



European Academy of DentoMaxilloFacial Radiology

Framework for Specialist Training in Dental and Maxillofacial Radiology

Background

The scope of DentoMaxilloFacial Radiology DMFR (Dental and Maxillofacial Radiology) has expanded significantly in recent years, particularly following the development of specialised cross sectional imaging of the jaws, cone beam CT and the use of ultrasound in the diagnosis and assessment of disorders in the head and neck region. This has led to an increasing need for radiologists specialising in this area and utilising these techniques.

In order to fill the growing need for DentoMaxilloFacial (DMF) radiologists a few countries in Europe have set up specialist training programmes for those with a dental background. One of the stated aims of The European Academy of DentoMaxilloFacial Radiology (EADMFR) is to encourage this trend by promoting the development of specific DMFR specialist training programmes throughout Europe. However, in order to maintain standards, the Academy feels that it is important that these courses are broadly similar in their content, in the standard of training and in the experienced gained by the trainee. To facilitate this ideal, the EADMFR has produced this document, which is designed to provide a framework for those wishing to set up a specialist training course in DMFR. This document is not meant to be prescriptive, but rather to provide guidance, and outlines those areas that the Academy regards as important for inclusion in a specialist training programme.

Aims:

The aims of this document are to:

- Help promote the speciality of DentoMaxilloFacial Radiology within Europe.
- Provide a framework for those wishing to set up a specialist training programme in DMFR.

Definition of DentoMaxilloFacial Radiology

The specialty of DMFR can be thought of consisting of the following:

- The basic sciences related to the types of imaging applied to the investigation of the teeth, oral cavity, jaws, facial structures and head and neck region, excluding detailed neurological imaging
- Knowledge of the normal anatomical features seen on images taken of the teeth, oral cavity, jaws, facial structures and of the head and neck region
- Interpretation of the images of disorders that affect the teeth, oral cavity, jaws, facial structures and other parts of the maxillofacial region
- Knowledge and understanding of the diseases that affect the teeth, oral cavity, jaws, facial structures and head and neck region
- The ability to diagnose disorders of the teeth, jaws, oral cavity, facial structures and the other parts of the maxillofacial region
- Interventional radiology for selected conditions that affect the head and neck region
- Familiarisation with medical conditions and systemic disease that affect the head and neck region.
- Justification of appropriate imaging through evidence based knowledge of diagnostic methods (Evidence Based Radiology) and good clinical practice.

Suggested Specialist Training Course in DentoMaxilloFacial Radiology

The course ideals are listed below and are based broadly on those already in existence in Europe and the USA.

- The course should be designed such that on completion of training the graduate can act as an independent specialist in dentomaxillofacial radiology.
- The course contents should cover those subjects listed in the syllabus (Appendix 1).
- The course should consist of at least three years training, which preferably should be in the form of a full time appointment with an average working week of 40 hours. However, should an employer prefer to set up a part time training post, its overall duration should equate in length to that of a full time post.
- The course should provide the trainee with sufficient teaching and practical experience in all imaging modalities relevant to head and neck imaging, so that on the completion of training the trainee should be competent in dentomaxillofacial radiology.
- The course should develop competence in DMFR through theoretical and practical experience under supervision. Ideally this should be delivered by means of hands-on clinical/practical work, lectures, seminars, textbooks, manuals, scientific journals, computer and e-based learning materials.

- The course should include instruction and experience in communication, management and teaching skills. It should promote and include experience in the collaboration between specialists of all disciplines of medicine and dentistry and with dental and medical practitioners.
- The course should include instruction and practice in research methodology and how to critically examine research papers. It is recommended that as part of this process the trainee should undertake or participate in a scientific project as part their training.
- The course should include instruction and practice in evaluation of diagnostic methods
- The trainee should be encouraged to attend and participate in national and international meetings on dentomaxillofacial radiology and medical head and neck radiology
- The course should prepare the trainee for specialist recognition, ideally though formal testing and examination.

Individual Responsible for Training (Programme Supervisor)

There should be a named person – the Programme Supervisor - who has overall responsibility for overseeing the training. Ideally this person should be a specialist in dentomaxillofacial radiology or, where this is not possible, an individual who has extensive experience in dentomaxillofacial radiology.

The Programme Supervisor may wish to delegate some or all of the teaching to other specialists who form part of a training team and who have expertise in head and neck imaging or have skills in other relevant subjects, such as anatomy, radiographic techniques, radiation physics, radiation safety and research.

Quality assurance of specialist training

The programme supervisor is usually responsible for the attainment of the educational aims described. This should be regularly assessed to ensure that the trainee has attained the relevant level of proficiency as the course unfolds. One suitable framework for this is regular tutorial sessions. However, the trainee should undergo an annual formal appraisal to ascertain whether the trainee has met the course training needs and that the appropriate level of education has been provided. The trainee should be informed of the outcome of the appraisal. The appraisal system should utilise reports on the trainee from other heads of units involved with the supervision and training.

The Programme Supervisor should plan the teaching programme so that the trainee is able to complete the prescribed training within a reasonable time during the training period.

Documentation of experience by certificates of employment, course certificates log books and, where applicable, copies of radiological reports etc. are desirable.

The Trainee

- The trainee should be qualified in dentistry or medicine.
- It is recommended that the trainee should have been qualified as a dentist or doctor for at least two years before commencing training.
- The trainee should keep a log book of practical experience in radiographic and other imaging techniques and keep a portfolio of his/her training experience throughout the training period – this should be made available during appraisals.
- The trainee should ideally be able to participate in full time training or the equivalent thereof.

The Training Institution

- The Institution should be formally approved for training by the relevant national governing body responsible for higher training in the dental specialties or the national postgraduate educational body to ensure that there are sufficient resources and facilities available to allow the training to take place and to maintain appropriate standards.
- The institution(s) or places of training should have sufficient facilities to allow the trainee to gain both qualitative and quantitative experience in dentomaxillofacial radiography. This may require access to more than one hospital or clinic to meet deficiencies in training present at any one site.
- The institution(s) should have a range of modern x-ray and other imaging equipment to allow the syllabus requirements to be fully met.
- The institution should have a comprehensive and up to date library with a modern IT infrastructure and access to e-learning materials and facilities.

Supplementary training

No specific number of courses or days of study are prescribed as requirements for the specialist qualification.

Trainees should decide, in consultation with their programme supervisors, whether

undertaking further courses, attendance at other clinics or lectures may accelerate the development of competency or supply essential knowledge or skills which may be difficult to acquire at the centre where they are based.

The need to attend additional courses, clinics or lectures should be based on individual and local circumstances. A preliminary assessment should be made when planning the trainee's course. This plan may need to be revised or supplemented during the period of training and should be relevant to the specific trainee's requirements.

Completion of Specialist Training

Once a trainee has successfully completed the period of training, the trainee should ideally be issued with a diploma or certificate that attests that the trainee has completed the specialist training to the satisfaction of the national examining body. The diploma or certificate should be issued by the governing body of the relevant country responsible for awarding specialist titles or responsible for issuing educational degrees (this might be a University or Hospital).

Additional Information

An institution wishing to set up a training programme will wish to design a course to their specifications. However, Appendix 1 and 2 outlines an approach on assessing a trainee's knowledge and skills in DMFR, and provides some additional information when planning or setting up a course that may prove helpful.

Appendix 1 - Syllabus

A suggested syllabus for a training programme in dentomaxillofacial radiology is outlined below:

1. **Physics**

- Fundamental properties of matter, types of radiation
- Structure of the atom, electron and photon interactions,
- Radiation decay, isotopes, concept of half life
- Basics physics of X-ray production, x-ray interactions with matter.

2. **Radiation Hazards and Dosimetry**

- Biological effects of the different types of radiation
- Risks of radiation
- Principles of radiation protection
 - Justification
 - Optimisation
 - Dose Limitation
- Different types of doses, their units, and dose levels from commonly used radiographic techniques, dose limits, diagnostic reference levels.

3. **Practical Radiation Protection**

- General physical methods of radiation protection and dose limitation
- Special requirements in pregnancy, for infants and children
- Protection of staff and members of the public
- The requirements when using ionising radiation in research.

4. **Statutory Requirement**

- Knowledge and understanding of the relevant national regulations and guidelines of the country in which the training is taking place
- Knowledge and understanding of the ICRP recommendations and guidelines
- Knowledge and understanding of any European regulations and guidelines.

5. **Evidence Based Radiology**

- Diagnostic properties of different diagnostic methods
- Terms and techniques for evaluation of diagnostic tests, for example: 2x2-table,

gold standard, sensitivity, specificity, predictive values, likelihood ratio, ROC-analysis

- Selection/Referral Criteria

6 Diagnostic Radiography

- Image formation
- Factors that affect patient dose
- Factors that affect image quality
- Practical knowledge and experience in the radiographic techniques used to image the teeth, jaws, facial structures including the related soft tissues
- Selection/Referral Criteria
- Quality assurance and quality control
- Film processing
- Digital imaging and image processing, PACS, DICOM and Teleradiology
- Fluoroscopy and image intensification

7 Computed Tomography (CT)

- Basic principles and basic physics of CT including CBCT
- Image reformatting
- Factors that affect dose
- Selection Criteria
- Practical experience with CT scanning of the oral and maxillofacial region

8 Magnetic Resonance Imaging

- Basics principles and physics of MRI
- Selection criteria
- Practical experience in MRI scanning of the oral and maxillofacial region
- Application of relevant imaging sequences

9 Diagnostic Ultrasound

- Basic principles and physics of diagnostic ultrasound
- Selection Criteria
- Practical experience in diagnostic ultrasound imaging of the head and neck region
- Ultrasound guided fine needle aspiration biopsy techniques

10 Radionuclide Imaging including SPECT and PET

- Basic principles of radionuclide imaging including SPECT and PET

11 Salivary gland imaging and interventional procedures

- Sialography
- Ultrasound
- Stone retrieval and duct dilatation procedures

12 Radiology and Image Interpretation

- Practical instruction and experience in normal radiological anatomy of the head and neck
- Practical instruction and experience in the radiological diagnosis of:
 - Developmental disorders of the teeth, jaws and facial regions
 - Disorders of the teeth and their supporting structures
 - Disorders affecting the jaws and facial bones
 - Pre- and post implant assessment
 - Trauma and fractures of the teeth, jaws and facial bones
 - Disorders of the paranasal sinuses
 - Disorders of the temporomandibular joint
 - Disorders of the salivary glands
 - Disorders that affect the soft tissue of the neck
- Familiarisation with:
 - Neuroradiology
 - Chest radiology
 - Functional imaging of speech and swallowing disorders
 - Contrast studies including angiography
 - Other medical imaging techniques of the head and neck region

Appendix 2 - Aims and Objectives of Training

This appendix provides guidance on the levels of competencies and knowledge that a trainee should achieve during the period of training.

Definition:

The speciality of DentoMaxilloFacial Radiology embraces knowledge of, and proficiency in, the use of diagnostic imaging modalities. The core of the speciality lies in the interpretation of diagnostic images of the teeth, jaws, facial skeleton, oral cavity, nasal sinuses, temporomandibular joints, salivary glands, pharynx and surrounding tissues as well as functions related to these organs. Diagnosis requires knowledge of normal anatomy, pathological processes, traumatic and post-operative conditions, and craniofacial disorders affecting individuals of all ages. The level of knowledge and skills required differ in different areas. These 'levels of knowledge and skills' and 'proficiency levels' are defined and described below:

Terminology - Definition of levels of knowledge and skills:

Levels of Knowledge:

- **In-depth:** Comprehensive knowledge of concepts, facts and theories with the ability to perform critical analysis and so fully understand information.
- **Understanding:** Good level of knowledge, which permits the ability to apply learnt facts or skills.
- **Familiarity:** A fundamental level of knowledge, which allows sufficient understanding of specific topics or skills through the understanding of general principles.

Levels of Skills:

- **Proficient:** Ability, which is greater than competency, acquired through advanced training and extensive experience, and which is consistently achieved or delivered.
- **Competent:** A good level of skill displaying ability or knowledge derived from training and experience.
- **Exposed:** The level of skill attained by observation of, or participation in, a particular activity.

General Objectives

The specialist in DMFR requires **in-depth** knowledge of, and **proficient** skills in, the

methods of diagnostic radiological and other imaging examinations, which have DentoMaxilloFacial applications, and knowledge of other diagnostic methods. The specialist requires an **understanding** of those facets of general radiology, particularly of the head and neck, which are required for co-operation between dental and medical radiologists. This necessitates having comprehension of the biological, physical and technical basis of different imaging techniques, equipment and different imaging processes. The specialist should have a good **understanding** of oral physiology, oral and maxillofacial surgery, oral pathology and disorders of the head and neck region and be **familiar** with conditions elsewhere in the body that affect the head and neck region.

Levels of proficiency

Three levels of proficiency are identified that should be achieved by the completion of training:

Level A. To be able to expertly and independently undertake:

- The interpretation of developmental and acquired disorders of the teeth, oral cavity, jaws, facial skeleton, temporomandibular joints, paranasal sinuses, salivary glands and the soft tissues of the head and neck region using relevant imaging techniques.
- Pre and post implant assessment.

Level B. To have a good knowledge and experience of:

- Cross sectional imaging of the head and neck area
- Existing radiological methods for examination and diagnosis of the functions of mouth, jaws, larynx and pharynx.
- Radiopharmaceutical diagnostic investigations of the head and neck area
- Cephalometric examination and analysis

Level C. To have a theoretical knowledge of, or have attended as an observer at:

- Radiological imaging and interpretation of the neurocranium, oesophagus and chest or other areas related to dental and maxillofacial disorders
- Contrast studies – angiography, interventional procedures

Level (A) requires **in-depth** knowledge and **proficient** skills such that the specialist must be able to expertly, diagnose and manage disorders that affect the head and neck region

with which he/she has experience and competence.

Level (B) requires **understanding** knowledge and competent skills and relates to conditions which may require referral to a specialist who has greater expertise in the relevant disorder and appropriate resources.

Level (C) requires **familiarity** with and **exposure** to rare or complex conditions with which the specialist has little or no experience and where the examination, diagnosis and treatment require specific and appropriate technical or staff resources that usually require referral to an appropriate specialist centre.

Additional Specialist knowledge and skills required

Specialist knowledge in radiation safety and selection criteria

The specialist should have sufficient knowledge be able to give information and advice in the fields of:

- Radiation protection
- Dose limitation and measurement
- Assessment of radiation risks
- Selection criteria

Co-operation within and outside the dental health system including other health and medical services etc

The specialist in DentoMaxilloFacial Radiology will interface with others in the field of medicine including general dental practitioners, specialists in dentistry, medical radiologists and with medical specialists. In particular, dentomaxillofacial radiologists should be able to work closely with their colleagues in general radiology.

Assessment of specialist knowledge and skills

Examination & Testing

The assessment of the acquisition of adequate knowledge by the trainee should be the responsibility of the training institution and the regulatory body of each member country.

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