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### Medical Imaging in Croatia: Nuclear Medicine

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**Asst. Prof. Drazen Huic, 46, has been working in nuclear medicine since 1991. He is a nuclear medicine specialist and presently works as head of the Centre for Radiation Medicine and Protection in Clinical Department of Nuclear Medicine and Radiation Protection, University Hospital Rebro, Zagreb, Croatia. Dr. Huic is also involved in students' education as an assistant professor at the School of Medicine, University of Zagreb, Croatia. On a European level, he acts as president-elect of the UEMS/Section Nuclear Medicine. His main areas of interest in nuclear medicine are thyroid cancer, nuclear oncology, haematology and PET.**

The Clinical Department of Nuclear Medicine and Radiation Protection, located at the University Hospital Rebro in Zagreb, is the oldest and largest nuclear medicine department in Croatia, originating in 1959. Croatian nuclear medicine started nearly simultaneously with the appearance of other European nuclear medicine departments. The department is organised in several divisions: the polyclinic division for thyroid diseases (consulting and ultrasound), a clinical division with 12 beds for radioisotope therapy, a polyclinic division for functional investigations, a polyclinic division of scintigraphy, division of biophysics, division of radiopharmacy and radioimmunology and a centre for radiation medicine and protection. There are 84 staff members, out of which there are 18 physicians (three residents), five physicists or electronic engineers, and three chemists. The clinical department of nuclear medicine and radiation protection now has seven gamma cameras; each year about 135,000 diagnostic or therapeutic procedures are performed, which accounts for approximately 30% of all nuclear medicine procedures in Croatia. The most in-demand procedures in my department are cardiac scans, bone scans, brain perfusion and receptor scintigraphy, PET in oncology and renal scintigraphy.

There is also huge demand for thyroid studies, especially ultrasound and fine needle aspiration biopsy (about ten thousand ultrasound exams and four thousand fine needle aspirations are carried out yearly). Because of a sufficient number of staff, we do not have long waiting lists, though sometimes patients must wait two to three months for a cardiac scan or thyroid ultrasound. Patients are well informed about the diagnostic/therapeutic procedures they will be exposed to, and informed consent is required.

#### How Evolved is Nuclear Medicine in Croatia?

At present, there are eleven nuclear medicine departments in Croatia. The national development of the science is not uniform. There are some centres with very advanced equipment, but also others with rather outdated gamma cameras. Standard (mostly technetium-based) nuclear medicine is generally well covered, but there is a lack of PET units and sections for radioisotope therapy. Although the first PET study with FDG was performed at the end of 1999 in our department (coincidence PET), advanced PET machines are only available at the moment in private facilities (at PET/CT centres in Zagreb and Split). There is also a problem with the supply of PET tracers, which are imported from Austria. Fortunately, the construction of a cyclotron at an institute in Zagreb will be finished soon and the production of our own PET tracers will begin.

Another field that requires further development is nuclear medicine therapy. Roughly half of nuclear medicine departments in Croatia are capable of doing radiotherapy, but the limiting factors are number of beds and price of differentiated therapy. The waiting list for radioiodine therapy in thyroid patients is about a few months. Others form of isotope therapy (I-131 MIBG, therapy with labeled antibodies in lymphoma, pain palliation in bone metastases and arthritis) are performed according to resources available. The level of nuclear medicine services in Croatia is satisfactory.

All departments are working according to the guidelines published and recommended by the European Association of Nuclear Medicine (EANM) or by the US Society of Nuclear Medicine (SNM). Because of excellent connections with prominent nuclear medicine centres in Europe and the US, a lot of specialists have been trained abroad.

### How is Nuclear Medicine Financed in Croatia?

The majority of nuclear medicine procedures (including PET) are covered by health insurance and reimbursed regularly by the state health insurance system. Every department has a monthly budget, which is dependent on the number of patients and number of studies performed. In the case of some new radiopharmaceuticals utilised in research, the approval of Central Ethics Committee and Ministry of Health is needed.

### Educating Nuclear Medicine Specialists in Croatia

To become a nuclear medicine specialist in Croatia takes four years. This specialty is not very popular among young medical doctors, though at the moment we do not experience understaffing. There is a slight predominance of female doctors, probably connected with the fact that there are more female students in medical faculties in Croatia. The education programme is coordinated by the recommended curriculum of UEMS/Section Nuclear Medicine. During their training, young doctors spend some time in radiology, cardiology, neurology, paediatrics and some other departments. After finishing their education they mostly stay in Croatia and do not leave the country.

10 or 20 years ago, many of our colleagues left Croatia to work in the US or EU. Since then, the financial situation has improved, but the recent onset of the financial crisis may be the trigger for further migrations. The other factor possibly influencing new migrations would be the expected inclusion of Croatia in the EU. At that moment the movement of specialists between our country and the other European countries will be more simplified, and some doctors will probably decide to move.

Nuclear medicine has also been incorporated in the undergraduate study of medicine at the universities of Zagreb, Rijeka, Split and Osijek as a separate subject with 30 hours of education and examination. Postgraduate study is also available at the school of medicine, at the university of Zagreb. At present we have a mixed population of technologists, some with secondary medical school education and some university educated, but newly employed technologists willing to work in nuclear medicine must finish three years university study obtaining the title of radiological technologists. After completing their studies, they can choose between radiology and nuclear medicine for further work.

### The UEMS/Section Nuclear Medicine Preparing Croatia for Europe

As a part of our country's preparations to join the EU, the medical sector is also preparing for unavoidable changes, which will occur at that very special moment for Croatia. Thus, we are very interested in the organisation of medical systems in EU countries, and that is one reason for our deep involvement in the UEMS (European Union of Medical Specialists), which was enabled by giving us the status of associate member country. I was first involved in the UEMS Committee for Syllabus and Education and after several years ended up as president-elect (in October 2009 becoming president). This position provides great motivation for further work and improvement of nuclear medicine services, not only in Croatia, but also in the whole of Europe.

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