Operational risks and radiation exposure related to NM Departments

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Since already between ten to twenty years, Nuclear Medicine Departments has been evolved significantly, namely first with the need to introduce PET – so Positron Emitting Tracers – on the classical Nuclear Medicine Departments, and secondly – and more actually – with the need to introduce Hybrid Systems, meaning this starting to include CT – so X Rays – for the first time in most of Departments that usually only deal with gamma emissions and, in any cases and less frequently, any beta emitters. This is an increasingly more and more popular trend, which will be – no doubt about it – followed by the next generation PET-MRI, introducing again a new source of radiation exposure, electromagnetically relevant this time. So, if there is no doubt that radiation exposure is indeed always an important issue, there is also the need to be able to comply with all the different levels and natures that might be concerned, depending on the Department, based not only on the equipment installed but essentially on the number and respective type of Nuclear Medicine examinations and procedures, modulated by the number of professionals executing them. Also, it must always be considered the possibility that the patient relative distribution (for instance: nuclear cardiology versus whole body scans, ^{201}Tl versus ^{99m}Tc, etc.) might be changing significantly quite quickly – as it is already happening in some countries, because of Technetium shortage, for instance, just to mention a very actual issue – obliging responsible professionals to keep things under strict surveillance and to try to constantly optimize intra-Departmental flows. Also in this sense, the design and specific organization of spaces and tasks in any modern Nuclear Medicine Department is far more complex than it used to be twenty years ago.

During this part of the presentation, it will be quickly surveyed the different kinds of structural organizations found at actual Nuclear Medicine Departments, mentioning them all, from the minimalist strictly SPECT based to the inclusion of PET, CT, MRI and Therapeutic Rooms. A special mention will be done for the cases of "Integrated Nuclear Medicine Departments" that, apart from all the Diagnostic and Metabolic Therapy activities, also include a radiopharmaceutical production facility, including on its premises a Clinical – Low Energy – Cyclotron and the correspondent Laboratories, since it is something more and more frequent in some countries, since it is perceived as allowing an interesting level of internal freedom and autonomy, namely concerning the industrial – external – radiopharmaceutical providers. Nevertheless, it indeed introduces another level of radiation exposure risks, which will be quickly mentioned either.

On other hand, distinct approaches needed to be considered, in order to assure the optimization – minimization – of radiation exposure risks regarding not only the patients by themselves, but also the health professionals dealing directly or indirectly with them, the remaining members of the family, the public and the environment.

During this presentation, some general considerations will be advanced, considering both type of cases: the need of adaptation of a previously existing classical – only SPECT – Nuclear Medicine Department to the introduction of PET, CT and MRI, as well as the possibility to start from the beginning, with the design of an entire (new) NM Department, in order to allow the distinct patterns of functioning and circulation (concerning patients, public, professionals, products, etc.) to occur in an harmonious and most efficient way. The purpose of this part of the study was to integrate the ultimate concepts concerning aspects so crucial as radiation protection, ergonomics and the practicability and efficiency of the facility, considered as a whole.

References

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