Pitfalls in manual dose reporting: A case report

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Authors: I. Rausch; ESHIMT Research Committee Vienna/AT
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Background/introduction

Single Photon Computed Tomography / Computed tomography (SPECT/CT) has been demonstrated to provide clinical value in patients with a range of benign and malignant diseases (1), and therefore, has become a standard imaging modality in nuclear medicine.

Nevertheless, both modalities (SPECT and CT) are based on the use of ionizing radiation. Thus, a SPECT/CT examination implies a risk of adverse stochastic effects associated with the radiation dose besides the clinical benefit of the examination.

To judge if the benefit of an examination exceeds the risk related to the exposure, an estimate of typical patient dose is needed for the specific examination protocols. However, for SPECT/CT an international survey reported a rather heterogeneous adoption of CT in the context of SPECT/CT (2) and a multicentre study showed large variations in patient dose between different SPECT/CT centres (3). Therefore, we conducted a study collecting information on exposure levels from three different imaging sites, to get further insights into typical exposure levels in routine SPECT/CT imaging (4).

To collect the necessary information on exposure levels, each site used a standard survey form presented in Excel format to document prospectively relevant exposure information for all combined SPECT/CT examinations conducted for a duration of a minimum of 4 month. During the data evaluation, several pitfalls of this manual data collection approach became visible. To raise awareness of possible flaws in such a manual reporting, this work seeks to provide an overview of issues encountered in the above mentioned study.
Description of activity and work performed

During the study period, the respective technologist on duty was asked to manually enter the following information into a standard Excel form:

Patient information:

 Acquisition date, a pseudonym for the patient, patient age, patient weight, patient height, patient gender.

Study information:

 CT acquisition protocol, type of SPECT examination and examined organ.

Technical information:

 Peak tube voltage (kVp), tube current time product (mAs), CTDIvol (mGy), DLP (mGy*cm), tracer, injected activity (MBq).

During data evaluation, the following pitfalls were encountered:

1. Wrong acquisition date: For contrast enhanced CT protocols one entry was done for each CT series. In such cases the examination date partly differed for one year between the series. As the examination date was one of the parameters to automatically attribute the different series to one examination, this caused major problems. The reason for this pitfall was found in the properties of Excel, adding one year per line if the date was copied to the next line by drop down.

2. Patient age and patient weight was interchanged in the Excel form (e.g. a patient with 45 cm size and 152 kg was reported): This issue was quite frequent (for one centre in >50% of the cases).

3. The examination protocol was not fitting the used tracer (e.g. one Myocardial perfusion examination was reported to be done with Tc-99m DPD which is a bone tracer).

4. Missing information: for multiple data sets, information was partly missing (e.g. patient weight and size, used tracer or imaging protocol).

5. Myocardial Stress/Rest perfusion imaging missing examinations: One technologist did only report data on "Stress" examinations in Tc-99m MIBI Stress/Rest protocols.
As a consequence of the occurrence of such pitfalls in a non-negligible amount of cases, any data entry was rechecked for consistency. Missing information was retrospectively added from the clinical records. Data sets which could not be restored/verified were deleted. This whole process delayed the data evaluation for several months.
Conclusion and recommendations

The manual assessment of examination parameters for individual patients is prone to mistakes in reporting. The retrospective inspection and verification of the data is difficult and time consuming especially in pseudonymized data and maybe impossible for anonymized data. Therefore, automatic reporting systems are recommended for the collection of large amounts of examination parameters and data on exposure of individual imaging studies.
Personal/organisational information

This work was submitted by Ivo Rausch, Center for Medical Physics and Biomedical Engineering, Medical University of Vienna on behalf of the ESHIMT research committee.

For correspondence please contact: ivo.rausch@meduniwien.ac.at

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References


