

WP4 Deliverables: WD4.1

The present report gives some explanation with the first deliverables of the ORAMED (Optimization of Radiation Protection of Medical Staff) project WP4 (Extremity dosimetry in nuclear medicine). The first WP4 deliverables are: the protocol for measurements and the protocol for simulations.

Measurement protocol

Within WP4 an extensive measurement program will be done in various hospitals in Europe using the same measurement protocol (Annex 1, 2, 3 and 4) to evaluate extremity doses and dose distributions across the hands of medical staff working in nuclear medicine departments. By using the same protocol in all hospitals, the measurements will be homogenized and all data will be compared and evaluated.

The protocols elaborated will cover the fields of diagnostics nuclear medicine procedures and those of therapy. The structure and the general information required for the measurement protocol is common for all radionuclides with some minor differences specific for different preparation procedures of the radionuclides. The protocol includes two phases: preparation and injection. The measurement protocol has been developed by the different partners involved in WP4, and has been optimised by test measurements. The specific modifications for the therapy measurement protocols will be included once the tests measurements will be completed.

The equipment parameters used in the different nuclear medicine services, such as syringe and vial dimensions, shielding devices, are also noted down in order to correlate them with the extremity doses. All the data will be analyzed in order to define the optimal radiation protection measures.

The data that need to be recorded in the measurement protocol are:

- General information for the hospital, worker and procedure of work
- The information about the equipment used by the medical staff, including the protective equipment as syringe and vial shields
- The measuring points: in total 11 measuring points for each hand have been chosen. Different positions at the inside and at the outside of the hand have been chosen. The details about the positions of the TLDs are given in the protocol.
- The activities and instrumentation used during the preparation process as well as those used for the injection process.
- The number of doses produced and injected with a special attention paid to the activities of those doses.

Simulation protocol

In order to perform the numerical simulations for a set of combinations of the main parameters that influence the extremity doses in nuclear medicine, a simulation protocol has been established (Annex 5 and 6) between the WP4 simulation partners. The simulation of the different procedures in nuclear medicine will be performed to determine the effectiveness of different radiation protection measures. As for the measuring protocol, the simulation protocol elaborated will cover the fields of diagnostics nuclear medicine procedures and those of therapy, as well as the two different processes like preparation and injection.

For the simulations, different scenarios (Annex 7) have been chosen together with the different hand phantoms which represent the most typical hand positions when preparation and injecting the doses. These hand phantoms will be produced out of paraffin and will be scanned to be later voxelized and introduced in the simulation code input file. A test of the whole procedure has been realized with three different hand phantoms.



The data needed for the simulation protocol is the following:

- The Monte Carlo Code and the simulated scenario
- The description of the source, isotope, activity... The main emissions of the radionuclides to be considered in the simulation have been also specified.
- The equipment used by the staff as well as the different protective devices.
- The TLD characteristics.