COURSE DATA

Data Subject	
Code	34462
Name	General radiology
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1204 - Degree in Medicine	Faculty of Medicine and Odontology	3	Second term

Subject-matter

Degree	Subject-matter	Character
1204 - Degree in Medicine	11 - Diagnostic and therapeutic procedures	Obligatory

Coordination

Name	Department
CIBRIAN ORTIZ DE ANDA, ROSA MARIA	190 - Physiology
DUALDE BELTRAN, DIEGO	260 - Medicine

SUMMARY

Theoretical and practical training of future doctors in the field of General Radiology (techniques and equipment, general anatomy), Radiation Oncology and Physical Medicine-Rehabilitation.

By the end of the course, the student should have acquired:

- Basic knowledge of the fundamentals and principles of Medical Physics, Radiotherapy Oncology, Radioprotection and the techniques used in diagnostic imaging (Radiodiagnosis).

- Knowledge of the different aspects of disability, its diagnosis and treatment, as well as the promotion of personal autonomy, functional adaptation to the environment and the therapeutic use of physical agents.

- Knowledge of the basic principles and scope of application of radiotherapy, as well as the different therapeutic irradiation modalities.

Article 6.2 a) of the Law on the Organisation of Health Professions states: "Graduates in Medicine are responsible for indicating and carrying out activities aimed at the promotion and maintenance of health, the prevention of illnesses and the diagnosis, treatment, therapy and rehabilitation of patients, as well as the judgement and prognosis of the processes that are the object of their care".

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is recomended to have passed "Anatomy"

OUTCOMES

1204 - Degree in Medicine

- Understand the foundations of action, indications and efficacy of therapeutic interventions, based on available scientific evidence.
- Have the capacity to make an initial diagnosis and establish a reasonable strategy of diagnosis.
- Establish the diagnosis, prognosis and treatment, applying principles based on the bestinformation available and on conditions of clinical safety.
- Acquire properclinical experience in hospitals, health care centres and other health institutions, under supervision, as well as basic knowledge of clinical management focused on the patient and the correct use of tests, medicines and other resources available in the health care system.
- Know how to use the sources of clinical and biomedical information available, and value them critically in order to obtain, organise, interpret and communicate scientific and sanitary information.
- Know how to use IT in clinical, therapeutic and preventive activities, and those of research.
- Keep and use medical records which contain information about the patient for later analysis, preserving the confidentiality of personal data.
- In the professional practise, take a point of view which is critical, creative, constructive and research-oriented.
- Understand the importance and the limitations of scientific thinking in the study, prevention and management of diseases.

- Be able to formulate hypothesis, gather information and evaluate it critically in order to solve problems by following the scientific method.
- Establish a good interpersonal communication which may allow professionals show empathy and talk to the patients efficiently,as well as to their relatives, the media and other professionals.
- Proper organisation and planning of the workload and timing in professional activities.
- Team-working skills and engaging with other people in the same line of work or different.
- Criticism and self-criticism skills.
- Capacity for communicating with professional circles from other domains.
- Acknowledge diversity and multiculturality.
- Consideration of ethics as a fundamental value in the professional practise.
- Working capacity to function in an international context.
- Evaluate the risk-benefit balance of diagnostic and therapeutic procedures.
- Is aware of the indications in biochemical tests, as well as haematological, immunological, microbiological, anatomical and pathological, and image tests.
- Knows the foundations of radiation interaction with the human body.
- Understands the foundations of basic radiological semiology of various organs and systems.
- Knows other techniques to obtain diagnostic image.
- Assesses indications and contraindications of radiological studies.
- Is able to apply radiological protection criteria within the diagnostic and therapeutic procedures with ionising radiation.
- Is able to interpret a radiological image through systematic reading.

LEARNING OUTCOMES

At the end of the course, students should be able to:

1. Describe the ionising radiations used in Radiodiagnosis, Nuclear Medicine and Radiotherapy.
2. Describe the physical bases of Radiodiagnosis, Nuclear Medicine and Radiotherapy.
3. Explain the rationale and basic procedures of physical dosimetry.
4. Justify the need for Radiological Protection.
5. Know the dose limits and basic radiation protection procedures in the medical applications of ionising radiation.
6. Explain the biological basis and the general indications of radiotherapy.

7. Describe the technological foundations of radiotherapy.

8. Explain the basic procedures for the planning and clinical dosimetry of radiological treatments.

9. Explain the main consequences of the interaction between ionising radiations and the human organism.

10. Describe the different radiological imaging modalities, knowing the technology used in Radiology.

11. List the most frequent morphological and functional studies in Radiology.

12. Know the classification and diagnostic and therapeutic use of the different physical agents used in medical rehabilitation.

13. Know the most common indications and contraindications in medical rehabilitation.

14. Describe the methodology for the assessment of the disabled patient.

15. Perform a functional assessment and establish therapeutic objectives.

16. Assess the possibilities of tumour response to radiotherapy and establish the indications for curative and palliative, exclusive and combined radiotherapy.

17. Assess the morbidity risks of cancer radiotherapy and apply preventive and corrective measures.

18. Differentiate the characteristics and indications of the different therapeutic irradiation modalities.

19. Describe and explain the integration of radiotherapy in the treatment of different types of cancer.

DESCRIPTION OF CONTENTS

1. THEORETICAL CLASSES

1. Information and general plan of the course.
2. Electromagnetic radiation. Genesis of EMR. Electromagnetic spectrum. Energy and intensity: importance in diagnosis and therapy. EMR interaction. Mechanisms of interaction. Photoelectric, Compton and pair creation effects. Dual nature of EMR.
3. Physical fundamentals of X-rays: Origin and properties of X-rays. X-ray spectroscopy. Continuous spectra. Duane-Hunt law. Characteristic spectrum. Moseley's law X-ray microanalysis Radiological image formation Radiological contrast.
4. Nuclear structure and radioactivity: The atomic nucleus: its constitution. Characterisation and classification of nuclear species. Mass defect and binding energy. Radioactivity. Characteristic laws and constants. Types of radioactive emission. Radioactive equilibrium Isotopic generators.
5. Dosimetry of ionising radiation: linear energy transfer and specific ionisation. Exposure. Absorbed dose. Kerma Equivalent dose Radiation weighting factors effective dose Tissue weighting factors Radiological patient quantities.
6. Radiological protection. General criteria: necessity and concept. Fundamental principles. Justification, optimisation and dose limitation. Basic measures.
7. Fundamentals and physical bases of the different types of diagnostic imaging systems in

Radiodiagnostics and Nuclear Medicine.
8. Radiotherapy: concept, scope of application, purpose and objectives. Tolerance to radiotherapy. Most frequent side effects of radiotherapy: diagnosis, toxicity scales, evaluation criteria and treatment.
9.Techniques for the application of radiotherapy: types, characteristics, equipment and general indications.
10. Effects of radiotherapy on tumours and conditioning factors. Tumour control vs. morbidity: therapeutic index. Dosage: criteria and requirements. Protraction and fractionation.
11. Radiotherapy in the integral treatment of the oncological patient. Clinical bases and indications for radiotherapy. Most common dose intervals.

2. THEORETICAL CLASSES

12. Combinations of radiotherapy with other treatments in the most prevalent tumours: rationale and strategies. Radiotherapy in non-neoplastic diseases: indications.
13. Stages in the radiotherapeutic process: objective and equipment. Palliative radiotherapy.
14. Introduction to radiology: concept and historical evolution. Content and scope of application.
15. Conventional radiography: concept, types of image and general indications. Contrast radiography: contrast media. IVUS and gastrointestinal tract.
16. Ultrasound: concept, types of imaging.
17. Computed tomography (CT): concept and general indications. Semiology. CT angiography.
18. Magnetic Resonance Imaging (MRI): concept, types of imaging.
19. Concept of Physical Medicine and Rehabilitation. Promotion of personal autonomy, quality of life and adaptation of the environment. The WHO ICF. The rehabilitation process: clinical-medical and medico-social tasks. Medical diagnosis and assessment of the patient with disability, prognosis and medical treatment protocol, functional assessment and ADLs. Quality of life.
20. Therapeutic resources: non-ionising physical therapeutic agents and means (electrotherapeutic, electromagnetic, thermotherapy, cryotherapy, phototherapy, phototherapy, etc.). Cryotherapy, phototherapy, kinesiological, hydrotherapy and orthopaedic means (prescription and medical indication of technical aids, walking aids and support products). Speech therapy and occupational aids.
21. Diagnosis, prognosis and medical and rehabilitative treatment of immobilisation syndrome and general trauma and surgical syndrome. Orthopaedic rehabilitation.
22. Diagnosis, prognosis and medical and rehabilitative treatment of cardiac and respiratory syndromes. Respiratory rehabilitation programme.

3. THEORETICAL CLASSES

23. Diagnosis, prognosis and medical and rehabilitation treatment of neurological syndromes: lesions of the central and peripheral nervous system: stroke, brain damage, spinal cord injury, neurodegenerative diseases.
24. Diagnosis, prognosis and medical and rehabilitative treatment of pain and musculoskeletal syndromes: rachialgias and alterations of the spinal column, fibromyalgia and myofascial syndrome.
25. Vascular rehabilitation: Lymphedema. Amputees.

4. SEMINARS

1. Medical Physics Seminar I: Exercises. Radiophysics in Radiotherapy.
2. Medical Physics Seminar II: Physical aspects of treatment calculation in Radiotherapy.
3. Basic aspects of radiological reading and semiology (radiography, ultrasound, CT and MRI). Bone densitometry: procedures and indications.
4. Basic aspects of image-guided therapy. Diagnostic and interventional, vascular and non-vascular procedures.
5. Integration of radiotherapy in the treatment of Head and Neck tumours. Case-based learning.
6. Integration of radiotherapy in the treatment of CNS and lung tumours. Learning based on clinical cases.
7. Integration of radiotherapy in the treatment of digestive tumours and benign lesions. Learning based on clinical cases.
8. Integration of radiotherapy in the treatment of gynaecological and urological tumours and the role of brachytherapy in their treatment. Learning based on clinical cases.
9. Integration of radiotherapy in the treatment of breast cancer. Palliative and emergency treatments. Learning based on clinical cases.
10. Rehabilitation. Practical cases of pathology of the locomotor system.

5. CLINICAL PRACTICES AND MEDICAL PHYSICAL LABORATORY PRACTICES

HOSPITAL INTERNSHIPS

1. Recognition of the various techniques in radiotherapy treatment
2. Recognition of the various techniques of exploration and rehabilitation treatment
3. Recognition of the different imaging techniques in Radiodiagnostics
4. Structure and functions of a Radiological Protection and/or Radiotherapy service.

Students are reminded of the importance of carrying out evaluation surveys on all the teaching staff of the degree subjects.

MEDICAL PHYSICS LABORATORY PRACTICES

1. Study of the laws of attenuation of electromagnetic radiation.
2. Experiments with X-rays. Radiological contrast.
3. Radioactive equilibrium: isotope generators.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	26,00	100
Seminars	20,00	100
Laboratory practices	9,00	100
Clinical practice	20,01	100
Study and independent work	40,00	0
Readings supplementary material	15,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	5,00	0
TOTAL	**150,01**	

TEACHING METHODOLOGY

- Theoretical classes supported by audiovisual material available to students in the virtual classroom.

- Practical seminar classes given in hospitals, with proposals for clinical cases and problems to be worked on in the classroom.

- Laboratory practicals with a practical guide available to the student in the virtual classroom prior to the practice, with a breakdown of the theoretical basis, objectives, results to be obtained and a results sheet with the graphs and values obtained in each practical.

- Clinical practicals, in Radiodiagnosis, Radiation Oncology and Physical Medicine and Rehabilitation hospital services, participating in the usual activity of these services.

EVALUATION

The evaluation will cover 50% of theoretical content and 50% of practical content and attendance at practices and seminars is mandatory.

Continuous evaluation (1 point): Study of 4 clinical cases and evaluation of these cases by examining 8 test questions, 2 for each clinical case. The questions will be multiple choice with multiple choice answers (4 possible answers and only one correct) on the clinical cases.

Final exam (9 points): 64 multiple-choice test questions (4 possible answers and only one correct), on theoretical topics, seminars and laboratory and clinical practices.

In all test-type exams, for every three erroneous answers, 1 valid is discounted.

The course will be passed with a grade equal to or greater than 5, being necessary to have attended at least 80% of the practical classes (total of seminars, laboratory practices and clinical practices).

Attendance to practical sessions is mandatory. Unjustified non-attendance to more than 20% of the sessions will make it impossible to pass the course.

Students are reminded of the importance of carrying out evaluation surveys on all the teaching staff of the degree subjects.

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