

# The Erasmus Program for Postgraduate Education in Orthodontics in Europe

## An update of the guidelines

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### Abstract

In 1989 the ERASMUS Bureau of the European Cultural Foundation of the Commission of the European Communities funded the development of a new 3-year curriculum for postgraduate education in orthodontics. The new curriculum was created by directors for orthodontic education representing fifteen European countries. The curriculum entitled "Three years Postgraduate Programme in Orthodontics: the Final Report of the Erasmus Project" was published 1992. In 2012 the "Network of Erasmus Based European Orthodontic Programmes" (NEBEOP) developed and approved an updated version of the guidelines. The core program consists of 8 sections: general biological and medical subjects; basic orthodontic subjects; general orthodontic subjects; orthodontic techniques; interdisciplinary subjects; management of health and safety; practice management, administration, and ethics; extramural educational activities. The program goals and objectives are described and the competencies to be reached are outlined. These guidelines may serve as a baseline for program development and quality assessment for postgraduate program directors, national associations and governmental bodies and could assist future residents when selecting a postgraduate program.

## 1. Introduction

The “Network of Erasmus Based European Orthodontic Programmes” (NEBEOP) was founded in 2009. It comprises a group of orthodontic postgraduate training programmes in Europe represented by programme directors or orthodontists assigned by institutes which deliver a structured programme in orthodontics. The primary concern of the Network is education, specific to the specialty of orthodontics and the main purpose is the advancement of orthodontic postgraduate training in Europe. In 1989 the ERASMUS Bureau of the European Cultural Foundation of the Commission of the European Communities funded the development of a new 3-year curriculum for postgraduate education in orthodontics. The curriculum was created by directors for orthodontic education representing fifteen European countries. It was published in 1992, entitled "Three years Postgraduate Programme in Orthodontics: the Final Report of the Erasmus Project" (van der Linden, 1992).

The next two decades the orthodontic profession has undergone substantial changes regarding need of education. New diagnostic tools, materials and clinical advancements as well as broadened interdisciplinary demands should be reflected in new recommendations for the speciality training. Therefore, at the general meeting of NEBEOP, 2010 in Portorož, Slovenia, a Task Force was installed with Professor Jan Huggare (Sweden) as the coordinator to make proposals for an update of the Erasmus programme. The commission was to update section 6, dealing with obligatory courses for education of orthodontists. After presenting the proposal to the Council of NEBEOP where further amendments were made the revision was presented to the general assembly of NEBEOP 2011 in Istanbul (Turkey) and was finally approved by NEBEOP assembly 2012 at the meeting held in Santiago de Compostela (Spain).

It should be noted that the revision should be considered as guidelines, not as rules, since NEBEOP is not a legal authority which can override the regulations and recommendations of the national Boards in each country. The main objectives of the programme, general and specific conditions and the distribution of hours remain largely unchanged as compared to the 1992 version of the program (Van der Linden, 1992) and have only been adapted to be in agreement with the updated and revised content of 2012. A new section has been added about competency levels to be reached. The full guidelines for postgraduate education in orthodontics in Europe are presented below.

## 2. Program objectives

The general objective of the programme is to educate dentists to become specialists in orthodontics with a solid and broad academic background and adequate clinical experience in different treatment methods. Upon completion of the program, the graduate must be able to:

- diagnose anomalies of the dentition, facial structures, and functional conditions
- detect deviations of the development of the dentition, facial growth, and functional conditions
- formulate a treatment plan and predict its course
- evaluate psychological aspects relevant to orthodontics
- conduct interceptive orthodontic procedures
- execute treatment for all types of malocclusions
- collaborate in the interdisciplinary treatment of medically and dental compromised patients, patients with syndromes and craniofacial anomalies, including orthognathic surgery care and CMD
- assess the need for orthodontic treatment on individual and societal levels
- practice orthodontics according to professional and ethical standards
- comprehensively review, understand, and evaluate the literature pertinent to orthodontics in a wide array of disciplines relevant to the speciality of orthodontics

- formulate a research hypothesis, design a methodological sound study, conduct the research, and present the findings
- use available opportunities for improving professional skills and lifelong learning

### 3. General conditions

1. The education of orthodontists must take place within universities or institutes with academic affiliation under responsibility of appointed academic teachers in orthodontics
2. The basic objective of the program is to educate clinicians; additional education is needed for those who also want to become a teacher and/or researcher
3. Candidates must be registered as a dentist in the country where the degree was obtained or in which the candidate is presently practicing
4. The program requires fulltime attendance of the residents
5. Residents should receive a stipend for living expenses
6. Specification of the minimal number of hours is provided for the obligatory courses, but is not indicated in detail for the preclinical and clinical activities
7. The core program requires 75 percent of the available time and must be supplemented by additional activities (electives).
8. The minimal number of clinical treatment hours is 16 hours per week (not including clinical seminars and discussion of treatment plans). The minimal number of hours over the 3-year period devoted to clinical practice (including preclinical course works) is 2000.
9. Each resident must start a minimum of 50 well-documented cases.
10. Residents must treat patients under continuous supervision of qualified orthodontists.
11. The clinical staff-student ratio in supervising treatment must be a maximum of 8 residents per supervisor
12. Dental laboratory work should be limited to learning experiences
13. Teaching of undergraduate students can be part of the program, but not for more than 10 percent of the time
14. Residents must conduct a research project leading to a publication or a congress presentation
15. Results of research and other activities undertaken in the postgraduate program can be used without limitation as partial fulfillment of requirements for an advanced degree
16. All theoretical courses must be concluded with an assessment of the acquired understanding and knowledge.
17. At the end of the program there must be a final examination by a committee including at least one external examiner
18. Part of the final examination is the presentation of 10 fully documented cases, representing different malocclusions and treatment procedures, started and completed by the resident.

### 4. Specific conditions

1. The director of the program must be:
  - Registered as a specialist in orthodontics for at least 5 years;
  - Actively practising the specialty
  - Appointed for at least 80 percent of the working week
2. Besides the director, the equivalent of one fulltime position for an orthodontist must be present. When more than a total of four residents is present, additional orthodontic staff are required
3. Adequate library, laboratory, clinical, research, and administrative facilities must be available

4. Sufficient non-academic staff must be available to realize an efficient conduct of the program and patient care
5. An established connection with centres for oral and maxillofacial surgery, periodontology, and restorative dentistry is required
6. Sufficient expertise must be available to realize the objectives of the theoretical courses
7. Research opportunities, methodological support and statistical guidance must be available

## 5. Distribution of hours

The academic programme is based on a minimum of 40 weeks a year and 40 hours a week, which totals 4800 scheduled hours for 3 years:

Staff/student contact activities	
clinical (and preclinical) practical work	2000 hrs
pretreatment clinical conferences	230 hrs
seminars on treatment evaluation	100 hrs
lectures, seminars, workshops on obligatory academic courses	455 hrs
lectures, seminars, workshops on elective theoretical subjects	150 hrs
staff/student contact time outside regular classes for individual consultations, research guidance, manuscript preparation etc.	115 hrs
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	3050 hrs
Non staff/student contact activities	
analysis of records of patients to be treated	120 hrs
undergraduate teaching, including preparation time	480 hrs
research	100 hrs
elective activities (including additional time for research)	1050 hrs
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	1750 hrs

In addition, students are required to put in a considerable number of hours of their own time for studying. For example, for every class hour on academic subjects, on an average two hours studying time are required.

## 6. Objectives of compulsory elements of theoretical education of orthodontists

The hours indicated in parentheses in the following sections are the minimum number of hours necessary for the average student to devote to the subject in order to achieve the required level of comprehension (= a sound knowledge and understanding of all subjects). The number of hours devoted to each of the subjects are shown in table 1. In addition the students are required to achieve a level of competency in the subjects indicated in section 7. The term 'competent to' means that students should have a sound theoretical knowledge and understanding of the subject together with adequate clinical experience to be able to independently resolve clinical subjects encountered. The number of hours to reach these competencies is not predefined.

At least one-third of the theoretical education hours must be spent in staff-student contact activities (lectures, seminars, workshops, etc.).

**Table 1**

*Subjects and number of hours in section 6 "Objectives of the compulsory elements of theoretical education of orthodontists"*

<b>part</b>	<b>NAME</b>	<b>New #hrs</b>
<b>A</b>	General biological and medical subjects	310
<b>B</b>	Basic orthodontic subjects	325
<b>C</b>	General orthodontic subjects	340
<b>D</b>	Orthodontic techniques	195
<b>E</b>	Interdisciplinary treatment procedures	125
<b>F</b>	Management of health and safety	25
<b>G</b>	Practice management, administration, and ethics	45
<b>H</b>	Extramural educational activities	elective
	Total theoretical hours	1365

The contents of the program can be restructured to larger modules for which each university may approve ECT credits.

## **A. GENERAL BIOLOGICAL AND MEDICAL SUBJECTS (310 hrs)**

### **A1. Paediatrics**

**(20 hrs)**

Knowledge of the implications of the following to orthodontics:

- somatic growth and its variations
- adolescent growth spurt and its relationship to growth of the craniofacial complex
- genetic and environmental factors that influence somatic growth
- concept of biological age, skeletal age, dental age, and stages of sexual development
- endocrine related problems in growth and development
- allergies (including eczema) related to orthodontics
- eating and weight issues in children and adolescents
- blood diseases including leukaemia
- diabetes
- DAMP (Deficits in Attention, Motor Control and Perception)
- non-accidental injury in children

### **A2. Anatomy and embryology of craniofacial structures**

**(40 hrs)**

Knowledge of:

embryology of craniofacial structures for understanding of

- normal growth and development of the face, jaws, and teeth
- teratogenesis
- development of clefts and other facial congenital malformations
- anatomical features, tissue systems, and functional anatomy essential for comprehension of
- growth of the craniofacial skeleton
- development of skeletal deformities
- orthognathic surgical correction of facial dysmorphology and malocclusion

### **A3. Genetics**

**(25 hrs)**

Knowledge of:

genetic principles essential for comprehension of:

- normal development of the craniofacial complex
- craniofacial malformations
- pre- and postnatal diagnosis of craniofacial anomalies
- genetic counselling
- molecular genetic methods

### **A4. Cell and molecular biology, immunology and microbiology**

**(30 hrs)**

Knowledge of:

Cytological, histo-chemical, and microbiological principles essential for the understanding of:

- cell metabolism under normal and abnormal conditions
- tissue formation and proliferation
- development of bone, cartilage, teeth, and muscle
- bone growth
- tooth eruption, movements and reactions in tooth supporting tissues
- soft tissue changes related to orthodontics
- mechanisms of root resorption
- biofilms

### **A5. Oral pathology and medicine**

**(20 hrs)**

Knowledge of:

the most common oral pathologic conditions and their impact on the orthodontic treatment:

- oral cancer and pre-cancer
- oral manifestations in immuno-compromised patients
- oral manifestations of diseases
- oral ulceration

- oral candidosis
- periodontal manifestations of systemic diseases
- salivary gland diseases
- facial trauma
- head and neck tumours

#### **A6. Pharmacology**

**(10 hrs)**

Knowledge of:

pharmacological agents with relevance to orthodontic treatment:

- antibiotics, antiviral and antifungal agents
- prostaglandin inhibitors
- non-steroidal anti-inflammatory drugs (NSAIDs)
- calcium regulators (parathyroid hormone, thyroid hormones, estrogens, bisphosphonates)
- anti-epileptics
- immunosuppressive agents
- growth hormone substitutes
- psychiatric drugs and tranquillizers
- agents affecting salivation

#### **A7. ENT and speech**

**(20 hrs)**

Knowledge of:

basic principles of normal function and ENT-pathophysiology related to orthodontics and/or craniofacial growth:

- of the nose and para-nasal sinuses
- of the pharynx, epipharynx, and larynx
- otitis externa, otitis media, and otitis interna
- normal and compromised nasal breathing
- sleep disorders and particularly Obstructive Sleep Apnoea and snoring
- diagnostic tools for sleep disorders and how to interpret the results
- normal and abnormal speech and its relation to craniofacial aberrations
- velo-pharyngeal function

#### **A8. Craniofacial syndromes**

**(20 hrs)**

Knowledge of:

most common types of oro-facial clefts, craniofacial anomalies, and syndromes in which the head is involved with respect to:

- aetiology
- classification
- effect on craniofacial growth
- psychosocial development

#### **A9. Psychology of the child, adolescent and adult**

**(35 hrs)**

Knowledge of:

concepts and principles of developmental psychology essential for the understanding of:

- patient motivation and assessment of co-operation
- psychological aspects of puberty and adolescence
- psycho-social impact of dental and facial appearance
- psychological aspects of orthognathic treatment
- development of cognition, language and communication, sex-differences

concepts of psychopathology and mental disorders essential for the understanding of their impact on orthodontic treatment

- delayed learning, dyslexia,
- eating disorders, anorexia nervosa, psychiatric disorders, depressions
- ADHD and other behavioural disorders
- autistic spectrum disorders
- conduct disorders, oppositional defiant disorders, self-harming behaviour

- suicidal thoughts and attempts

#### **A10. Research methodology and biostatistics**

**(90 hrs)**

Knowledge of:

general principles, theory and practice of research designs and commonly used statistical methods in

- diagnostic studies
- intervention and experimental studies
- aetiological research
- epidemiologic surveys
- systematic reviews and meta-analyses

Knowledge of:

- philosophy of science
- ethical and legal aspects in research involving animals and human subjects
- scientific integrity
- scientific misconduct
- evidence based decision-making

### **B. BASIC ORTHODONTIC SUBJECTS (325 hrs)**

#### **B1. Development of the dentition (normal and abnormal)**

**(70 hrs)**

Knowledge of:

- normal and abnormal development of the dentition from birth to adulthood
- abnormalities in number, size, form and position of the teeth
- genetic and environmental factors relevant to the development of the dentition
- orthodontic consequences of abnormalities of the dentition
- the impact of interceptive orthodontic measures

#### **B2. Facial growth (normal and abnormal)**

**(50 hrs)**

Knowledge of:

- growth sites in the craniofacial skeleton
- postnatal growth changes in the craniofacial region, including soft tissues
- variations within the craniofacial region relevant to facial growth
- influence of genetic and environmental factors on facial growth

#### **B3. Physiology and pathophysiology of the stomatognathic system**

**(35 hrs)**

Knowledge of:

- the process of mastication and swallowing
- normal and abnormal functional dental occlusion
- normal and abnormal behaviour of soft tissue structures
- normal and abnormal function of the temporomandibular joint

#### **B4. Aspects of tooth movements and dento-facial orthopaedics**

**(35 hrs)**

Knowledge of:

- the process of tooth eruption and spontaneous tooth movement
- biological response to different types of force application
- influence of force systems and force magnitude
- post-treatment changes

#### **B5. Oral and maxillofacial radiology and other imaging techniques**

**(30 hrs)**

Knowledge of:

- abnormalities and pathological conditions that can be diagnosed on radiographs
- health and safety guidelines with respect to oral and maxillofacial radiology
- digital oral and maxillofacial radiographic and other imaging techniques
- 3D imaging (CT, CBCT, MR, stereo photogrammetry) and their indications



**B6. Cephalometric radiography (45 hrs)**

Knowledge of:

- the anatomy of the head as applied to radiology
- cephalometric analyses
- limitations of cephalograms and their analyses

**B7. Orthodontic materials (25 hrs)**

Knowledge of:

- properties, composition and uses of orthodontic materials

**B8. Orthodontic biomechanics (35 hrs)**

Knowledge of:

- force systems produced by different orthodontic appliances
- force systems produced by dento-facial orthopaedic devices

**C. GENERAL ORTHODONTIC SUBJECTS (340 hrs)****C1. Aetiology and epidemiology of malocclusions (25hrs)**

Knowledge of:

- genetic and environmental factors that influence postnatal development of the dentition and facial complex
- unfavourable environmental influences and their interception
- prevalence of malocclusions and ethnic variation

**C2. Need and demand for orthodontic treatment (15 hrs)**

Knowledge of:

- validity of indices in estimating need for treatment
- models to determine the demand for treatment
- influence of society on demand for treatment
- aspects involved in subjective need for treatment
- role played by orthodontists in establishing demand for treatment
- factors involved in estimating objective need

**C3. Diagnostic procedures (15 hrs)**

Knowledge of:

- taking a patient history and clinical examination
- prerequisites for high quality diagnostic records (impressions of the dentition, extra-oral and intra-oral photographs, radiographic images necessary for orthodontic purposes).

**C4. Orthodontic diagnostic assessment, treatment objectives, and treatment planning (60 hrs)**

Knowledge of:

- principles of orthodontic diagnostic assessment, treatment objectives and systematic treatment planning

**C5. Growth and treatment analysis (45 hrs)**

Knowledge of:

- indices to measure occlusal and aesthetic outcomes of orthodontic treatment
- growth analyses based on serial radiographic images
- limitations of analyses of growth and treatment changes (including computerized prediction)

**C6. Long-term effect of orthodontic treatment (30 hrs)**

Knowledge of:

- the long-term effect of orthodontic treatment in individual patients, also in relation to ageing effects on the face and dentition

**C7. Iatrogenic effects of orthodontic treatment (30 hrs)**

Knowledge of:

- the development of decalcification, pulp necrosis, root resorption, recession and periodontal disease during orthodontic treatment
- caries risk evaluation and preventative measures during orthodontic treatment
- pain and discomfort related to orthodontic treatment
- the possible influence of treatment on dento-facial aesthetics
- the influence of orthodontic treatment on temporomandibular disorders (TMD)

**C8. Orthodontic literature (120 hrs)**

Knowledge of:

- methods to evaluate the methodological quality of scientific publications

**D. ORTHODONTIC TECHNIQUES (195 hrs)**

A level of competency is required for the topics D1-D8. The requirements are described in detail in Section 7

**D1. Removable appliances (30 hrs)****D2. Functional appliances (20 hrs)****D3. Extra-oral appliances (20 hrs)****D4. Partial fixed appliances (20 hrs)****D5. Fixed labial and lingual appliances (60 hrs)****D6. Retention appliances (15 hrs)****D7. Skeletal anchorage devices, TADs (20 hrs)****D8. Oral devices for OSA treatment (10 hrs)****E. INTERDISCIPLINARY TREATMENT PROCEDURES (125 hrs)****E1. Adult orthodontics (20 hrs)**

Knowledge of:

- indications and specific aspects of orthodontic treatment in adults

**E2. Treatment of patients with orofacial clefts and craniofacial anomalies (25 hrs)**

Knowledge of:

- interdisciplinary aspects of treatment
- indication, timing, and process of interdisciplinary treatment
- orthodontic treatment in cleft lip and palate patients

**E3. Orthodontic-surgical treatment (20 hrs)**

Knowledge of:

- minor surgical procedures in relation to orthodontic treatment
- indication and application of different types of orthognathic procedures
- 2D and/or 3D treatment planning and cast/model surgery

**E4. Orthodontic-periodontal treatment (20 hrs)**

Knowledge of:

- the effect of orthodontic treatment on the periodontium
- specific aspects of orthodontic treatment in periodontally compromised dentitions

**E5. Orthodontic-restorative treatment (20 hrs)**

Knowledge of:

- principles of combined orthodontic-restorative treatment
- orthodontic implications of implants

**E6. Craniomandibular disorders (20 hrs)**

Knowledge of:

- aetiology of craniomandibular disorders
- methods for clinical assessment of the temporomandibular joint
- general measures to improve craniomandibular disorders

**F. MANAGEMENT OF HEALTH AND SAFETY (25 hrs)****F1. Management of oral health (10 hrs)**

Knowledge of:

- procedures to detect a high risk of developing periodontal problems, enamel decalcification, and dental caries in orthodontic patients

A major part of this subject is incorporated in C7 (iatrogenic aspects of orthodontic treatment).

**F2. Health and safety in orthodontic practice (10 hrs)**

Knowledge of:

- guidelines and recommendations for preventing and controlling infectious diseases in orthodontic settings and complying with these guidelines

**F3. Multicultural health and health care behaviour (5 hrs)**

Knowledge of:

- cultural differences in patient expectations
- cultural differences in communication skills in a patient–care provider relationship

**G. PRACTICE MANAGEMENT, ADMINISTRATION, AND ETHICS (45 hrs)****G1. Office management (15 hrs)**

Knowledge of:

- design of an orthodontic practice
- equipment and instruments needed in an orthodontic practice
- recruitment and selection of auxiliary personnel
- personal and professional development of auxiliary personnel
- financing and administration of an orthodontic practice
- public relationships
- quality management certification

**G2. Communication (10 hrs)**

Knowledge of:

- principles of effective communication with patients, parents, staff, and third parties

**G3. Ergonomics (5 hrs)**

Knowledge of:

- principles of ergonomic positioning of patient, orthodontist, chair-side assistant, instruments

**G4. Legislation (10 hrs)**

Knowledge of:

- laws and regulations that apply to orthodontic practice
- aspects of litigation in orthodontic practice

**G5. Professional ethics (5 hrs)**

Knowledge of:

- behaviour and conduct expected of an orthodontist as a health care provider
- ethical standards that apply to relationships with personnel, patients, and colleagues

**H. EXTRAMURAL ACTIVITIES**

It is highly recommended to:

- participate in EOS Distinguished Teacher's Lectures where possible
- participate in meetings and congresses arranged by national and international orthodontic societies

## 7. Essential competency levels for postgraduate education in orthodontics

In addition to the theoretical knowledge levels indicated in Section 6 the students are required to achieve a level of competency in the below mentioned subjects. The term 'competent to' means that students should have a sound theoretical knowledge and understanding of the subject together with an adequate clinical experience to be able to resolve clinical problems encountered, independently, and without assistance.

The minimal number of hours necessary for the average student to devote to the subject in order to achieve the required level of comprehension (= a sound knowledge and understanding of all subjects) are indicated in chapter 6. The competency level "competent to" should be achieved throughout the education without specified hours.

### A. GENERAL BIOLOGICAL AND MEDICAL SUBJECTS

#### A10. Research methodology and biostatistics

Competent to:

- apply the principles of evidence based medicine
- assess the quality of evidence and validity of conclusions
- use electronic databases efficiently to obtain the evidence to answer a clinical or research question
- understand and evaluate statistical methods and interpretation of findings in current literature
- perform an analytical review of research papers
- write a protocol for a research project
- apply data processing procedures
- interpret own research findings
- present research findings in oral and written form.

### B. BASIC ORTHODONTICS SUBJECTS

#### B1. Development of the dentition (normal and abnormal)

Competent to recognize and identify:

- normality or abnormality of growth and development
- developmental stage attained
- potential future development
- possibilities for interceptive measures to improve the current and future situation

Competent to

- plan and undertake interceptive orthodontic treatment

#### B2. Facial growth (normal and abnormal)

Competent to recognize and identify:

- postnatal growth changes in the craniofacial region, including soft tissues
- variation in the function of components within the craniofacial region relevant to facial growth
- individual variation in facial morphology
- influence of genetic and environmental factors on facial growth

#### B4. Aspects of tooth movements and dento-facial orthopaedics

Competent to recognize and identify:

- the process of tooth eruption and spontaneous tooth movement
- biological response to different types of force application
- influence of force systems and force magnitude
- post-treatment changes

**B5. Oral and maxillofacial radiology and other imaging techniques**

Competent to:

- recognize and identify abnormalities and pathological conditions that can be diagnosed on radiographs
- apply the ALARA (As Low As Reasonably Achievable) principles for radiation protection
- judge and improve the quality of radiographs for orthodontic purposes
- apply health and safety guidelines with respect to oral and maxillofacial radiology

**B6. Cephalometric radiography**

Competent to:

- describe the radiographic anatomy of the head
- identify relevant anatomical structures on cephalograms
- undertake digital or manual tracings of cephalograms in *norma lateralis* and *norma frontalis*
- undertake cephalometric diagnostic analyses and draw appropriate conclusions

**B7. Orthodontic materials**

Competent to:

- select appropriate materials for orthodontic procedures
- handle and use orthodontic materials appropriately

**B8. Orthodontic biomechanics**

Competent to:

- apply principles of mechanics to clinical problems
- estimate force systems produced by different orthodontic appliances
- estimate force systems produced by dento-facial orthopaedic devices

**C. GENERAL ORTHODONTIC SUBJECTS****C1. Aetiology and epidemiology of malocclusions**

Competent to:

- assess orthodontic treatment need and perform screening procedures

**C3. Diagnostic procedures**

Competent to:

- obtain a relevant patient history
- perform a thorough clinical examination
- determine habitual occlusion, evaluate functional occlusion, and different jaw relationships
- evaluate influence of functional components of soft tissues on dento-facial morphology
- take high quality impressions of the dentition
- take high quality extra-oral and intra-oral photographs
- take high quality radiographic images necessary for orthodontic purposes.

**C4. Orthodontic diagnostic assessment, treatment objectives, and treatment planning**

Competent to:

- arrive at a tentative diagnosis and classification based on the initial clinical examination of a patient
- provide advice after an examination concerning feasibility of treatment, need for a more detailed analysis and treatment planning, or further consultation with other specialists
- arrive at a proper diagnosis on the basis of anamnestic data, patient examination, dental casts, photographs, radiographs, and other relevant data
- predict the likely effect if no therapy is implemented
- define objectives of treatment with due consideration of the alternatives

- define a treatment plan for various types of orthodontic and dento-facial abnormalities, including treatment and retention strategies, therapeutic measures, timing and sequence of their application, prognosis, and estimated treatment and retention time
- undertake a cost/benefit assessment for different treatment and retention procedures
- assess scope, limitations and likely stability of orthodontic treatment
- communicate the treatment plan to patients (and their parents if the patient is under the age of consent)

#### **C5. Growth and treatment analysis**

Competent to:

- use indices to measure occlusal and aesthetic outcomes of orthodontic treatment
- undertake growth analyses based on radiographic images
- describe treatment changes by analysis of before and near end of treatment records
- understand the benefits and limitations of analyses of growth and treatment changes

#### **C6. Long-term effect of orthodontic treatment**

Competent to:

- describe the potential long-term effect of orthodontic treatment in individual patients, also in relation to ageing effects of the face and dentition
- inform the patients about potential post-treatment changes associated with different anomalies and treatment procedures

#### **C7. Iatrogenic effects of orthodontic treatment**

Competent to:

- identify factors involved in development of decalcification, pulp necrosis, root resorption, gingival recession and periodontal disease during orthodontic treatment
- prevent or manage intra- and extra-oral lesions due to orthodontic treatment
- make a caries risk evaluation and apply preventive measures during orthodontic treatment
- advise patients how to manage pain and discomfort related to orthodontic treatment
- describe the possible influence of treatment on dento-facial appearance and aesthetics
- evaluate the influence of treatment on craniomandibular disorders (CMD)

#### **C8. Orthodontic literature**

Competent to:

- detect essential publications in the current literature (taught in specific literature review sessions)
- evaluate the methodological quality of scientific publications
- develop and present a critical appraised topic (CAT)

### **D. ORTHODONTIC TECHNIQUES**

#### **D1. Removable appliances**

Competent to:

- describe the use of removable appliances, including uses and limitations
- identify indications and contra-indications for removable appliance use
- design appliances, describe and evaluate the construction
- undertake limited repairs

#### **D2. Functional appliances**

Competent to:

- describe the use and the limitations of of removable and fixed functional appliances
- identify indications and contra-indications
- design appliances and describe and evaluate the construction
- undertake limited repairs

**D3. Extra-oral appliances**

Competent to:

- describe the use and the limitations of various types of headgears, face masks, chin cups, and combined extra-oral/functional appliances
- identify indications and contra-indications
- design appliances and describe and evaluate the construction
- identify safety aspects of extra oral appliances

A major part of the section is covered in B4 (Aspects of tooth movements and dentofacial orthopaedics).

**D4. Partial fixed appliances**

Competent to:

- describe the use of partial fixed and semi-removable appliances
- identify indications and contra-indications, and design appliances
- describe the different concepts and treatment approaches in partial fixed appliance therapy

**D5. Fixed labial and lingual appliances**

Competent to:

- describe the use of labial and lingual fixed appliances, including their limitations
- identify indications and contra-indications
- describe different concepts and treatment approaches in design and biomechanical principles
- use at least one fixed appliance system

**D6. Retention appliances**

Competent to:

- describe the uses and limitations of retention appliances
- identify indications and contra-indications
- design the appliance and describe and evaluate the construction
- describe the most appropriate duration of retention
- undertake limited repairs

**D7. Skeletal anchorage devices, TADs**

Competent to:

- recognise when TADs or skeletal anchorage devices should be considered as part of the management of a malocclusion

**D8. Oral devices for OSA treatment**

- The achievement of a competency level is encouraged, but is not obligatory.

**E. INTERDISCIPLINARY TREATMENT PROCEDURES****E1. Adult orthodontics**

Competent to:

- describe indications and specific aspects of orthodontic treatment for adults
- collaborate in the diagnosis and treatment planning of adult patients with general dental practitioners and other specialists

**E2. Treatment of patients with orofacial clefts and craniofacial anomalies**

- The achievement of a competency level is encouraged, but is not obligatory.

**E3. Orthodontic-surgical treatment**

Competent to:

- describe aspects of orthodontic treatment specific for patients requiring orthognathic treatment



- collaborate in the diagnosis and treatment planning of patients who require minor surgical procedures or orthognathic treatment

#### **E4. Orthodontic-periodontal treatment**

Competent to:

- describe how orthodontic treatment may benefit patients who have a history of periodontal disease
- describe aspects of orthodontic treatment specific for periodontally compromised dentitions
- evaluate indications and contra-indications for orthodontic treatment in periodontally compromised dentitions
- collaborate in the diagnosis and treatment planning of periodontally compromised dentitions

#### **E5. Orthodontic-restorative treatment**

Competent to:

- identify indications and contra-indications for combined orthodontic-restorative treatment
- describe orthodontic implications of implants
- describe aspects of orthodontic treatment specific for combined orthodontic-restorative patient care
- collaborate in the diagnosis and treatment planning of patients requiring orthodontic-restorative treatment

#### **E6. Craniomandibular disorders**

Competent to:

- describe indications and contra-indications for orthodontic treatment in patients with craniomandibular disorders
- identify possible implications of orthodontic treatment in the presence of a craniomandibular disorder
- collaborate in the diagnosis and treatment planning of patients with a craniomandibular disorder by a team of specialists

### **F. MANAGEMENT OF HEALTH AND SAFETY**

#### **F1. Management of oral health**

Competent to:

- instruct patients to maintain optimal oral hygiene as a preventative measure for gingival and dental lesions

#### **F2. Health and safety conditions in an orthodontic practice**

Competent to:

- implement guidelines and recommendations for preventing and controlling infectious diseases in an orthodontic setting and comply with them
- implement guidelines and recommendations for managing personnel health and safety concerns related to infection control in an orthodontic practice and comply with them
- evaluate systematically the practice infection-control program to ensure procedures are followed accurately
- control exposure to substances hazardous to health for patients and personnel

### **G. PRACTICE MANAGEMENT, ADMINISTRATION, AND ETHICS**

#### **G1. Office management**

Competent to:

- implement a quality management system in an orthodontic practice

#### **G2. Communication**

Competent to:

- communicate effectively with patients, parents, staff, other medical personnel, and third parties
- utilize effective communication tools and different presentation modes

### **G3. Ergonomics**

Competent to:

- position patient, orthodontist, chair-side assistant, and instruments in an ergonomic optimal manner
- to perform specific clinical procedures in the most efficient sequence

### **Acknowledgements**

The authors would like to express their gratitude to the members of the Network of Erasmus Based European Orthodontic Programmes (NEBEOP) for their valuable input to this document. Furthermore they are grateful to the European Orthodontic Society for providing support to the meetings.

### **References**

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