APPENDIX A

Learning Outcomes for the Membership in Orthodontics –
a foundation for competent and reflective Specialists in Orthodontics
Introduction -

Background
This document is based on the curriculum and specialist training programme produced by the Curriculum Working Party of the SAC in Orthodontics and Paediatric Dentistry in December 1996 (version 2.H)

Outcome based education
Outcome based education is neither a new concept nor a passing phase in education, and is equally applicable throughout the educational continuum from primary school to postgraduate training.

Outcome based education focuses on the end product and defines what the learner is accountable for. It is not about telling teachers how to teach or students how to learn. Learning outcomes determine what is taught and assessed, and can help to identify what is and is not essential. A clearer idea of the desired outcomes does not necessarily have to be restricting, as the methods of achieving the outcomes are still flexible.

Using learning outcomes leads to common sense curriculum design and specifies what orthodontic trainees are to learn. They provide a clear and unequivocal statement of what the “end product” will be like.

This is particularly relevant in modern specialist training, where the “end product” is the newly qualified specialist who must, from the outset, demonstrate competency and a range of capabilities that will allow him/her to function satisfactorily. This implies that the competencies required for specialist training should be present at the end of undergraduate education, even if only in embryonic form and in need of further development. Hence the need for clearly defined learning outcomes that reflect the requirements of specialist training.

This document is intended to assist Directors of Training, trainers and orthodontic trainees. It is not intended as a blue print. Although predominantly a description of the orthodontic specialist we believe we are producing now, rather than an unrealistic wish list, it also contains an aspirational or visionary element in keeping with the high expectations and standards set by the GDC and other bodies concerned with the quality of dental specialists.

The content of this document is by no means the end of the story as far as learning outcomes in orthodontics are concerned. It is intended to be a “living” document; the content will evolve and develop further as it is used in specialist orthodontic training programmes.

The structure of the document
The starting point for the development of the outcomes was the definition of the three essential elements of the competent and reflective practitioner.

The three essential elements are:-

- what the orthodontist is able to do ("doing the right thing" = technical intelligences):
- how the orthodontist approaches clinical practice ("doing the right thing right" = intellectual, emotional, analytical and creative intelligences: and
- the orthodontist as a professional ("the right person doing it" = personal intelligences).

Eleven key domains are identified, each related to one of the three elements listed above. These are:-

What the orthodontist is able to do – “doing the right thing”

- Clinical information gathering
- Treatment planning
- Treatment procedures

How the orthodontist approaches clinical practice – “doing the right thing”

- Application of basic clinical sciences
- Clinical reasoning and judgement
- Communication
- Health promotion
- Attitudes, ethical stance and legal responsibilities
- Information handling

The orthodontist as a professional – “the right person doing it”

- Role of the orthodontist within the health service
- Personal development

These eleven domains are an essential component of the competent and reflective orthodontist.

Each domain is further subdivided into the appropriate learning outcomes. These are essentially those identified by the Curriculum Working Party of the SAC in Orthodontics and Paediatric Dentistry (1996).

Each domain is allocated a separate page in the document. The left hand column of each page lists the essential outcomes for that domain and the right hand column indicates what is included in each of these when they are broken down into more detail.

The outcomes are intentionally lacking in precise detail, which will vary between each training programme director according to their own interpretation of the outcome and how it should be achieved.

The degree of emphasis placed on each outcome and the level of detail to which it is taken will vary between training programmes, as will the learning and teaching methods which depend on the available resources.
Inevitably there is overlap between some of the different domains with some outcomes being common to more than one domain. This serves to illustrate the inextricable links and interdependence between the different elements comprising a competent and reflective orthodontist.

An outcome based approach to specialist training allows curriculum development and reform to keep pace more effectively with changes occurring in orthodontic practice and the delivery of health care.
**What the Specialist is able to do**

Outcomes for clinical information gathering

*The Specialist should be able to:*

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Required Competencies</th>
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<tbody>
<tr>
<td>Take a History from patients, relatives, and others</td>
<td>Take a relevant and complete (medical and dental) patient history and a history of the presenting complaint</td>
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</tbody>
</table>
| Undertake an intra and extra oral examination of the head and neck | Perform a thorough clinical examination of:  
  - anterior posterior, vertical, and transverse facial proportions.  
  - soft tissues, dentition, and supporting structures  
  Perform intra and extra oral examinations comprising:  
  - TMJ and muscles of mastication  
  - Periodontium  
  - Teeth  
  - Soft tissues and lymph nodes  
  - Oral cancer screening  
  - Skeletal pattern and occlusal relationships |
| Examine the occlusion | Determine habitual occlusion, evaluate articulation, and jaw relationships  
  Evaluate functional components of soft tissue structures on morphology and understand their influence.  
  Take high quality impressions of dental arches with a maximal reproduction of adjacent structures.  
  Be familiar with jaw registration using facebow recordings and mount casts on an articulator. |
| Obtain and interpret relevant clinical, radiological and laboratory investigations | Take high quality extra-oral and intra-oral photographs.  
  Understand the use of radiographic investigation and the appropriateness of each investigation to particular problems.  
  Understand the importance and limitations of cephalometric analyses based on both manual and computer tracings.  
  Describe various forms of specialised imaging techniques. Use of specialised radiographic investigations: isotope scans, and computerised tomography, MRI, video imaging, and 3D imaging. |
What the Specialist is able to do
Outcomes for treatment planning

The Specialist should be able to:

General
Plan appropriate management of acute dental conditions.
Develop a problem list, identify possible solutions and alternative treatment plans.
Explain the treatment options, the risks and benefits, and obtain informed consent for the agreed option.
Develop an appropriate sequence of treatment.
Refer patients when appropriate.

Craniofacial Anomalies
Diagnose and classify common craniofacial disorders, and know where to find information about the more unusual syndromes.

Cleft Lip and Palate
Have an understanding of the role of the orthodontist in the multi-disciplinary care of patients with cleft lip and palate.

Integrating Restorative Care
Understand the involvement of the orthodontist in restorative treatment planning.
Understand specific indications for orthodontic treatment for restorative problems.
Understand the limitations and contra-indications of orthodontics in cases requiring multi-disciplinary restorative care.
Understand the materials and techniques currently used in specific restorative situations.
Provide appropriate orthodontic treatment for a range of routine restorative problems.
Provide risk/benefit advice on long term orthodontic - restorative treatment.

Integrating Oral and Maxillofacial Surgery
Diagnose skeletal disproportion of such severity that routine orthodontic procedures cannot achieve a result without a combination of surgery and orthodontics.
Knowledge of orthognathic surgical techniques and be able to explain, in general terms, the risks and benefits.
Integrating Oral and Maxillofacial Surgery
Diagnose dentoalveolar problems requiring surgery.
Understand dentoalveolar surgical procedures and carry out associated orthodontic treatment.

Malocclusion and medical problems
Treat appropriately in the knowledge of underlying medical conditions.
Manage, advise and treat patients who are physically or mentally challenged.
Understand possible effects of medical conditions which may affect general dental or orthodontic patients.
What the Specialist is able to do
Outcomes for treatment procedures

The Specialist should be able to:

Removable appliances
Understand and explain the theory, indications, design and use of removable appliances.
Understand and explain the possibilities and limitations of removable appliances.
 Appropriately evaluate the work sent to, and received from, orthodontic laboratories.
Have sufficient understanding of the process of fabrication so that they can adjust and repair removable appliances in the laboratory and at the chairside.
Treat suitable patients with removable appliances effectively.
Explain to patients and parents the benefits, process, likely outcome and problems associated with removable appliance therapy.

Functional appliances
Understand and explain the theory, indications, design and use of functional appliances.
Understand and explain the possibilities and limitations of functional appliances including timing of treatment.
Demonstrate practical and clinical skills, and a thorough knowledge of at least one major type of functional appliance system.
Understand the fabrication of these appliances and be able to adjust and repair their chosen system in the laboratory and at the chairside.
Explain to patients and parents the benefits, process, likely outcome and problems associated with functional appliance therapy.
What the Specialist is able to do
Outcomes for Treatment Procedures

The specialist should be able to:

Extra-oral appliances

Understand and explain the theory, indications, design, use and safety of extra oral appliances including safety measures.

Understand and explain the possibilities and limitations of extra oral appliances.

Select, fabricate, adjust and repair extra oral appliances in the laboratory and at the chairside.

Treat patients with extra oral appliances and achieve a good standard of result.

Explain to patients and parents the benefits, process, likely outcome and problems associated with extra oral appliance therapy.

Fixed appliances

Understand and explain the theory, indications, design and use of fixed orthodontic appliances.

Understand and explain the possibilities and limitations of fixed orthodontic appliances.

Fabricate, adjust and repair fixed orthodontic appliances at the chairside and in the laboratory.

Treat a wide range of suitable patients with fixed orthodontic appliances and achieve a good standard of result. The trainee should have practical skills and clinical skills and a thorough knowledge of at least one major type of fixed orthodontic appliance system.

Explain to patients and parents the benefits, process likely outcome and problems associated with fixed orthodontic appliance therapy.
What the Specialist is able to do
Outcomes for Treatment Procedures

Retention appliances

The specialist should be able to:

Understand and explain the theory, indications, design and use of orthodontic retainers.

Understand and explain the possibilities and limitations of orthodontic retainers.

Understand the fabrication, adjustment and repair orthodontic retainers in the laboratory and at the chairside.

Fit retainers and supervise retention in suitable patients.

Explain to patients and parents the benefits, process, likely outcome and problems associated with the use of orthodontic retainers.
# What the Specialist is able to do

## Outcomes for Treatment Procedures

**The Specialist should be able to:**

<table>
<thead>
<tr>
<th>Guiding the developing occlusion</th>
<th>Demonstrate an understanding of the development of malocclusion.</th>
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<tbody>
<tr>
<td></td>
<td>Describe procedures to reduce the severity of the malocclusion by interceptive measures.</td>
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<td></td>
<td>Describe the indications and contra-indications for such procedures.</td>
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<td></td>
<td>Understand the timing of the various procedures and be able to use growth charts and understand the limitations of facial growth prediction.</td>
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<td></td>
<td>Describe the limitations of such interceptive procedures.</td>
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<td></td>
<td>Discuss current knowledge on growth and growth modification procedures.</td>
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<table>
<thead>
<tr>
<th>Adult Orthodontics</th>
<th>Demonstrate an understanding of the indications and limitations of adult orthodontic treatment.</th>
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<tbody>
<tr>
<td></td>
<td>Describe the principles of treatment in the non-growing patient.</td>
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<td></td>
<td>Describe the modifications to the biomechanics and treatment techniques required for adult treatment.</td>
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<td>Understand the role of adult orthodontic treatment within the interdisciplinary team management of appropriate cases.</td>
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<td></td>
<td>Carry out a full range of treatment in conjunction with periodontal/restorative advice from restorative specialists and consultants.</td>
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<td></td>
<td>Provide risk/benefit advice for the adult and demonstrate an understanding of stability and retention of such cases.</td>
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<thead>
<tr>
<th>Cranio-mandibular dysfunction</th>
<th>Demonstrate an understanding of relevant literature and provide a critical appraisal of it.</th>
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<tr>
<td></td>
<td>Demonstrate an understanding of the possible relationship between craniomandibular dysfunction and malocclusion or orthodontic treatment.</td>
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<tr>
<td></td>
<td>Describe treatment modalities for craniomandibular dysfunction.</td>
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<td></td>
<td>Provide a rational basis for the aims and limitations of such treatment.</td>
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<tr>
<td>What the Specialist is able to do</td>
<td>Outcomes for Treatment Procedures</td>
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<tr>
<td><strong>General</strong></td>
<td><em>The specialist should be able to:</em></td>
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<tr>
<td></td>
<td>Play a part in interdisciplinary teams as appropriate.</td>
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<tr>
<td><strong>Interface with Oral and Maxillofacial Surgery</strong></td>
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<tr>
<td></td>
<td>Carry out planning and orthodontic treatment of joint dentoalveolar surgical / orthodontic cases at an advanced level</td>
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<tr>
<td></td>
<td>Have an understanding of the interface of orthodontics and oral and maxillofacial surgery</td>
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<td></td>
<td>Understand the oral surgeons viewpoint and the surgical difficulties and complications</td>
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<td></td>
<td>Understand fully the implications of the patients medical history in planning and executing oral surgical / orthodontic treatment</td>
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<td></td>
<td>Take into account the risk / benefits and health gains of such treatment.</td>
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<tr>
<td><strong>Interface with Restorative Dentistry including Implantology</strong></td>
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<tr>
<td></td>
<td>Understand the treatment approaches to periodontal disease and other restorative problems and be able offer an informed perspective on those cases which have occlusal problems.</td>
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<td></td>
<td>Carry out orthodontic treatment in relation to the prevention and treatment of periodontal disease and be able to discuss the risk /benefit aspects of such treatment.</td>
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<td>Identify those cases seen in childhood for which orthodontic treatment is indicated on periodontal grounds.</td>
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<td></td>
<td>Describe the involvement of the orthodontist in treatment planning where osseointegrated implants are used.</td>
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<td></td>
<td>Treat cases prior to and after the use of osseointegrated implants.</td>
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<tr>
<td><strong>Interface with Paediatric Dentistry</strong></td>
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<td></td>
<td>Carry out orthodontic treatment in co-ordination with paediatric dental consultants and specialists.</td>
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<tr>
<td></td>
<td>Demonstrate an understanding of the treatment approaches to dental disease in children and be able offer an informed perspective on those cases.</td>
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How the Specialist approaches clinical practice
Application of basic clinical sciences

The Specialist should be able to understand and apply basic clinical sciences to their clinical practice. He/she should be able to:

General
Recognise normal and abnormal structure, function and behaviour appropriate to the patient’s age, general health and circumstances.

Apply knowledge of the pathophysiology of common dental/oral health problems.

Recognise the potential impact of medical history on dental treatment.

Apply knowledge of pharmacology.

Apply behavioural management techniques, recognising the social, cultural and psychological aspects of patient care.

Apply the principles of infection control to ensure safety of patients and dental staff.

Cell and Molecular biology
Explain the cellular and biological mechanisms involved during orthodontic tooth movement and tooth eruption.

Explain the cellular and biological mechanisms involved in mechanical loading of tissues during facial "orthopaedics".

Explain the cellular and biological basis of theories of root resorption.

Use the knowledge gained in this section in other biological areas of orthodontics.

Genetics
Understand how DNA replicates, realise that genes are sequences of nucleotide as part of a DNA molecule and that genes code for polypeptides. Understand the role of messenger RNA, transfer RNA and the ribosome.

Understand how DNA is transferred from parent to offspring in sexual reproduction. Understand the terms dominant and recessive and how sexual reproduction produces variation in offspring.
How the Specialist approaches clinical practice
Application of basic clinical sciences

The Specialist should be able to understand and apply basic clinical sciences to their clinical practice. He/she should be able to:

Genetics

Describe in simple terms, how the relative positions of gene loci on chromosomes are determined. Outline the use of restriction enzymes in removing sections of the genome and describe the formation of recombinant DNA.

Explain what is meant by a genetic disorder and how genetic screening is carried out. Explain the theoretical basis of genetic fingerprinting and outline how this is carried out. Understand how these techniques may be utilised in determining a genetic basis for malocclusions and craniofacial disorders.

Use this knowledge to understand the genetic basics of craniofacial syndromes.

Craniofacial embryology

Describe normal embryological craniofacial development with a clear understanding of cellular and molecular mechanisms involved.

Describe in anatomic terms the development of the orofacial complex and teeth. Understand the cellular and molecular mechanisms, which contribute to formation of these structures.

Demonstrate how disruption of normal development can contribute to the major craniofacial disorders.

Use the knowledge gained to have a fundamental understanding of clinical problems in craniofacial disorders.

Somatic and craniofacial growth

Describe normal body growth and development from birth to adulthood. Demonstrate a clear understanding of the relevance to clinical orthodontics.

Describe methods available and limitations for studying physical growth of the body and jaws. Discuss the relevance to orthodontic practice.

Provide a critical appraisal of the theories of craniofacial growth.
How the Specialist approaches clinical practice
Application of basic clinical sciences

The Specialist should be able to understand and apply basic clinical sciences to their clinical practice. He/she should be able to:

Somatic and craniofacial growth

Demonstrate an understanding of the clinical implications of jaw growth in the child, adolescent and adult.

Use the knowledge gained to provide a rational basis for the limitations and timing of orthodontic treatment.

Physiology of breathing, swallowing, mastication and speech

Diagnose and discuss the likely involvement of respiration, deglutition and soft-tissue patterns in the aetiology and treatment of malocclusion.

Describe in detail the contribution of the occlusion to temporomandibular joint disorders, tooth wear and periodontal breakdown.

Recognise abnormal speech patterns and discuss with speech therapists realistic treatment goals.

Use the knowledge gained to achieve realistic aims and objectives in clinical orthodontic treatment.

Psychology

Recognise patients who might benefit from psychological support before, during and after orthodontic, orthognathic or craniofacial treatment.

Describe strategies utilised by psychologists for coping and motivation. Apply motivation strategies to orthodontic patients.

Apply this knowledge to providing realistic patient expectations and satisfaction.
How the Specialist approaches clinical practice
Clinical reasoning and judgement

The Specialist should be able to:

General

Assimilate and critically analyse history, examination and investigation findings to formalise a diagnosis and identify potential solutions.

Make decisions based on evidence based practice.

Formulate a plan of action appropriate to the needs and wishes of the patient.

Devise creative solutions to problems and restrictions encountered.

Growth and Treatment Analysis

Perform various cephalometric superimposition methods, and discuss their possibilities and limitations.

Understand the restrictions of analysis of growth and treatment change.

Understand the validity and limitations of the various methods of growth prediction including computerised prediction.

Long Term Effects of Orthodontic Treatment

Understand the long term effects of orthodontic treatment in individual patients.

Describe a variety of retention methods and regimes based on current thinking.

Understand specific occlusal traits that are more susceptible to relapse and discuss measures taken to minimise relapse.

Iatrogenic Effects of Orthodontic Treatment

Discuss the factors involved in root resorption and understand orthodontic mechanics aimed at minimising resorption.

Describe the process of enamel demineralisation and its contributing factors including inadequate oral hygiene and inappropriate diet.
How the Specialist approaches clinical practice
Clinical reasoning and judgement

The Specialist should be able to:

Iatrogenic Effects of Orthodontic Treatment

Describe the long term effects of orthodontic treatment on periodontal structures in both healthy patients and those with periodontal problems.

Explain the possible adverse effects on dento-facial appearance and aesthetics of alternative treatment plans.

Discuss the effects of contact of various orthodontic materials on soft tissues.

Discuss the possible influences on the temporomandibular joints of both orthodontically treated occlusions and untreated malocclusions.
How the Specialist approaches clinical practice
Communication

The Specialist should be able to:

General

Demonstrate active listening skills.

Demonstrate appropriate communication skills with patients.

Demonstrate appropriate communication skills (verbal and written) with other professional colleagues

Demonstrate appropriate communication skills with others in the dental team in order to ensure efficient and effective working.

Demonstrate appropriate case presentation skills, give appropriate advice and information to promote learning in others.
How the Specialist approaches clinical practice

Health Promotion

*The Specialist should underpin their practice with an understanding of health promotion. He/she should:*

**General**

- Take into consideration the impact of social, cultural and behavioural factors on dental health.
- Keep up to date with strategies for prevention of disease in different settings e.g. primary prevention, screening, public awareness campaigns.
- Collaborate with other professionals in health promotion and disease prevention.
- Apply the knowledge principles and methods of health promotion so as to include an appropriate health promotion dimension to most clinical contacts.

*The Specialist should be able to:*

**Oral Health**

- Discuss the relationship between oral health and malocclusion
- Describe and diagnose the aetiological features encountered in orthodontic practice with regard to development of dental caries and non-curious tooth substance loss.
- Describe and diagnose the aetiological features encountered in orthodontic practice with regard to development of periodontal problems and soft tissue lesions.
- Carry out procedures to detect orthodontic patients with a high risk of developing periodontal problems.
- Prescribe methods of reducing the potential for iatrogenic damage during orthodontic treatment.
- Provide risk / benefit advice for the improvement of overall oral health with orthodontic treatment.

**Health Education**

- Describe methods of enhancing patient understanding of orthodontic treatment.
- Describe oral health programmes and patient motivation techniques for the individual patient.
- Describe methods of ensuring patient understanding of orthodontic treatment and that proposed for the individual patient.
How the Specialist approaches clinical practice
Attitudes, ethical stance and legal responsibilities

*The Specialist should be able to:*

**General**

Demonstrate an understanding of patient psychology in relation to health education.

Demonstrate an ethical and moral approach (to patients, their relatives, colleagues and staff, and research undertaken).

Demonstrate confidentiality, integrity, truthfulness and respect, without discrimination, towards patients and colleagues.

Demonstrate an appropriate approach and response to complaints about performance.

Recognise and respond to legal responsibilities.

Recognise and respond appropriately to colleagues whose professional conduct gives cause for concern.
How the Specialist approaches clinical practice
Information handling

The Specialist should:

General
Keep accurate and contemporaneous patient records in relation to clinical and laboratory work.

Conform to ethical and legal imperatives in respect to data.

Use computers to access information from appropriate sources and use the information for effective practice.

Demonstrate understanding and application of appropriate methodology when participating in audit activities.

Demonstrate understanding of research methods and statistical evaluation and be able to critically assess published work.

Computer Based Technology

Have practical experience of software and hardware systems, and be able to decide on the appropriate “tool for the job”.

Understand the medico legal obligations as they relate to the practice of orthodontics.

Evaluate the scientific basis of existing and new clinical practices
The Specialist as a professional
Role of the Orthodontist within the Health Service

General

The Specialist should:
Have an acceptance of code of conduct and required personal attributes.

Understand the role of the orthodontist in primary and secondary health care.

Appreciate the role of the orthodontist as a manager. Work co-operatively in a team.

Accept responsibility for teaching others.

Recognise merits in colleagues in other disciplines, so that multiprofessional opportunities for patient care are enhanced.

Appreciate the role of, and undertake the process of clinical governance, in order to maintain the highest standards of patient care.

The Specialist should be able to:

Health and Safety
Understand their responsibilities in relation to Health & Safety, COSHH, and Radiation Safety.

Legislation and Ethics
Understand their legal and ethical responsibilities.

Surgery Management
Understand the concepts of good design and stock control.

Ensure appropriate protocols are established for referral of patients.

Prioritise patients fairly

Counsel and reconcile on matters of clinical dispute.

Control standards of care

Personnel Management
Understand the problems and implications of staff management and the principles of equal opportunities and sex discrimination in the workplace.

Finance
Understand the concepts relating to sound financial management.

Audit
Run an audit cycle with set standards.

Health Service Structures
Understand the organisation of Health Service structures nationally.
The Specialist as a professional
Personal Development

<table>
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<tr>
<th>General</th>
<th>Self awareness – reflect on own personal strengths and limitations.</th>
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<tbody>
<tr>
<td></td>
<td>Continuing professional development – set clear learning goals, pursue them and apply the learning to the practice of dentistry.</td>
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<td></td>
<td>Personal growth – accept and respond appropriately to constructive criticism from patients, peers and supervisors.</td>
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<td></td>
<td>Self-care – identify problems and issues in relation to own wellbeing and their potential impact on practice.</td>
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<tr>
<td></td>
<td>Career Development – recognise career alternatives in dentistry.</td>
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<tr>
<td></td>
<td>To be given the opportunity to develop additional experience in areas of practice in which the individual feels to be deficient or in which he or she wishes to develop a special interest.</td>
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</tbody>
</table>