Module Specification

Science and Instrumentation in Current Nuclear Medicine Practice

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Contents

Part 1: Information

Module title: Science and Instrumentation in Current Nuclear Medicine Practice

Module code: UZYSQ4-15-M

Level: Level 7

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Health & Applied Sciences

Department: HAS School of Health and Social Wellbeing

Partner institutions: None

Field: Allied Health Professions

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: Yes

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: See Learning Outcomes.

Outline syllabus: The syllabus includes:

Physics of radionuclides and interaction with matter

Formation and decay of radionuclides

Principles of radiation detection and instrumentation

Radiation detection systems

Overview of SPECT/CT and PET/CT systems

Fundamental system performance, testing and analysis

Computing applied to nuclear medicine

Correct use of nuclear medicine equipment to obtain optimum images

Radiation dosimetry

Practical radiation protection and associated legislation

Part 3: Teaching and learning methods

Teaching and learning methods: The learning and teaching strategy for this module has been developed to show achievement of a good level of understanding of physical principles of nuclear medicine, equipment design and operation, practical application, quality assurance and understanding of relevant legislation and guidelines governing nuclear medicine practice. The student will understand the essential principles determining optimum image quality, equipment operation, safe and effective practice, and radiation dose optimisation.

To ensure engagement in the module learning opportunities, assessment will be linked to involvement in and contribution to discussion boards where specific tasks will be set. The tasks will be constructed to ensure that the module learning outcomes must be addressed.Contributions to these tasks will form source material

from which students may extract content to add to their portfolio for assessment. Experience from other modules using this format indicates the potential for valuable discussion relating to the module content and helps ensure timely engagement as opposed to leaving personal study and revision to the end of the module delivery. The capacity to engage in debate with peers helps to facilitate networking, peer/shared learning and knowledge exchange.

A variety of approaches will be used including; narrated presentations, video presentation material, discussions, seminars, workshops, and article review. Additional student centred learning guided by tutorials and discussion will include:

Evaluation and discussion of current working practices

Directed practical exercises at student place of work (or suitable secondment)

Scheduled learning will include upto 40 hours engaged with lectures, video presentation, seminars, tutorials, discussion board entries, project supervision, work based learning.

Independent learning will include upto 110 hours engaged with essential reading, assignment preparation and completion.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Demonstrate an understanding of basic nuclear medicine physics and interaction of radioactive substances with matter

MO2 Understand the fundamentals of Single Photon Emission Computed Tomography/Computer Tomography (SPECT/CT) and Positron Emission Tomography/Computer Tomography (PET/CT) systems, including an understanding of basic CT physics relevant to the hybrid environment

MO3 Evaluate the formation and decay of radionuclides and associated practical radiation protection measures

MO4 Demonstrate an understanding of gamma camera and SPECT/CT gantry designs, and other devices for radiation detection

MO5 Critically evaluate methods of acquisition, image manipulation and archiving

MO6 Critically evaluate the fundamentals associated with the provision of an optimal clinical nuclear medicine service

MO7 Demonstrate problem solving abilities with reference to decay calculations for various radioactive isotopes

MO8 Discuss the fundamentals of radiation biology and dosimetry, with reference to patients, carers and staff

MO9 Evaluate safe working practice andthe role of the modern practitioner within a nuclear medicine environment

MO10 Apply knowledge of hybrid equipment function and dosimetry to clinical decision-making

MO11 Understand the fundamentals of quality control procedures performed within a modern nuclear medicine department

MO12 Apply theoretical knowledge within clinical practice to safely handle unsealed radioactive sources and produce optimum images

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 110 hours

Face-to-face learning = 40 hours

Total = 150

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/uzysq4-15-m.html

Part 4: Assessment

Assessment strategy: A 1500 word assignment and 1000 word portfolio of discussion board extracts will demonstrate achievement of the learning outcomes.

The 1500 word assignment based on a write-up of practical work in the student's department has consistently demonstrated very effective discrimination on the basis of sophistication of understanding of essential components of the process of image formation in nuclear medicine. Several learning outcomes can be assessed with it, and the process of undertaking the practical procedures is a very effective learning aid to the students. Those students limited by availability of test equipment in their own department are able to make use of model data provided by us.

Assessment task 1 - 1500 word assignment:

Indicative assignment title:

Undertake a range of experimental tests on the gamma camera to determine and evaluate:

The effect of an incorrect isotope photopeak energy setting on image quality

The practical effects of:
a) scatter
b) collimator type
c) distance
d) counts on the system resolution

Assignment guidelines:

You are required to evaluate to the various aforementioned factors associated with image quality and write up as clinical experiments. You should access the on-line information, which provides video footage of the experiments being conducted and basic results / images obtained. You are encouraged to undertake these experiments within your own department, using appropriate quality control test tools

(for example, flood source, line source, bar phantom, Williams phantom, Perspex blocks). However, this may not be achievable due to the limited availability of quality control test tools. At a minimum, you should refer to the on-line information, in order to access details relating to the experiment methodologies and results / images obtained.

Assessment task 2 - 1000 word portfolio of discussion board extracts:

The portfolio will assess selected module learning outcomes. Inclusion of extracts from discussion board contributions ensures student engagement with the module content but also with peers for shared learning and debate.

Formative assessment will be achieved by feedback on discussion board contributions from the module team, indicating where good understanding has been achieved or where there is scope for further exploration and development.

Assessment tasks:

Written Assignment (First Sit)
Description: 1500 word assignment
Weighting: 60 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO11, MO12, MO6

Portfolio (First Sit)
Description: 1000 word portfolio of discussion board extracts
Weighting: 40 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO10, MO2, MO3, MO4, MO5, MO7, MO8, MO9

Written Assignment (Resit)
Description: 1500 word assignment

Weighting: 60 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO11, MO12, MO6

Portfolio (Resit)

Description: 1000 word portfolio of discussion board extracts

Weighting: 40 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO10, MO2, MO3, MO4, MO5, MO7, MO8, MO9

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Nuclear Medicine [Distance] MSc 2023-24