External radiation dose in a Spanish Central Radiopharmaceutical Service

J. Baró [(1)], C. Piera [(2)] and I. Ramirez [(2)]

(1) Barcelona University. Radiological Protecition Service josep@org.ossma.ub.es
(2) CADISA, C/ Josep Anselm Clavé nº 100, 08950 Esplugues de Llobregat (Barcelona), Spain

Nuclear Medicine Departments use radiopharmaceuticals in order carry out their diagnostic and therapeutical tasks. Originally, all the radiopharmacy was carried out by technicians at each individual clinical site. Each Nuclear Medicine Department purchased its own generator (one or more per week), and prepared radiopharmaceuticals daily as needed. Nowadays, the Central Radiopharmacy Services (CRS) prepare the radiopharmaceuticals in individual units, and deliver them to several clinical sites, according to demand. Thus, there is decrease in the total amount of generators and radiopharmaceutical activity, as well as the corresponding generated waste. Within a CRS there is important activity (of the order of 500 GBq), due basically to liquid radiopharmaceuticals labelled with gamma emitters, which represents a risk of contamination and external radiation. The second risk can be quantified by measuring the external dose received by the workers.

In this paper, the evolution of external doses at the CADISA CRS, which is working since November 1995, is shown. This CRS is serving some hospitals and some free-standing Nuclear Medicine Departments. The radiopharmaceuticals are dispensed in individual units and are transported, by an outside company, to the licensed customers using type A packages. Afterwards, the contaminated waste material used for radiopharmaceutical administration to the patient is returned to the CRS using the same packages.

In 1996 an amount of 81312 individual units were prepared, which have produced a collective equivalent depth dose of 37.02 mSv x man to the CRS workers and a maximum individual equivalent depth dose of 9.43 mSv. In 1997 the number of individual units was 96716, and the corresponding collective depth dose and maximum individual dose were 27.09 mSv x man and 6.94 mSv respectively. Finally, during the first three months of 1998 the number of individual units has been 26303, with its corresponding collective depth dose of 6.55 mSv x man.

These figures represent a satisfactory evolution in reduction of the dose. The following table shows the collective equivalent dose per individual unit for each considered period:

Period	collective eq. dose per indiv. unit
Year 1996	0.455 _Sv/indiv. unit
Year 1997	0.280 _Sv/indiv. unit
First quarter of 1998	0.249 _Sv/indiv. unit

The collective dose due to transport is not greater than 2 mSv x man per year.

The use of ALARA culture during the design period, apart from optimisation of the shielding dimensions, basically consists of good space distribution in order to provide a safe working environment. The goodness of this design is reflected in a reasonable collective dose during the first working year. Moreover, the dose reduction in the following years is due to minor design improvements and basically to the skill of the personal. The next step in dose reduction could be the use of robots for dispensing the individual units.