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WORLD FEDERATION OF ORTHODONTISTS (WFO) GUIDELINES FOR POSTGRADUATE ORTHODONTIC EDUCATION

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In July 2006, the Executive Committee of the World Federation of Orthodontists (WFO) accepted the president's proposal for establishing a WFO task force on Guidelines for Postgraduate Orthodontic Education.

This task force was chaired by WFO President Professor Athanasios E. Athanasiou and had as members Professor M. Ali Darendeliler, Associate Professor Theodore Eliades, Professor Urban Hägg, Professor Brent E. Larson, Professor Pertti Pirttiniemi, Professor Stephen Richmond, Professor Kunimichi Soma, Professor Alexander Vardimon, and Professor William Wiltshire.

The objective of this task force was to provide the WFO Executive Committee with detailed recommendations concerning guidelines for postgraduate orthodontic education, which may assist countries, associations, and educational institutions to develop or improve such programs.

Over the past several years, the WFO has placed increased emphasis on support for the recognized training programs in every region of the world through its affiliate national organizations. At the same time, the WFO intends to continue to provide, when requested, encouragement and expertise to developing orthodontic graduate programs in areas where orthodontic education did not previously exist.

It is anticipated that these guidelines will be used by postgraduate program directors all over the world and by related educational, scientific, and administrative institutions at all levels of sophistication to measure their respective curriculum against a worldwide standard.

The following detailed recommendations of the task force on Guidelines for Postgraduate Orthodontic Education are herewith presented, and they are accompanied by two appendices: (1) Clinical Care, Study, and Research Facilities and (2) Educational Topics.

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1. PROGRAM GOALS AND OBJECTIVES

The goal of the program is, *inter alia*, to be in accordance with the requirements of the present and past WFO documents on Orthodontic Specialty Education Guidelines to identify and recognize appropriately trained orthodontic specialists worldwide, who have credentials that satisfy the standards set by the WFO.

According to the currently described guidelines, the objective of orthodontic postgraduate educational programs is to produce graduates who have completed their didactic and clinical education under the auspices and direction of an advanced education institution. Graduates of an orthodontic program—based in or affiliated with an advanced education institution—are provided with a broad-based higher level of education in orthodontics and its allied biomedical sciences and clinical disciplines. Graduates are trained in the discipline of orthodontics and dentofacial orthopedics so they will become specialists in this area with a solid background in orthodontic diagnosis and orthodontic treatment modalities.

Upon completing the academic, clinical, and research requirements of the program, the graduate must be able to:

- Diagnose and characterize anomalies of the dentition, growth of the craniofacial skeleton, and functional abnormalities
- Formulate and exercise a controlled and predictable treatment plan
- Conduct interceptive and preventive orthodontic procedures
- Treat all types of malocclusion
- Evaluate psychological aspects of relevance to orthodontics
- Collaborate in the interdisciplinary treatment of medically compromised patients, syndromes, and craniofacial anomalies, including orthognathic surgery care
- Assess the need for orthodontic treatment on individual and societal levels
- Practice orthodontics according to the standards of ethics
- Comprehensively review, understand, and evaluate the literature pertinent to orthodontics in a wide array of disciplines relevant to the specialty, including molecular biology, biomaterials, and biomechanics
- Formulate a research hypothesis and design and conduct an experiment to test its validity
- Efficiently organize, present, and publish research findings, as well as present clinical cases in a comprehensive manner

2. PROGRAM DURATION

Postgraduate orthodontic programs should be a minimum of full-time, 24-month duration. However, it is strongly recommended to have at least 36 months of full-time specialist education, specifically to allow residents sufficient time to complete their research projects, the majority of orthodontic and interdisciplinary cases assigned to them, as well as to plan and monitor retention for at least a few months prior to graduation.

3. RESIDENTS

To be admitted to the postgraduate program, the candidate should have undertaken and passed a full-time course in dentistry of at least 4 years. The candidate must provide proof of registration as a dentist in the country in which the degree was obtained or in which the candidate is presently practicing.

It is recommended that the candidate should have completed at least 2 years of general dentistry practice experience in a private, government, or university-clinic environment before being accepted into the postgraduate orthodontic program.

Admission criteria should include previous academic performance, clinical and research experience, foreign language familiarity as needed, as well as evaluation of goals and motivation for orthodontics.

4. FACULTY

An appropriately qualified academic staff and program director are essential for academic success. The faculty may be composed of permanent, affiliate/adjunct, and full- or part-time academic staff.

The clinical staff–resident ratio in supervising treatment must be at least 1:4-6.

It is recommended that the program director should:

- Possess a PhD and/or MSc (or equivalents) in orthodontics and present a strong research and publication record, as well as teaching experience
- Be registered as an orthodontic specialist for at least 10 years
- Actively practice the specialty at least 1 day a week
- Demonstrate excellence in clinical experience with completion of a sufficient number of cases per year
- Be member in good standing of the country's orthodontic specialists' association
- Be appointed for at least 60% of the working week
- Demonstrate administrative ability to coordinate a graduate clinical program
- Present research ability and a proven track record in supervising research studies for higher degrees

In addition to the director, a full-time position for an orthodontist (clinical academic) must be present. When more than six residents are enrolled, additional clinical academic staff is required.

It is recommended that the clinical academic should:

- Possess a PhD and/or MSc in orthodontics or equivalents
- Be registered as an orthodontic specialist for at least for 5 years
- Actively practice the specialty
- Complete a sufficient number of cases per year to maintain clinical skills
- Be member in good standing of the country's orthodontic specialists' association

When more than one clinical academic is appointed, the appointment may be also on a part-time basis.

Nonorthodontic clinicians, such as a research academic and/or biostatistician, may occupy other faculty positions.

The research academic must:

- Possess a PhD with experience in graduate-level teaching and graduate student research supervision
- Possess research ability with an important publication record in refereed journals and proven experience in supervising research of Masters and Doctoral students.

External collaborators (orthodontic specialists or other dental specialists) may be appointed to conduct lectures in basic and interdisciplinary subjects. These lecturers do not have to be enrolled permanently as faculty staff.

Orthodontic experts with a high degree of clinical experience and dedication in teaching not enrolled in the faculty may be invited to conduct lectures or seminars.

5. CLINICAL CARE, STUDY, AND RESEARCH FACILITIES

A specialist course in orthodontics needs to provide adequate clinical, building, administrative, information technology (IT), and research facilities.

I. Clinic

Clinics should include waiting room, reception area, consultation/disabled/special-care room, operatory (main clinic) rooms, oral hygiene room/cubicle/corner, sterilizing room/area, mixing area, and a photography area.

II. Radiology area

Should be in the same department or building.

III. Offices

Department's head and program director offices, lecturers' office(s), administrative staff office, residents' office/study area, and lecture/tutorial room.

IV. Storage

Storage is required to store teaching, research, and clinical materials, as well as office stationery.

V. Technical laboratory

Technical work can be performed in-house and/or in cooperation with external orthodontic laboratories. If technical work is performed exclusively in-house, a full-time dental laboratory technician for each six residents is required. Local conditions, appliances' characteristics, and available resources should be considered regarding the place in which the technical work will take place.

VI. Research facilities/support

Clinical and laboratory facilities and support are required based on research interest and specialization fields of the institution.

See Appendix 1 for details on these areas.

6. REQUIRED CURRICULUM

I. Program curriculum

Residents must be enrolled full-time and are required to attend an adequate amount of faculty-supervised clinical sessions to establish proficiency in clinical orthodontics. Twenty-four (24) hours per week of supervised patient management is recommended. The trainee may spend more time in preparatory work in the form of individual studies, research, or other specific assignments. However, all clinical training and taught courses must fit within an 8-hour daily work schedule. Ten to 12 hours per week, 25% to 30% of the program, should be dedicated for research and administration (treatment planning, preparation of tutorials, assignments, and case presentations).

The number of new patients assigned to each resident should not be fewer than 30, and equal or more transferred patients will be assigned during the course of the study. Clinical responsibilities of the residents should also include supervision of retention patients and recall for observation of former patients with special clinical interest. A minimum of 2 hours per week should be devoted to case presentation and another 1 hour for review of the current literature in the form of a journal club. Treatment modalities and appliances should include removable and fixed appliances, growth modification and orthognathic surgery, guided eruption of impacted teeth, craniofacial anomalies, interdisciplinary management, and preventive and interceptive case management.

Written and/or oral examinations must be conducted in all courses. In addition, programs may electively impose a final examination upon completion of the program. The latter is necessary, especially in countries where orthodontics is not an official dental specialty recognized by the local education, health, or other professional authorities, which usually organize independent assessments of competence.

As a requirement for successful completion of the program, residents must submit a thesis in the form of a typical Master's document, which reports original data derived from research activities in various fields, and/or prepare a paper in publishable format.

II. Specific conditions

Orthodontic curriculum must be assessed independently. However, active interaction with adjunct dental disciplines, including restorative dentistry, oral and maxillofacial surgery, pediatric dentistry, and periodontology, is essential in providing a thorough perspective on treatment planning.

III. Course work/topics to be covered

A. Biomedical sciences with emphasis on biological and medical subjects

- Growth and development
- Anatomy of the head and neck
- Genetics
- Embryology of the head
- Cell and molecular biology
- Oral immunology and microbiology
- Oral physiology
- Biostatistics
- Research methodology

B. Basic orthodontic subjects

- Development of the dentition
- Physiology of the stomatognathic system
- Orthodontics as it relates to growth
- Biomechanics
- Dental radiography
- Introductory orthodontic seminars/diagnosis and treatment planning
- Cephalometric radiography
- Orthodontic materials
- Occlusion and TMJ
- Iatrogenic effects from orthodontics

C. Special orthodontic subjects

- Biomechanics and tooth movement
- Obstructive sleep apnea and orthodontics
- Interdisciplinary treatment (eg, prosthodontics-periodontics)
- TMD and orthodontics
- Orthognathic surgery joint clinics and seminars
- Face asymmetries
- Class I malocclusion
- Class II malocclusion
- Class III malocclusion
- Vertical problems
- Maxillary constriction
- Orthodontic diagnosis in 3 dimensions of space
- Orthodontic techniques
- Cleft lip and/or palate treatment
- Adult orthodontics
- Noncompliance treatment
- Temporary anchorage device (TAD)
- Practice management

7. SPONSORING INSTITUTION AND INSTITUTIONAL COMMITMENTS

Advanced orthodontic specialty education programs must be sponsored by institutions (university/school/hospital), which are properly chartered and licensed to operate and offer instruction leading to degrees, diplomas, or certificates with recognized education validity. It is recommended that hospitals that sponsor advanced orthodontic specialty education programs should be university-affiliated. All educational institutions that sponsor advanced orthodontic specialty education programs must be accredited by an agency recognized by the national or regional governmental education and/or health authorities.

I. Academic and quality assurance

A. Compatibility of standards, eg, with subject benchmarking statements and meeting the requirements of the professional and statutory bodies

- The sponsoring institution must provide a committee structure to oversee the course taught in orthodontics to ensure that it delivers what it is supposed to and provides a high standard of teaching and learning compatible with the course provided at the university and other universities nationally and internationally.
- The sponsoring institution must facilitate visitations from other professional and statutory bodies nationally and internationally to ensure that course standards are being maintained and that resources (eg, staff, environment, and financial) are above the accepted minimum.

B. The communication of those standards to staff and residents

- The sponsoring institution must provide documentation of structures that set out standards of teaching and learning consistent with national and international standards, ensuring that these are clearly stated and communicated to both staff and residents.

C. An account of the school's quality-assurance arrangement applicable to the program, including school quality manual.

- The sponsoring institution must provide a protocol of how the orthodontic program is managed and integrated in the university/school/hospital quality manual.

D. Monitoring and review arrangements in accordance with institutional requirements and opportunities to ensure continuous enhancement (accreditation)

- The sponsoring institution must provide a mechanism of review of the provision of the orthodontic course (every 3 to 6 months) and facilitate a period of self-assessment and external assessment (1 to 3 years).

E. The involvement of residents in the quality-assurance process

- Residents should be formally invited to contribute to the review and development of the orthodontic program and quality-assurance initiatives.

II. Regulations and program administration

A. Program regulations

- The orthodontic regulations should be incorporated with university/school/hospital documentation and be consistent with national and international guidelines.

B. Program management and reporting structures

- There should be a robust managerial structure that integrates fully with the university/school/hospital structure so that minutes of meetings are reported/referred to the appropriate university/school/hospital committees.

C. The contribution of residents to the program-management process

- The residents should be encouraged to provide feedback and develop suggestions on all aspects of the course, resources, management, and sponsoring institution.

III. Support for residents

A. Academic support for residents

- The university/school/hospital should provide the infrastructure to support teaching and learning with state-of-the-art facilities: clinical, laboratory, personal workspace, and information technology. There should be excellent library support with Internet access to relevant academic journals.

B. Mechanisms to be employed for monitoring the academic progress of residents

- Monitoring should be undertaken on a frequent basis with regular formal documented meetings with the residents every 3 to 6 months.

C. Pastoral support for residents

- The university/school/hospital should provide formalized systems for personal support for the resident. This support can be provided by members of the orthodontic staff, but it may be more appropriate if the support is provided by staff not associated with the orthodontic teaching (essential in cases where there is potential orthodontic staff/resident conflict). The university/school/hospital should provide occupational health and safety facilities to ensure total well-being throughout the education period.

D. Personal tutor system

- Residents should be allocated personal tutors to mentor them throughout their training period. The tutors should follow the role of tutor guidelines set out by the institution.

E. Personal development planning for residents

- A detailed personal-development plan (PDP) must be provided for each resident. It may be either paper- or electronically based. Financial support should be allocated to attend conferences and other continuing professional educational courses.

F. Support for residents studying away from the institution, including placement settings

- The university/school/hospital should support travel expenses for work undertaken outside the host institutions. Facilities similar to the host institution should be available.

G. Support for overseas residents

- Overseas residents often need extra support to ease the transition into the postgraduate course (eg, language and cultural), and the university/school/hospital should provide these supporting mechanisms.

IV. Corporate governance (financial, physical, and human resources)

A. Financial and resource plan for the orthodontic program

- The university/school/hospital should provide and support facilities for the orthodontic course, although the provision of the course should not cause a financial strain on university/school/hospital resources.

B. Staff resources to support the program

- There should be sufficient administrative, clinical, and technical staff support to cover the postgraduate program.

C. Resources to support learning and teaching, including library, IT, and other resident support mechanisms

- There should be adequate resources to support teaching and learning.

D. Recruitment

- The university/school/hospital should provide support for the recruitment process for orthodontic postgraduates.

E. Fulfilment of legal responsibilities

- The university/school/hospital should fulfill and ensure that national and international legal responsibilities are met.

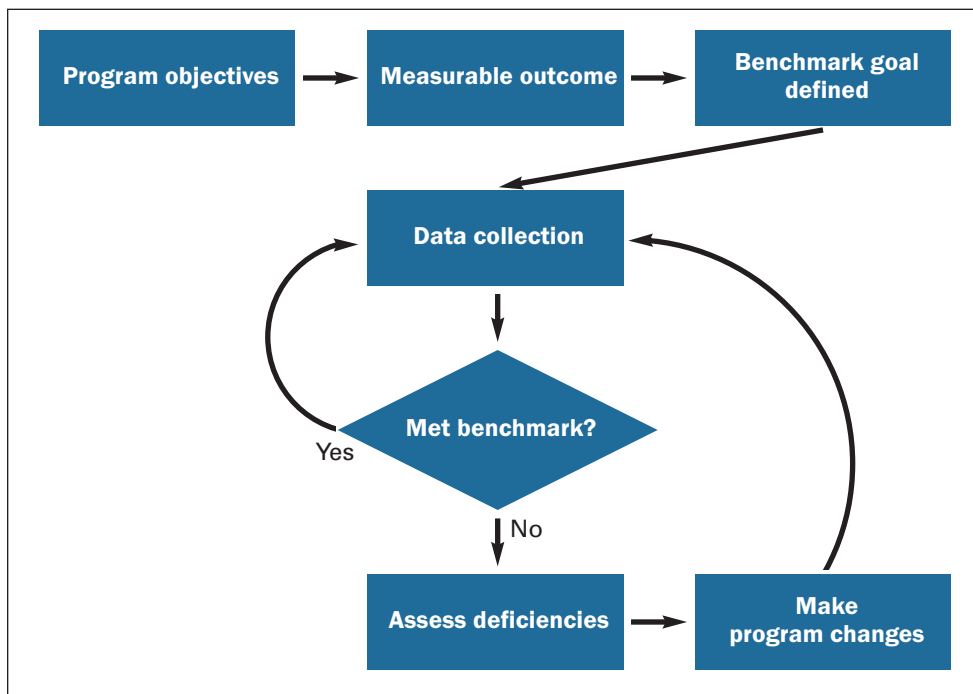


Fig 1

F. Training of staff

- The university/school/hospital should provide the training of staff to keep them up-to-date with legal matters and international and national policies pertinent to the training of residents.

G. Health and safety

- The university/school/hospital should comply with appropriate international and national law and policies. In addition, the orthodontic program must comply with local rules and regulations.

V. Research governance

A. Research ethics

- Any research undertaken in the university/school/hospital should follow and comply with international/national/regional rules and regulations on ethics.

B. Research management

- The university/school/hospital should monitor and manage research and ensure that research follows stringent guidelines set out by the appropriate international and national bodies.

8. PROGRAM EVALUATION

Each program is expected to maintain an ongoing assessment of its effectiveness based on the program's defined goals and objectives. The goals and objectives must minimally address the areas of didactic education (including biomedical and clinical sciences), patient-care experience, and research experience. The objectives should be measurable by one or more indicators.

The degree to which the program objectives are met should be assessed on a regular basis (at least annually), and deficiencies that are noted should lead directly to program changes designed to improve performance in this area. This will result in a continual process of program evaluation and improvement as diagrammed in Fig 1.

This program evaluation could be instituted on several levels.

Internal. All programs are expected to engage in this type of ongoing assessment with data collection and evaluation at least annually. Documentation of the process should minimally include evidence of data collected, evidence of discussion by faculty, recommendations for program changes (as indicated), and timetable for repeated data collection.

Country or region. In areas where formal accreditation exists, site visitors could review this program evaluation. Specific emphasis should be placed on identification of program weaknesses, institution of suggested changes, and follow-up data collection to evaluate the changes.

Worldwide/WFO. The program evaluation materials could be submitted on a periodic basis to a WFO review committee to demonstrate compliance with the program evaluation process. This could be of value especially in countries/regions that do not have accreditation processes in place.

The process relies heavily on program-specific goals and objectives. The goals and objectives must be complete and well-defined for the process to be effective.

9. RESIDENT EVALUATION

By evaluating the program, it may be assumed that if the individual components (eg, program curriculum, facilities, and staff) are present in the right proportions, the product will be an efficient program that will produce competent graduates. However, existing international practices suggest that apart from curricula compliance examination of the graduate, there should be a direct approach to assess the competency of the treatment provider, regardless of the reputation and overall standing of the program from which he/she has received advanced education. This method secures a minimum standard in the provision of orthodontic services by directly examining the qualification of the graduate. In addition, taken in large scale, a resident's evaluation may serve as an indirect means of revealing the effectiveness of specific advanced orthodontic program curricula.

Evaluation of residents should take place on a regular and prescheduled basis throughout the program, as well as on completion. The residents, teachers, and internal and external examiners should undertake this evaluation. The program should enable continuous assessment of residents' performance, thus recognizing individuals' strengths and identifying areas of improvement through personal-development plans.

There should be a process of appraisal for all residents, consisting of an informal discussion between residents and their academic staff at least in every semester, during which they are encouraged to reflect on their progress and set goals for the remainder of the course. The residents are encouraged to review their progress in achieving these goals. The appraisal process provides an opportunity to identify potential problems early and provide appropriate support and guidance. With sufficient staff support, the problems may be discussed and resolved expeditiously.

Evaluation of residents may take place at the end of each semester, year, or specific module.

Examinations/evaluations

During the program

After completing a subject/module/course, and depending on the subject/module/course, this assessment should include theoretical examination (eg, written essay or multiple-choice test), practical evaluation of residents' capabilities (eg, wire bending, typodont exercises), or assignment of independent review paper writing or presentation. Other informal assessments for resident feedback will be based on direct observation of clinical performance, as well as on performance at problem-based seminars.

Final examination

After completing the program, residents should participate in the final examination(s), which will involve assessment of their overall knowledge regarding orthodontics and related clinical disciplines.

If external examiners are used in the final examination (recommended) a viva-voce examination with an internal and an external examiner using set questions may be utilized.

Final examination(s) should include an initial examination, diagnosis, and treatment-planning exercise on a set of patient records that are not known to the residents. The examiner(s) will have previously examined the record(s) and agreed on questions and solutions. The residents will examine these records for a specific period (eg, 45 to 60 minutes) and then be examined by the examiners on their diagnosis and treatment plan.

If a National Orthodontic Board exists in the country, it is recommended that this Board should be involved in the final examination; if the resident passes the exam, he/she should receive the Board's certification and become eligible for re-certification every certain number of years in order to maintain a high standard of care.

Should unsatisfactory outcomes characterize the performance of a resident, a resit evaluation should be held within a reasonable time period. In case of another failure, repetition of the subject/module/course at the next academic semester or year should be considered. In cases of serious and repeated unsatisfactory performance by the resident, the situation should be discussed within the faculty and the resident may be advised that his/her registration be suspended or terminated.

Practical requirements

Residents are expected to attend all scheduled sessions punctually. Attendance and active participation by the residents in all seminars organized by the postgraduate program is mandatory.

To acquire sufficient knowledge and capabilities regarding orthodontic laboratory work, each resident should fabricate a specific number of study models, diagnostic setups, retainers, and removable and functional appliances assigned by the program.

Each resident should be ready to present a minimum number of finished and fully documented cases (5 to 10 cases) that were treated entirely by the resident during the course of the program. Documentation should be made according to the guidelines of the country governing authority (eg, American Board of Orthodontics).

Dissertation or Master's thesis

Each resident should undertake a research project for which its methodology, as well as the results, should be presented in the form of a dissertation. The resident should produce a bound dissertation of 20,000 to 50,000 words by the required submission date and be able to discuss and defend the research in an oral examination. Residents are expected to publicize the findings of their research in a variety of ways, including (a) presentation at research seminars, (b) presentation at national/international meetings, and (c) publication in a refereed journal.

Subject to achieving a satisfactory performance in all elements of the program, he/she will be awarded with the degree.

With regard to the level of educational award and assessments (eg, MSc, professional doctorate, PhD—merit and distinction), local rules in universities/institutions/countries should apply.

10. OUTCOME ASSESSMENT

Orthodontics, like any medical discipline, is a dynamic field. Orthodontic specialists and scientists working in this field are committed to improving treatment results and stability, and minimizing the side effects. The motivation and initiative for these advancements have to come within the field, as well as through interaction with other dental and medical disciplines. This implies that postgraduate orthodontic education providers and graduate orthodontic specialists should be committed to the continuing process of expanding orthodontic knowledge. This commitment may be facilitated by WFO-sponsored actions, activities, and programs that aim to expand academic staff knowledge (eg, education exchange programs), acknowledge students and academic staff research (ie, awards), and recognize continuously updated educators (eg, certification).

Appendix 1: Clinical Care, Study, and Research Facilities

CLINIC

Clinics should consist of a waiting room, reception area, consultation/disabled/special care room, operatory (main clinic) rooms, oral hygiene room/cubicle/corner, sterilizing room/area, mixing area, and a photography area. The details are highlighted below.

Waiting room

- Space
- High capacity (chairs and tables, etc)
- Relative comfort
- Toilets/accommodations for disabled*

Reception area

- Visible/first contact*
- Provide record access
- Administrative tasks*
- Scheduling*
- Clinical coordination
- Center for deliveries*
- Media center
(screens in reception and waiting room)
- IT equipment

Consultation room(s)

- Dental chair*
- Parent/patient discussion desk with
light box incorporated
- Multimedia facilities
- Interactive and educative software
- Display cabinet
- Access for disabled*

Operatory

- Dental chairs* (at least one chair per two residents)
in a cubicle, clinical room, or open set-up
- Utility/storage*
- Working drawers
- Hygienic flooring*
- Sharp disposal*
- Bins*
- Compressed air*

Oral hygiene area

- Sink*
- Mirror*
- Storage
- Bin*
- Display cabinet
- Hygienic flooring*

Sterilizing area

- Clean/dirty area*
- Bins*
- Sharp disposal*
- Sink/tap*
- Ultrasonic bath*
- Cold sterilizer*
- Packing area*
- Sterilizer*
- Drying area*
- Clean instruments storage*
- Consumables storage
- Hygienic flooring*
- Lighting*
- IT equipment

Mixing area

- Alginate mixer
- PVS mixer
- Tray storage*
- Consumables
- Sink/tap*
- Bins*
- Hygienic flooring*

Photography area

- Image background*
- Controlled lighting
- Mirrors and accessories*
- 2D or 3D digital photography unit
(fixed or removable)*
- IT equipment

Appendix 1: Clinical Care, Study, and Research Facilities (continued)

RADIOLOGY AREA

In the same department or building: orthopantomograph, cephalometric, and/or 3D diagnostic radiographic imaging machines*; chair; IT equipment; storage/accessories.

Safety features

Lead linings*
Blinds*
Glasses*
Warning labels/lights*

OFFICES

Head of department's office*, lecturers' office (can be open set-up)*, administrative staff office (can be open set-up)*, residents' study office (can be open set-up)*

Lecture/tutorial room*

Meeting-sized table/seating *
Multimedia/IT equipment *

Computer/server room

Workstations*
Server and IT hardware*
Peripherals (printers, scanners)*
Back-up disks/drives*
Communications: network stations*

Software

Practice management
Image analysis (radiographic and photographic)
Internet*
Email*
Word processor*
Database management
(Microsoft Excel, SRL, SPSS)*
Remote access
Security*
Financial
Patient database

STORAGE

Consumables* and study models

TECHNICAL LABORATORY

Plaster-mixing equipment*
Plaster storage*
Sinks with plaster trap*
Working benches with necessary technical accessories*
Model trimmers*
Bench tops*
Laboratory jobs in/out storage*
Steam source*
Wax removal*

Sand blaster
Fume cupboard*
Curing light box
Vacuum curing (for thermoplastic materials)*
Dust extraction*
Laboratory materials*
Compressed air lines*
Bins*
Welding equipment (laser and gas)
3D laser scanner for 3D digital models

Storage

IT equipment
Job booking and follow-up software
Lighting assorted with magnifying glass
Hygienic and nonslip flooring*
Administrative desk

RESEARCH FACILITIES/SUPPORT

Clinic*

Laboratory with equipment

Orthodontic
IT
Biomaterials
Histology
Molecular
Microscopy
Animal facilities

Support

University*
Government/hospital
Professional
Private/corporate
Experienced manpower
Administrative

Items marked with an asterisk (*) constitute minimum requirements.

Appendix 2: Educational Topics

BASIC MEDICAL SUBJECTS

Growth and development

Somatic growth and variations
Growth adolescent acceleration
Development of the craniofacial complex
Genetic/environmental factors and growth
Determination of skeletal and biological age
Stages of sexual development

Anatomy of the head and neck

Craniofacial structures
Skeletal deformities
Craniofacial malformations

Genetics

The genetic basis of diseases
Genetic diseases - syndromes
Cancer genetics
Gene therapy and bioethics
Development of malformations
Genetic and epigenetic control of growth

Embryology of the head

Development of jaws, teeth, and face
Teratogenesis and syndromes
Development of clefts

Cell and molecular biology

Cell metabolism
Tooth movement and reaction to force
Biochemical pathways of force transduction to cell
Biological mechanisms of root resorption
Biological events accompanying force application to cartilage, bone and periodontal ligament

Oral immunology and microbiology

Oral immunology
Saliva and the formation of acquired pellicle
Oral microbiology
Biofilms

Oral physiology

Physiology of speech, swallowing and gestation
Physiology of TMJ
Physiology of breathing and swallowing
Normal and abnormal breathing and obstructive sleep apnea

General and oral pathology

Systemic diseases (growth and sex hormone imbalances, hepatitis, HIV, leukemia osteoporosis, and endocarditis)
Oral manifestations of diseases (radiation, cysts, herpes, and aphtha)

Biostatistics

Regression and correlation
Parametric and nonparametric analyses
Analysis of variance
Meta analysis
Applications in orthodontics
Biostatistic-epidemiologic surveys
Clinical research in orthodontics

Research methodology

Ethics and integrity in research
Design of a study
Submission of a protocol
Statistical analysis of findings

BASIC ORTHODONTIC SUBJECTS

Development of the dentition

Development of normal occlusion
Tooth eruption
Development of abnormal occlusion
Local and genetic factors
Deviation from normality
Agenesis and supernumerary teeth

Physiology of the stomatognathic system

Constituent muscles, bone, and cartilage
Abnormal function
TMJ physiology and function in health and disease
Diagnostic procedures
Therapeutic protocols

Orthodontics as it relates to growth

Types of growth in bone, condyle, and sutures
Adaptation of tissues to stimuli
Mechanical stimulation
Dentofacial orthopedics

Biomechanics

Equilibrium of bodies
Mechanics of solids
Viscoelasticity

Oral and maxillofacial radiography

Periapical radiographs [intra- and extraoral technique]
Variables affecting the quality of radiographs

Anatomical landmarks in intra- and extraoral radiographs
Caries diagnosis through radiographs
Periodontal diagnosis and radiographs
Oral and maxillofacial applications
Orthodontic applications
Digital imaging
Cone beam computed tomography
Radiation safety

Introductory orthodontic seminars/diagnosis and treatment-planning

Medical/dental history
Records
Extra- and intraoral examination
Diagnostic sequelae
Photographic assessment
Model analysis (crowding/space assessment, Bolton analysis, set-up)

Cephalometric radiography

Lateral
Posterior - anterior
Landmark identification
Measurements
Noninvasive techniques
Analyses (Steiner, Wits, Downs, Hasund, Coben, Bjork, Sassouni, Tweed, Ricketts, McNamara, and Pancherz)
Superimpositions (overall, regional)
3D imaging

Orthodontic materials

Alloys
Polymers
Ceramics
Bonding to enamel
Bonding to restorative materials
Enamel side effects

Occlusion and temporomandibular disorders (TMD)

Anatomy and function
General TMJ concepts
Normal occlusion and function
Differential diagnosis of TMD
TMD in children, adolescents and adults
Management philosophies

Iatrogenic effects from orthodontics

Classification of undesirable tissue, organ, and system effects
Enamel effects during bonding; debonding and treatment with fixed appliances
Root resorption
Damage to tooth-supporting tissues
Risk-management principles

Appendix 2: Educational Topics (continued)

SPECIAL ORTHODONTIC SUBJECTS

Biomechanics and tooth movement

Methods of study
Applications to clinical practice

Obstructive sleep apnea and orthodontics

Interdisciplinary treatment (prosthodontics, periodontics, etc)

TMD and orthodontics

Orthognathic surgery joint clinics and seminars

Face asymmetries

Classification
Etiology
Diagnosis
Treatment options

Class I malocclusion patient

Diagnosis
Etiology
Treatment planning

Class II malocclusion patient

Diagnosis
Etiology
Treatment planning
Headgear
Functional appliances

Class III malocclusion patient

Diagnosis
Etiology
Treatment planning
Face mask, chin cup

Vertical problems

Open bite
Deep bite
Diagnosis
Etiology
Treatment-planning

Maxillary constriction

Rapid maxillary expansion
Diagnosis
Appliances (Quad-helix, Haas and Hyrax expanders)
Effects on periodontium
Effects on airway

Orthodontic diagnosis in 3 dimensions of space

Sagittal
Transverse
Vertical
Appliances

Orthodontic techniques

Straight-wire
Tweed
Ricketts
Standard edgewise
Tip-edge
Self-ligating techniques
Clear sequential appliances

Cleft lip and/or palate treatment

Indications, timing, protocols
Interdisciplinary approach
Speech therapy
Psychological Involvement

Adult orthodontics

Esthetics
Emergence profile
Periodontal considerations
Treatment planning complex cases
Limitations of reconstructive techniques

Noncompliance treatment

TAD

Accelerated osteogenic orthodontics (eg, Wilckodontics)

Practice management

Sterilization and disinfection protocols
Orthodontic practice: setting up/the design process
Orthodontic practice: engaging with the team/the building process
Medical and legal aspects of orthodontic care
Practice visits and discussion with private practitioners
Professional ethics

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