2004. Meanwhile the IHE REM (Radiation Exposure Management) Profile describes the important Use Cases in well-defined precision.</p> <p>The scope of this CP is to clean up the use cases in PS3.17 that are redundant with the IHE REM profile and therefore no longer needed to avoid inconsistencies.</p> <p>As per discussion of Supplement 94, the sub-section with the Definitions shall remain untouched to complete the understanding of the Dose Reporting Templates laid out in PS3.16 of the Standard.</p> <p>Some remaining workflows shall be kept to indicate simple use scenarios, not mentioned on IHE, but relevant for fostering the possibility of electronic dose documentation.</p>
Correction Wording:	

AA Radiation Dose Reporting Use Cases (Informative)

AA.1 PURPOSE OF THIS ANNEX

This Annex describes the use of the X-Ray Radiation Dose SR Object. Multiple systems contributing to patient care during a visit may expose the patient to irradiation during diagnostic and/ or interventional procedures. Each of those equipment may record the dose in an X-Ray Dose Reporting information object. Radiation safety information reporting systems may take advantage of this information and create dose reports for a visit, parts of a procedure performed or accumulation for the patient in total, if information is completely available in a structured content.

AA.2 DEFINITIONS

Irradiation Event

An irradiation event is the loading of X-Ray equipment caused by a single continuous actuation of the equipment's irradiation switch, from the start of the loading time of the first pulse until the loading time trailing edge of the final pulse. The irradiation event is the "smallest" information entity to be recorded in the realm of Radiation Dose reporting. Individual Irradiation Events are described by a set of accompanying physical parameters that are sufficient to understand the "quality" of irradiation that is being applied. This set of parameters may be different for the various types of equipment that are able to create irradiation events. Any on-off switching of the irradiation source during the event is not treated as separate events, rather the event includes the time between start and stop of irradiation as triggered by the user. E.g., a pulsed fluoro X-Ray acquisition is treated as a single irradiation event.

Irradiation events include all exposures performed on X-Ray equipment, independent of whether a DICOM Image Object is being created. That is why an irradiation event needs to be described with sufficient attributes to exchange the physical nature of irradiation applied.

Accumulated Dose Values

Accumulated Dose Values describe the integrated results of performing multiple irradiation events. The scope of accumulation is typically a study or a performed procedure step. Multiple Radiation Dose objects may be created for one Study or one Radiation Dose object may be created for multiple performed procedures.

AA.3 USE CASES

The following use cases illustrate the information flow between participating roles and the possible capabilities of the equipment that is performing in those roles. Each case will include a use case diagram and denote the integration requirements. The diagrams will denote actors (persons in role or other systems involved in the process of data handling and/or storage). Furthermore, in certain cases it is assumed that the equipment (e.g., Acquisition Modality) is capable of displaying the contents of any dose reports it creates.

These use cases are only examples of possible uses for the Dose Report, and are by no means exhaustive.

AA.3.1 Basic Dose Reporting

This is the basic use case for electronic dose reporting. See Figure AA.3-1.

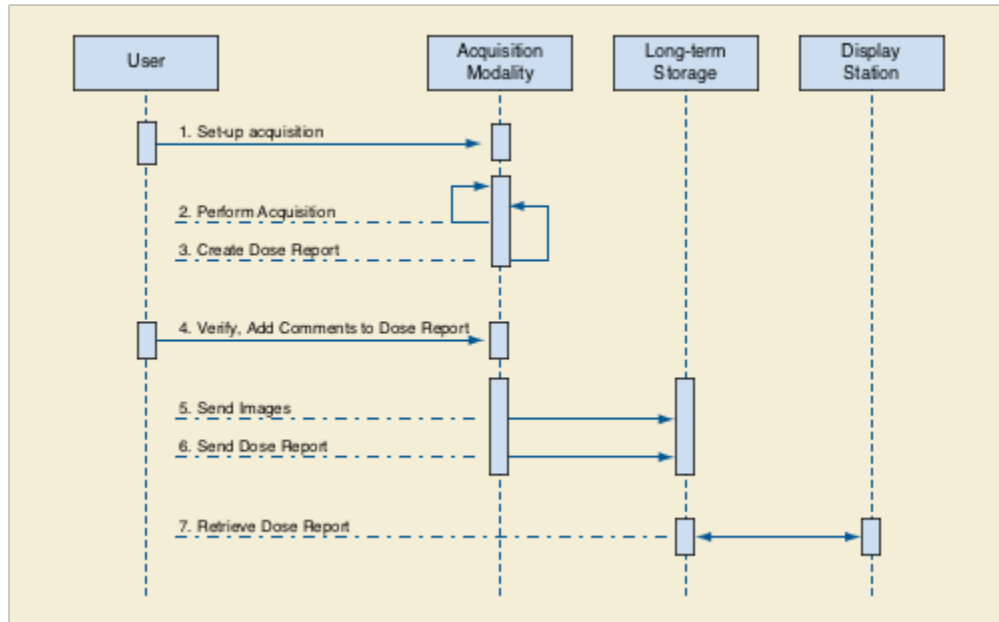


Figure AA.3-1. Basic Dose Reporting

In this use case the user sets up the Acquisition Modality, and performs the study. The Modality captures the irradiation event exposure information, and encodes it together with the accumulated values in a Dose Report. The Modality may allow the user to review the dose report, and to add comments. The acquired images and Dose Report are sent to a Long-Term Storage system (e.g., PACS) that is capable of storing Dose Report objects.

A Display Station may retrieve the Dose Report from the Storage system, and display it. Because the X-Ray Radiation Dose SR object is a proper subset of the Enhanced SR object, the Display Station may render it using the same functionality as used for displaying any Enhanced SR object.

AA.3.2 Dose Reporting For Non-digital Imaging Manual Data Entry

The Dose Report, by manual data entry, may also be used for image acquisitions using non-digital Acquisition Modalities. See Figure AA.3-2.

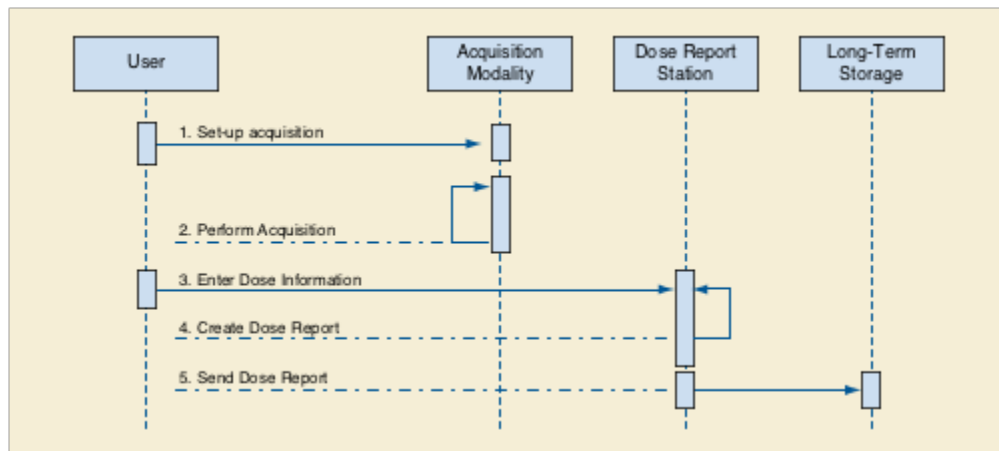


Figure AA.3-2. Dose Reporting for Non-Digital Imaging by Manual Data Entry

In this use case the user may manually enter the irradiation event exposure information into a Dose Reporting Station, possibly transcribing it from a dosimeter read-out display. The station encodes the data in a Dose Report and sends it to a Storage system. The same Dose Reporting Station may be used to support several acquisition modalities.

This case may be useful in ~~film-only~~ radiography environments, ~~or in mixed film and digital environments with legacy systems not being able to provide DICOM functions~~, where the DICOM X-Ray Radiation Dose SR Object provides a standard format for recording and storing irradiation events.

Note that in a non-PACS environment, the Dose Reports may be sent to a Long-Term Storage function built into a Radiation Safety workstation or information system.

AA.3.3 Dose Reporting Post-processing

A specialized Radiation Safety workstation may contribute to the process of dose reporting in terms of more elaborate calculations or graphical dose data displays, or by aggregating dose data over multiple studies. See Figure AA.3-3. The Radiation Safety workstation may or may not be integrated with the Long-Term Storage function in a single system; such application entity architectural decisions are outside the scope of DICOM, but DICOM services and information objects do facilitate a variety of possible architectures.

In the following figure AA.3-3. remove the following transactions in the graphic:

“4. Store Cumulative Dose Report”,

“5. Retrieve Referenced Images”,

“6. Create Dose Map”,

“7. Store Dose Map”

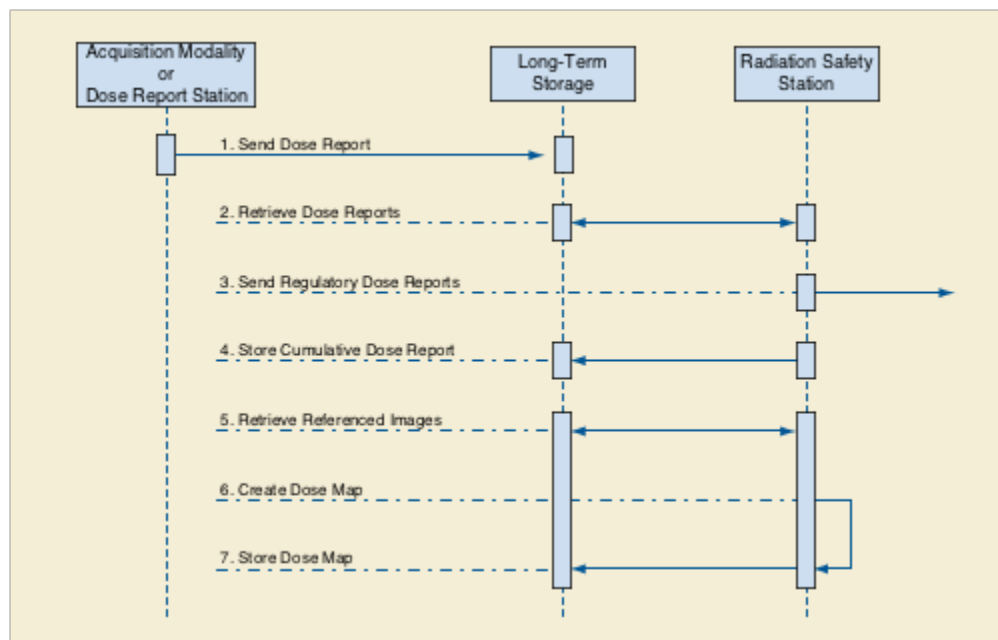


Figure AA.3-3. Dose Reporting Post-Processing

The Radiation Safety workstation may be able to create specific reports to respond to dose registry requirements, as established by local regulatory authorities. These reports would generally not be in DICOM format, but would be generated from the data in DICOM X-Ray Radiation Dose SR objects.

~~The Radiation Safety workstation may also be used to generate more elaborate reports on patient applied dose. The workstation may retrieve the Dose Reports for multiple procedures performed on a particular patient. A report of the cumulative dose for a specified time period, or for a visit/admission, may be generated, encoded as a DICOM Dose Report, and stored in the Long-Term Storage system. Any such further reports will be stored in addition to the "basic report".~~

~~Note that such cumulative Dose Reports may describe irradiation events that are also documented in other Dose~~

~~that may be reported in multiple objects. The structure of the X-Ray Radiation Dose SR object also allows a cumulative report to reference the contributing report objects using the Predecessor Documents Sequence (0040,A360) attribute.~~

~~An advanced application may be able to use the Dose Report data, potentially supplemented by the data in the image objects referenced in the Dose Report, to create a Dose Map that visualizes applied dose. Such a Dose Map may be sent to the Long Term Storage system using an appropriate object format.~~

Other purposes of the Radiation Safety workstation may include statistical analyses over all Dose Report Objects in order to gain information for educational or quality control purposes. This may include searches for Reports performed in certain time ranges, or with specific equipment, or using certain protocols.

AA.3.4 Dose Reporting Workflow Management (Retired)

~~The dose reporting workflow may be managed using the same DICOM services used for managing the imaging workflow.~~

~~In particular, a Dose Report produced for an Acquisition Modality Performed Procedure Step can be identified in the MPPS Referenced Non-Image Composite SOP Instance Sequence (0040,0220).~~

This section was previously defined the DICOM Standard but has been retired (see PS3.17-2021b). Dose Reporting workflow is described in the IHE Radiology Radiation Exposure Monitoring (REM) Integration Profile.