

**FARMACI, RADIOFARMACI E PROCEDURE ANESTESIOLOGICHE (RMC010)****1. language**

English

**2. course contents**

Coordinator: Prof. VITTORIA RUFINI

Year Course: 2

Semester: First semester

UFC: 8

Modules and lecturers

ANESTHESIOLOGY AND INTENSIVE CARE (RMC053) - 1 ufc - ssd MED/41.

Prof. Mariano Alberto Pennisi

- APPLIED PHARMACOLOGY (RMC052) - 2 ufc - ssd BIO/14.

Prof. Sergio Laurino

- NUCLEAR MEDICINE RADIOPHARMACEUTICAL – QUALITY CONTROLS (RMC058) - 1 ufc – ssd MED/50.

Prof. Annarita Mautone

- RADIOLOGY AND CONTRAST MEDIA (RMC054) - 1 ufc - ssd MED/36.

Prof. Luigi Natale

- RADIOPHARMACEUTICALS IN PET IMAGING (RMC056) - 1 ufc - ssd MED/36.

Prof. Saverio Schiavariello

- RADIOPHARMACEUTICALS AND TRADITIONAL NUCLEAR MEDICINE (RMC055) - 1 ufc - ssd MED/36.

Prof. Daniela Di Giuda

- RADIOMETABOLIC THERAPY (RMC057) - 1 ufc - ssd MED/36.

Prof. Vittoria Rufini

**3. BIBLIOGRAPHY***Radiopharmaceuticals in Nuclear medicine*

- Volterrani D., Erba P.A., Mariani G. Fondamenti di Medicina Nucleare. Ed. Springer 2010.

Capitolo 3: Caratteristiche generali dei radiofarmaci; Capitolo 4: Radiofarmaci diagnostici convenzionali; Capitolo 6: La radiofarmacia convenzionale.

- Cuocolo A., Mansi L., Salvatore M., et al. Medicina Nucleare e. Tecniche-Methodologie-Applicazioni per studenti e medici di medicina generale. Idelson-Gnocchi 2010. Capitolo 2: Radiofarmaci.

*Radiometabolic therapy*

- Volterrani D., Erba P.A., Mariani G. Fondamenti di Medicina Nucleare. Ed. Springer 2010. Capitolo 16: Terapia medico-nucleare.

For specific topics pdf presentations and/or scientific publications will be available, where no reference textbooks have been listed.

Further textbooks are allowed, with previous teacher's approval.

**4. LEARNING OBJECTIVES**

*Knowledge and understanding* - At the end of the course students are expected to be able to demonstrate and understand the activities for drug preparation and administrations, considering the benefit/risk profile of drugs, contrast media and radiopharmaceuticals and their clinical use in Radiology, Nuclear Medicine, and Radiotherapy. Finally at the end of the course students are expected to understand risks and all the needed activities in emergency situations in Radiology, Nuclear Medicine, and Radiotherapy

*Applying knowledge and understanding* - At the end of the course students are expected to understand and apply the appropriate clinical use and preparation of approved drugs as per SmPCs and the rules for pharmacovigilance, for contrast media and radiopharmaceuticals and

their specific use in diagnostic / therapeutic protocols. Furthermore, students need to be familiar with the underlying risks of radiological investigations and apply proper procedures for handling and positioning patients at risk and to evaluate vital signs.

*Making judgements* - At the end of the course students are expected to be able to independently recognize and distinguish proper use of drugs, specifically contrast media and radiopharmaceuticals, recognize, and distinguish medical emergency and emergency vs non-emergency situations.

*Communication skills* - At the end of the course students are expected to be able to communicate in an easy and understandable way benefits and risks of drugs of common use and specifically for contrast media and radiopharmaceuticals, to be able to communicate a medical emergency and activate the survival chain. The communication is supposed to be helpful for experts and non-expert patients.

*Learning skills* - At the end of the course students are expected to be able to recognize, understand and apply independently study methods to update their knowledges for course topics by searching reference sources, guidelines, and operating procedures and SmPCs and to understand and review clinical study reports.

## 5. prerequisites

Basic knowledge in Mathematics, Physics, Biochemistry, Anatomy, Histology, Biology and Physiology are needed for course comprehension.

## 6. TEACHING METHODS

Power point presentations and links to reference websites for further readings are provided. Students will be engaged to improve their communication and practical skills by providing descriptions, commented reviews of selected topics.

## 7. OTHER INFORMATIONS

Teachers may be reached by email for any further questions or specific study support or appointment.

## 8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

Written, oral and practical exams will be offered at the end of the course, as final examinations, and during the course by teacher's considerations. For the final examination a  $\geq 18/30$  evaluation in any topic is requested.

## 9. program

### *Anesthesiology and intensive care*

General approach to the critically ill patient. Main vital functions' assessment and monitoring. The patient at risk during the diagnostic or interventional imaging procedures. Clinical accidents due to positioning. Clinical accidents due to handling. Accidents from contrast media. Anesthesiology procedures during medical imaging. Neurological, respiratory, and cardiac emergencies. First aid. Basic Life Support and early defibrillation.

### *Applied Pharmacology*

General Pharmacology: definitions, medicinal products. Pharmacokinetics: route of administration, absorption, distribution, and elimination of drugs. Clinical pharmacokinetics. Pharmacodynamics and pharmacological action. Undesired effects and adverse drug reactions. Incompatibility. Drug

interactions. Pediatric dosing. Variations in drug activities. Drug classification. Pharmacotherapy.

#### *Nuclear Medicine radiopharmaceuticals - Quality controls*

Key features of Technetium-99m generators. Key features of radiopharmaceuticals. Quality control on eluate. Quality control on the different radiopharmaceuticals with chromatography techniques. Quality control on operators.

#### *Radiology and contrast media*

Barium Contrast media for gastrointestinal diagnostics: composition and administration. Iodine contrast media for gastrointestinal, uro-genital tract diagnostics: composition and administration. Iodine contrast media in TC angiography: composition and administration. Paramagnetic and superparamagnetic contrast media in NMR. Contrast media and ultrasound diagnostic.

#### *Radiopharmaceuticals for PET imaging*

Radiopharmaceuticals for PET imaging: General information on radiopharmaceuticals for PET imaging. Radionuclide production techniques, regarding the cyclotron and generator systems. Brief explanations of the main labelling methods. Preparation of the main radiopharmaceuticals used for PET imaging. Brief explanations on the quality control of radiopharmaceuticals. Localization mechanisms and pharmacokinetic characteristics of radiopharmaceuticals for PET imaging. Regulatory and legislative aspects.

#### *Radiopharmaceuticals and traditional nuclear medicine*

Physical characteristics and production of radionuclides used in traditional Nuclear Medicine. Radiopharmaceuticals in Nuclear Medicine: definition; peculiarities of radiopharmaceuticals in comparison with drugs; legislative aspects; chemical classification of radiopharmaceuticals; classification according to the Good Manufacturing Practice of Radiopharmaceuticals for Nuclear Medicine; criteria for the selection of a radiopharmaceutical. General characteristics of traditional diagnostic radiopharmaceuticals. Basics of radiopharmaceutical production: the conventional radiopharmacy. Molybdenum-99/Technetium-99m generator: structure and operational procedures. Technetium-99m labelled radiopharmaceuticals: oxidation states of technetium-99m; formulation of kits for Technetium-99m labelling; reconstitution of kits; basics of quality controls; examples of Technetium-99m labelled radiopharmaceuticals. Principles of distribution/localisation of radiopharmaceuticals used in traditional Nuclear Medicine.

#### *Radio-metabolic Therapy*

General concepts of radioisotope therapy. Physical properties of the radionuclides used and biological properties of radiopharmaceuticals; modality of administration of radiopharmaceuticals; dosimetric evaluations preliminary to treatment. Main clinical applications of nuclear medicine therapy: therapy with I-131 for hyperthyroidism and thyroid cancer; <sup>131</sup>I-MIBG therapy for neuroendocrine tumors; treatment of pain from bone metastases; Lu-177-oxodotreotide therapy in neuroendocrine tumors and Lu-177-PSMA in metastatic prostatic cancer. Aspects of radiation protection of the patient in nuclear medical therapy; discharge of radioactive patient.