

## Standardized image documentation in nuclear medicine

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*There are no generally accepted standards for image documentation in every day nuclear medicine practice. This is a problem whenever hardcopies from other centers are to be re-interpreted or compared to present images of the same patient. In order to support image reading by a third party proposals of documentation necessary within images are elaborated. Examples of image documentation of the most frequently performed nuclear medicine studies are given, i.e. lung scintigraphy, thyroid scintigraphy, bone scintigraphy both in planar and in SPECT-technique, renal function scintigraphy, myocardial perfusion scintigraphy, and positron emission tomography. These examples are intended to stimulate discussion within the nuclear medicine community about the content of documentation necessary in nuclear medicine images.*

*Key words: nuclear medicine; diagnostic imaging; medical records-standards; minimal requirements*

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### **Problems of image documentation in nuclear medicine**

There are no generally accepted standards for image documentation in every day nuclear medicine practice. This is a problem, whenever hardcopies from other departments/clinics/institutions have to be re-interpreted or compared to present images of the same patient. This problem is independent of the image quality itself. Even best image quality may be insufficient for interpretation, if essential information is missed. In consequence, incomplete image documentation may render interpretation difficult or even

impossible. Thus, the main task of the working group „Standardized Image Documentation“ of the German Society of Nuclear Medicine is to define guidelines for minimal requirements of nuclear medicine image documentation. This group has gained experience in this field for the last three years. Their proposals have been discussed on several national conferences and published in different journals.<sup>1-4</sup> The members of the working group are co-operating with corresponding working groups of various national nuclear medicine societies.

The examples presented below should be extensively discussed in order to maintain a consensus about them. These generally accepted standards could then support the manufacturers of nuclear medicine computers to implement the accepted requirements within their software. However, the standardization of image documentation should be

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considered as definitely independent of the ongoing standardization of nuclear medicine procedures. Furthermore, the elaborated proposals should not limit the definition of individual layout or individual extensions in image documentation.

### Examples of images

The presented examples of typical nuclear medicine studies are partly representing the results of consensus conferences held as pre-congress meetings prior to the last three national congresses of nuclear medicine in Germany. The subcommittee considers them in a presented form as an initial point for an intended discussion within the European Nuclear Medicine Community. They are designed to cover the requirements of every day routine studies. The limitation of labeling to the minimum necessary for understanding of the image content by third parties is one of the declared intentions of the subcommittee. However, individual extensions of these minimal requirements by particular institutions should be permitted definitely.

Several data should be documented clearly on all nuclear medicine studies, i.e. patient name, date of birth, date of the study, and institution in which the study was performed. The injected amount of radioactivity and the tracer used are probably the most important study related data. The interpretation of the image should be supported by the display of the color bar used. Parameters derived from regions-of-interest should be supported by documentation of the underlying ROIs. The image sequence with the time of individual images should be documented for image sequences.

For most often performed types of studies the following specific requirements should be fulfilled in addition to the above mentioned basic requirements.

#### *Lung*

Thorough labeling of the views is mandatory in lung scintigraphy. Ventilation and perfusion studies should be clearly distinguished by appropriate labels (Figures 1 and 2). Documentation may be completed by denoting the side-related perfusion as well as the position of the patient both at the time of injection and during acquisition.

#### *Thyroid*

Labeling of the jugulum and of the Technetium-99m-uptake value in percent is essential in documentation of thyroid scintigraphy. It is recommended to complete the documentation by the matrix size, the display of the reference scale, and the time interval between injection and acquisition. It may be helpful to identify findings of palpation within the image (Figure 3).

#### *Bone*

Whole body bone scans should be documented at least in two directions both at two intensity levels, the first optimized for the ribs and the second for the spine (Figure 4).

#### *Myocardium*

For myocardial perfusion SPECT, the whole left ventricular myocardium has to be documented. Short axis, horizontal and vertical long axis slices should be presented both as stress and as rest images. An optimized arrangement of identical slices of the stress and resting study within the same image is recommended. Moreover, information on the position of the patient during acquisition and anatomical labeling of the slices are required. Pictograms or data about the type of the stress may support interpretation of the images as well (Figure 5).

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Musterman , Otto, date of birth : 06-16-64, date of study: 05-29-98

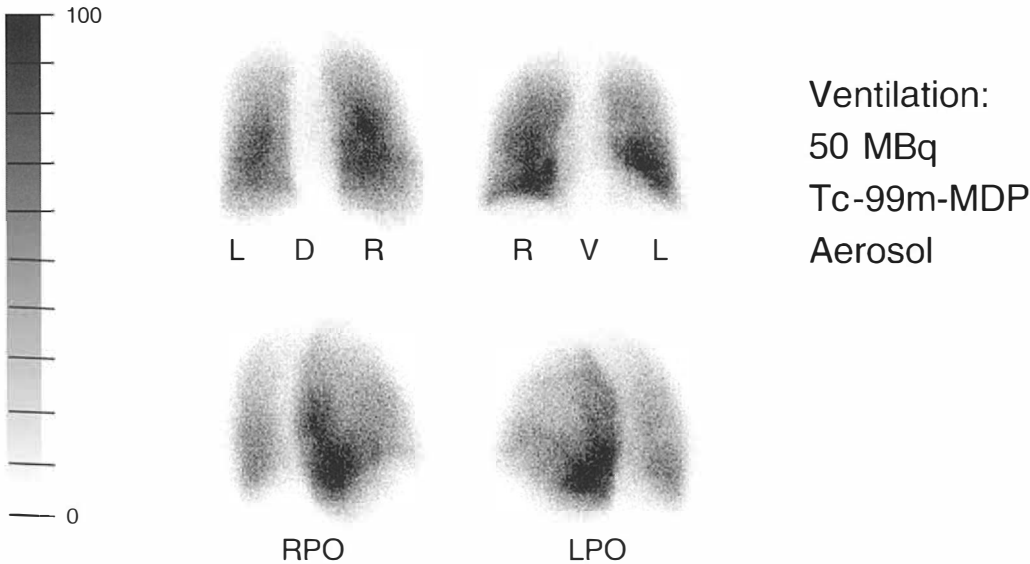


Figure 1. Ventilation scintigraphy of the lung.

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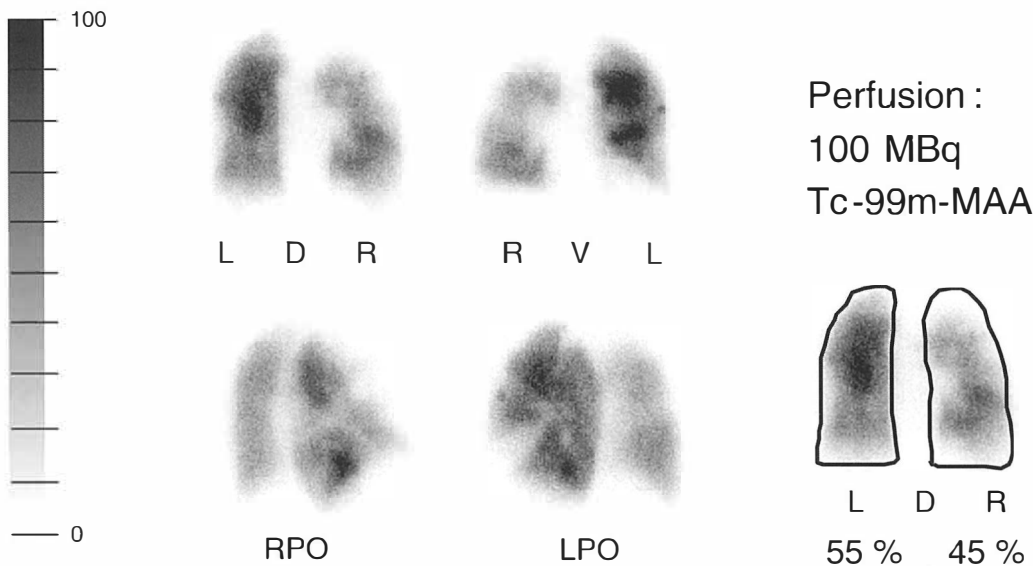


Figure 2. Perfusion scintigraphy of the lung.

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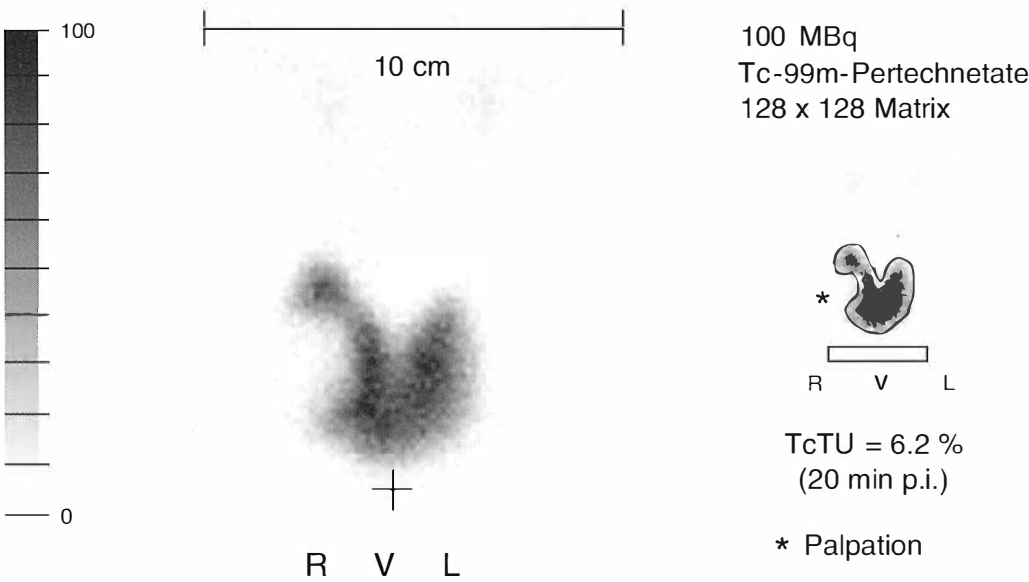


Figure 3. Quantitative thyroid scintigraphy.

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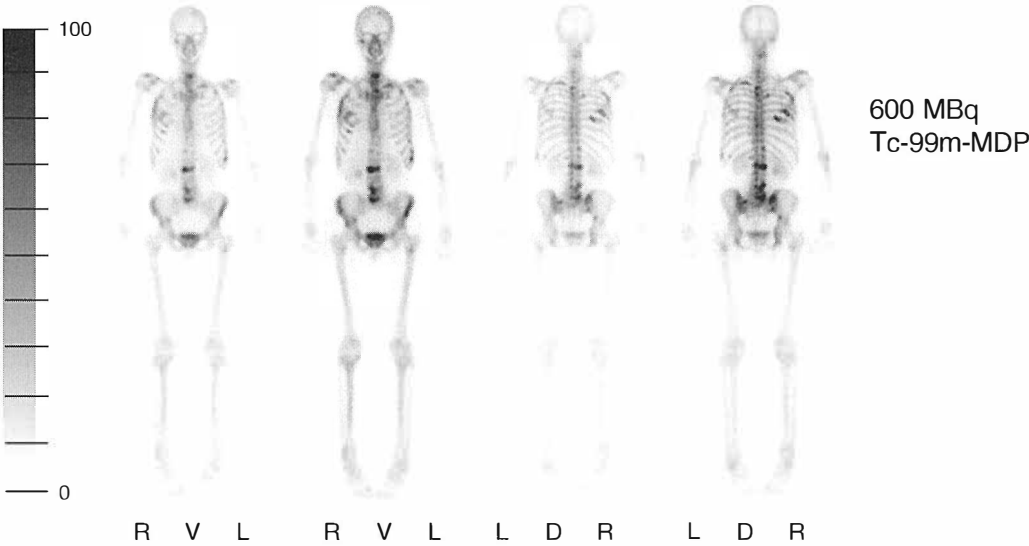


Figure 4. Whole body bone scan.

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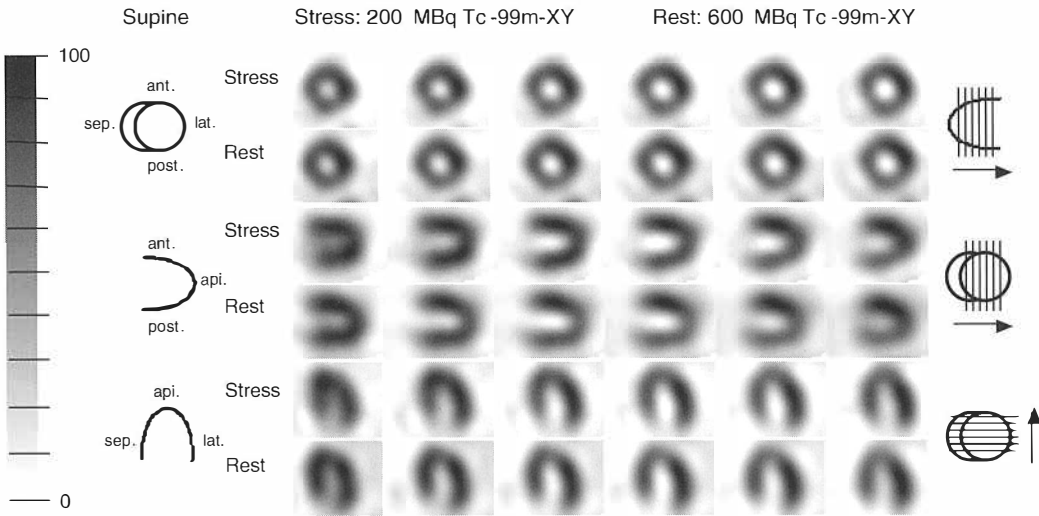


Figure 5. Myocardial perfusion scintigraphy.

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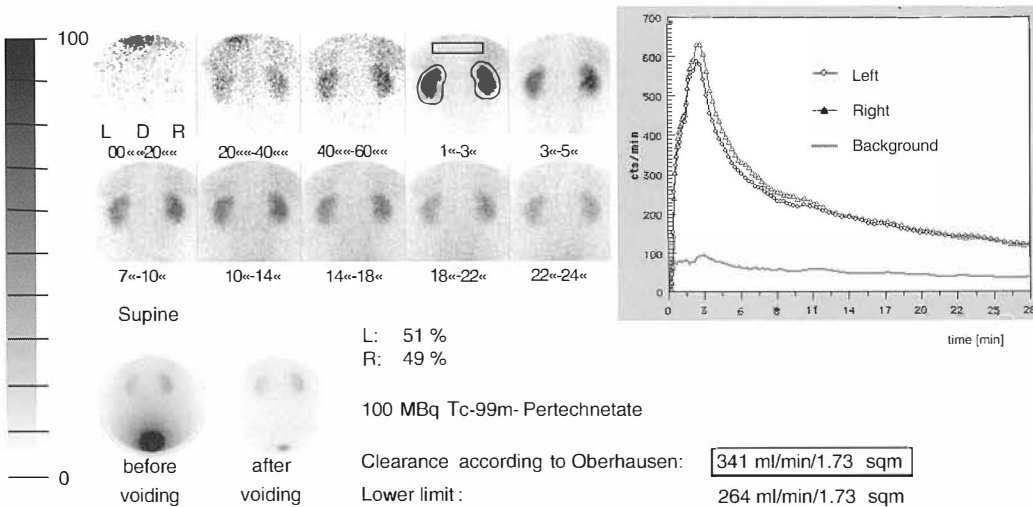


Figure 6. Renal function scintigraphy.

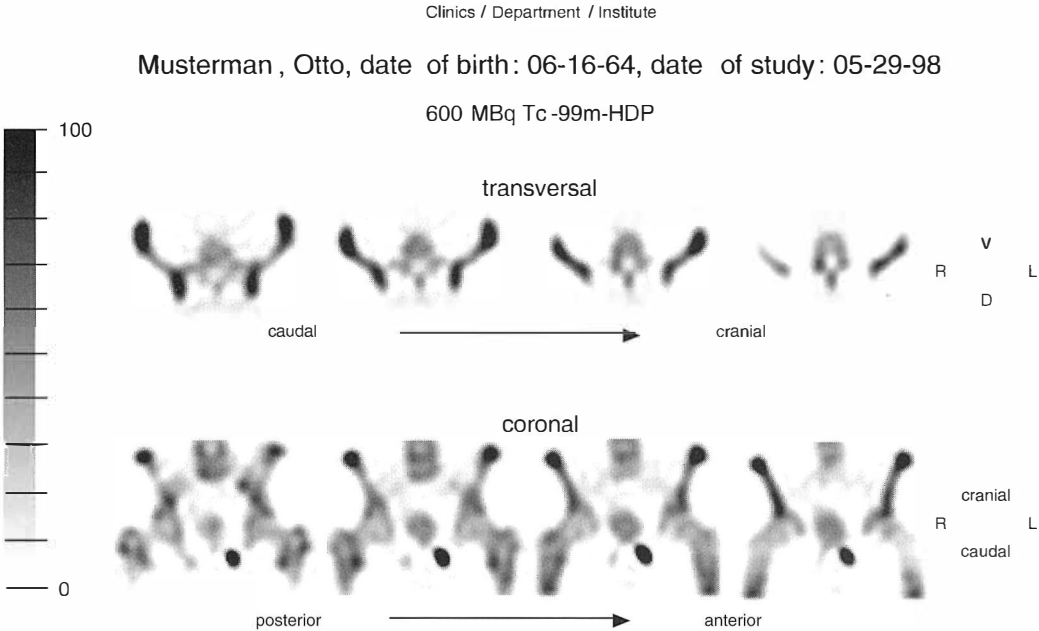


Figure 7. Transersal and coronal slices of bone scan in SPECT-technique.

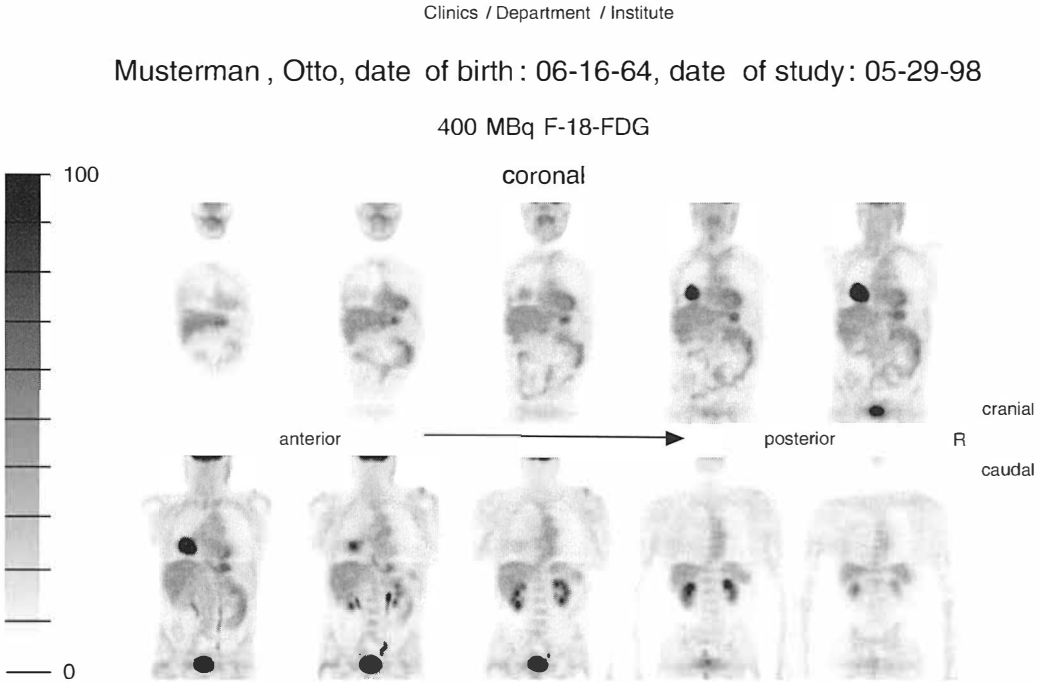


Figure 8. Coronal slices of positron emission tomography.

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400 MBq F-18-FDG

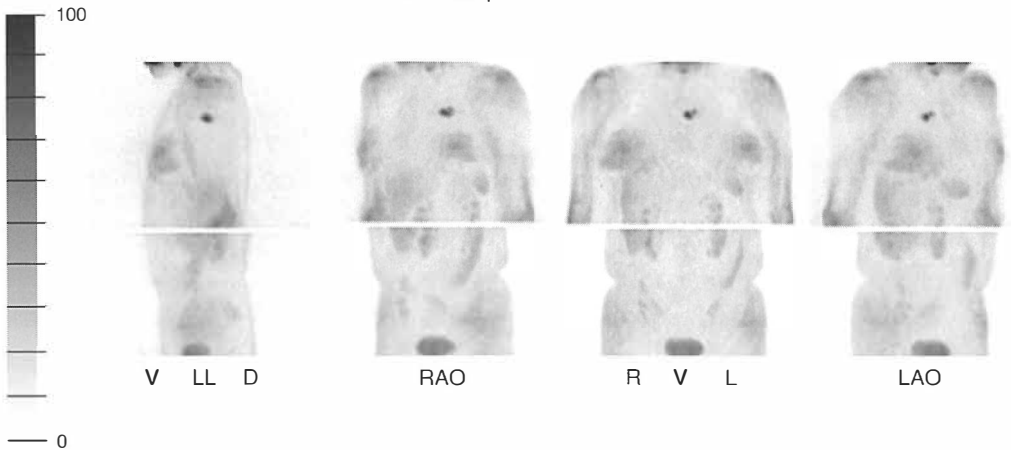


Figure 9. MIPs of positron emission tomography.

#### Function of the kidneys

Split renal function is the main data that should be documented within the image. Apart from numeric data on clearance, the method and age-dependent lower limits should be given in renal scintigraphy. After diuretics the documentation of the time of application, the curve and the effect of the diuretics in percent are essential (Figure 6). For the Captopril scintigraphy a separate documentation is recommended.

#### SPECT / PET

Regarding tomographic studies both the direction of the slice sequence and an anatomical labeling of the slices should be presented within the images (Figures 7 and 8). The interpretation of images may be supported by the use of pictograms. PET studies may be displayed as maximum intensity projections (MIPs) for overview (Figure 9).

#### Conclusion

Standardized image documentation in nuclear medicine is mandatory in order to ease image reading by a third party. Suggestions given above should be extensively discussed among nuclear medicine physicians in order to maintain a consensus about them.

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