

## IN BRIEF

- Enables comparison of current undergraduate orthodontic courses in UK dental schools.
- Shows changes occurring in the courses in the last three years.
- Analyses the effects of *The First Five Years* General Dental Council document and university pressures on the courses.

## Undergraduate orthodontic teaching in UK dental schools

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**Aims and objectives:** This paper assesses the current teaching of undergraduate orthodontics in UK dental schools and the changes these courses have undergone in the last three years.

**Method:** Questionnaires were emailed to the undergraduate orthodontic course leaders in each of the UK dental schools. Twelve dental schools agreed to participate in the survey. Responses were checked for completeness, summarised and sent back to individual course leaders to verify. These verified responses were then analysed.

**Results:** There was a wide variation in the orthodontic course form and content in the 12 UK dental schools. The greatest variation occurred in the clinical teaching hours (50 to 126), the types of patient treatment undertaken (removable only to full fixed), the laboratory teaching hours (0 to 60), the content of the laboratory course (removable appliances to fixed appliance typodonts), the in-course assessment (minimal to extensive, and 0% to 40% of BDS), and the format of the BDS examination. A number of dental schools reported reductions in their orthodontic courses in academic, clinical and laboratory hours and content, and in the number of undergraduate orthodontic teaching staff in the last three years.

**Conclusions:** Comparison of undergraduate orthodontic courses revealed a wide variation in course hours and content, and in student assessment and examination. Considerable changes have occurred to the courses in the last three years. Half of the UK courses have been affected by *The First Five Years* General Dental Council document<sup>1</sup> and university pressures, with reductions in both course content and staffing in the last three years. For standards to be maintained, guidelines are needed to safeguard clinical content and student assessment in undergraduate orthodontic courses in UK dental schools.

### INTRODUCTION

The orthodontic content of the undergraduate dental course is of great importance if students are to qualify with adequate knowledge to recognise and deal with orthodontic problems in their patients appropriately. In recent years there has been a worrying generalised opinion among colleagues in other dental specialties within the dental schools that orthodontics is a postgraduate subject, and therefore need not be taught at an undergraduate level. Following the publication of the General Dental Council (GDC) *The*

*First Five Years* (FFY) document<sup>1</sup>, misinterpretation has led to the report being cited as reason to justify further cuts to orthodontic course hours. Orthodontic undergraduate teaching courses are now under further pressure with the proposed increase in the numbers of undergraduate students, and further training programmes for Dentists with Special Interest in Orthodontics and Orthodontic Therapists. In order to establish adequate hours and content for each developing undergraduate course, evidence of what all UK orthodontic courses currently teach is needed.

The last survey of undergraduate orthodontic teaching carried out in 1997 for the University Teachers Group of the British Orthodontic Society,<sup>2</sup> assessed only total course hours, lecture, seminar, laboratory and clinical hours, and patient treatment numbers. In view of the radical changes in courses that have taken place in recent years, this survey is no longer up-to-date

and lacks any details of the course contents. A new survey giving current details of the content of each course, the changes that have taken place in the courses over the last three years, and future course developments, was clearly needed. The aim of this survey was to fulfil this role allowing comparison of the current courses and assessment of the changes taking place. Analysis of the reasons for changes may indicate possible means to prevent any further changes which impinge on teaching and course quality.

### METHOD

Questionnaires were emailed to the undergraduate orthodontic course leaders in each of the UK dental schools. Twelve dental schools agreed to participate in this 2004 survey. Responses were checked for completeness, summarised and returned to each course leader to verify. These verified responses were then analysed. Course

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**Table 1 Summary of survey results (RA=removable appliances, FIX=fixed appliances, FUN=functional appliances) (Teaching staff=refers to the number of staff directly involved in teaching, not the number of sessions)**

Question	Belfast	Birmingham	Bristol	Cardiff	Dundee	Glasgow	G.K.T	Leeds	London	Manchester	Newcastle	Sheffield
Course duration (years)	2	2	3	3	2	2.3	1.5	2	2.3	2	3	3
Number of students	45	70	55	55	58	70	155	55	60	65	70	55
Lectures-number	21	18	21	10	23	21	16	22	35	20	19	22
-duration (minutes)	45	50	50	40	45	45	45	60	45	45	45	45
Seminars-number	21	21	26	48	42	24	19	30	0	30	16	21
-duration (minutes)	30	45	60	180	45	90	45	40	0	60-90	60-150	45
Clinical teaching -hours	90	55	60	66 <sup>[1]</sup>	96	105	50	60	100	75	126	60
years	3,4,5	3,4	3,4,5	3,4	4,5	4,5	4,5	4,5	3,4,5	3,4	4,5	3,4,5
Treatment(T), Diagnosis(D), Observe(O),	T,D,O	T,D	T,D,O	T,D,O	T,D	T,D,O	T,D,O	T,D,O	T,D,O	T,D	T,D,O	T,D,O
Dental School (DS), OutReach clinic (OR)	DS	DS	DS	DS,OR	DS	DS	DS	DS	DS	OR,DS	DS	DS
student pt treat, RA, FIX,FUN	RA, FIX, FUN	RA, FIX, FUN	RA, FIX	RA, FIX	RA, FIX, FUN	RA, FUN	RA	RA	RA	RA	RA, FIX, FUN	RA, FIX, FUN
Laboratory teaching-hours	21	9	60	24	0	54	0	0	0	35	18	12
RA=rem.app, FIX=fix.app.typo	RA, FIX	RA, FIX	RA	FIX	0	RA, FIX	0	0	0	RA, FIX	RA, FIX	RA, FIX
BDS exam-written paper	✓2Q	✓1Q	✓2Q	✓1Q	✓1Q+1Q	✓1Q	✓1Q	✓1Q	✓integrate	✓1Q yr4	✓1Q	✓1Q
-short answer paper	-	✓2Q	-	-	✓1Q+2Q	✓	-	-	✓3 of 4Q	-	✓2Q	✓4Q
-clinical	✓1 in 6	✓1 in 5	✓all	✓1 in 3	✓1 in 5	✓all	✓1 in 3	✓all	✓1 in 3	✓yr4yr5	✓all	✓1 in 7
-case presentation	-	-	✓all	✓some	-	-	-	-	-	-	✓all	-
-osce	-	✓	-	-	✓	-	-	-	✓	-	-	-
Teaching staff -academics	1	2.5	1	2	2	1.8	2	1	2	4.5	2	1
consultant	3	3	4	-	1	3	-	1	2	-	3	4
FTTA	1	2	3	-	1	2	-	3	3	4	1	-
SpR	1	-	-	-	1	-	-	-	-	-	1	-
Specialist Practitioner	1	2	1	-	-	-	-	-	2	-	-	2
SDO	-	-	-	4	-	-	-	1	1	-	-	-
Associate Spec/ staff grade	-	-	-	-	-	1	-	-	1	-	1	1
Clinical Assistant	-	-	-	-	-	-	2	-	-	-	-	1

notes [1] 162 ortho/paedo hours combined

leaders were also requested to send copies of their course manuals to enable clarification of information as necessary.

**RESULTS (PRESENTED UNDER THE HEADINGS OF THE QUESTIONNAIRE)**

**Course duration and number of students**

All courses are held over a two or three year period except one (GKT-18 months) (Table 1). The number of students per year range from 45 (Belfast) to 155 (GKT), with numbers at most schools between 55 and 65 (Table 1). Student numbers in all

schools are divided into small groups for teaching, ranging from four to five (Leeds, Dundee), to 10 to 11 (Birmingham, Cardiff, GKT, London), and six to nine in the remaining schools.

**Method of teaching – lectures, seminars, diagnostic clinics, treatment clinics, laboratory**

Teaching sessions occur fortnightly in nine courses (Belfast, Bristol, Dundee, Glasgow, GKT, Leeds, London, Newcastle, Sheffield), monthly in one course (Birmingham), weekly in two courses (Manchester, Cardiff

final year), with some block teaching in one course (Cardiff).

Eight courses use all methods of teaching (Belfast, Birmingham, Bristol, Cardiff, Glasgow, Manchester, Newcastle, Sheffield); three courses use all methods except laboratory teaching (Dundee, GKT, Leeds); one course uses all methods except laboratory teaching and seminars (London).

**Lectures**

Lectures are mainly held in years 3 and 4 of the courses (Fig. 1a). The number of lectures range from 10 (Cardiff) to 35

Table 2a Lecture titles

**Belfast**

- Yr. 3
- Ortho. introduction
- Development of occlusion.
- Cephalometrics
- Growth
- Need for ortho
- Tissue reaction to ortho
- Removable appliances
- Retention
- Ortho extractions and anchorage

Yr. 4

- Aetiology of malocclusion
- ortho extractions
- Class II div. 1
- Class III
- Class II div. 2 and deep overbite
- Crossbite
- Stability
- Adverse reaction to ortho
- Canines
- Anterior open bite

**Birmingham**

Yr. 3

- Introduction
- Skeletal
- Soft tissues
- Dental
- Assess + T.P
- Fixed
- Removable
- Functionals
- EOT
- Development of occlusion
- Management of mixed dentition
- Canines
- CLP
- Case selection

Yr. 4

- Class I
- Class II div. 1
- Class II div. 2
- Class III

**Bristol**

Yr. 3

- Introduction
- Adams clasp
- Tooth movement and anchorage
- Properties of spring
- Labial bow
- Buccal springs

- Z and T springs
- Properties of wire
- Skeletal pattern
- Soft tissue and tooth/arch ratio

Yr. 5

- Ortho tooth movement
- Extraction 1<sup>st</sup> molars
- IOTN
- Interceptive ortho
- Facial growth
- Surgery for clefts
- Ortho for clefts
- Adult ortho and who does what in ortho

**Cardiff**

Yr. 3

- Craniofacial growth and development
- Timing, eruption, development
- Classification of malocclusion
- Aetiology and management of malocclusion in mixed dentition
- Aetiology and management of malocclusion in mixed dentition in juvenile and adult dentition (+ lectures on growth, development given by paed + DPH). (Lectures on psychological, intellectual and social development from psychologist)

**Dundee**

Yr. 3

- Introduction.
- Aetiology.
- Introduction appliances.

Yr. 4

- Ortho materials.
- Tooth movement and anchorage.
- Mixed dentition.
- Class II div. 1 + functionals
- Class II div. 2.
- Classification of malocclusion
- Aetiology of malocclusion
- Class III.
- Ortho/surgery incisors/canines.
- EOT.
- IOTN.

Yr. 5.

- Management and caries
- Fixed.
- Late incisor crowding.
- Functionals and facial growth.
- Ortho/restorative.
- Severe skeletal.

- Treatment with functionals
- Functionals
- Genetics.
- CP

**Glasgow**

Yr. 3

- Introduction to orthodontics.
- Physiology of tooth movement.
- RA design.
- Examination of patient.
- IOTN.
- Cephalometrics.
- Diagnostic + treatment planning.
- Extractions.
- Development and occlusion.
- Aetiology of malocclusion x 2.
- RA design and management.
- Class II div. 1.
- Class II div. 2.
- Class III.
- Functionals.
- Interceptive.
- Fixed.
- Ortho in GDS.
- Cleft.
- Examination technique/feedback.

**GKT**

Yr. 4

- Introduction to orthodontics, classification of malocclusion.
- Introduction to removable appliance design.
- Treatment planning, choice of extractions and appliance therapy.
- Development of dentition.
- Aetiology of malocclusion - skeletal and soft tissues.
- Aetiology of malocclusion - local and dental factors.
- Class I malocclusion.
- Class II div. 1.
- Class II div. 2.
- Class III.
- Crossbites.
- Functionals.
- EOT and anchorage.
- Facial growth and timing of treatment.
- Histology of tooth movement, stability, retention.
- Referral to specialist and IOTN.
- (CLP - topic teaching with OS).

(London), with the majority of courses in a range of 21 to 25 (Table 1). The duration of lectures range from 40 minutes (Cardiff) to 60 minutes (Leeds), with most at 45 minutes (Table 1).

Two schools have integrated courses, with topic teaching with paedodontics (Manchester), or with paedodontics and dental public health (DPH) (Cardiff). A small amount of topic teaching occurs in three courses (Bristol, London, Newcastle).

Most courses have very similar basic lecture titles, except two courses (Manchester has nine broad based lecture titles, and Cardiff has 10 broad based lectures combined with paedodontics and DPH) (Table

2a, 2b). Lecture format in most schools is similar, with the lecture delivered by a lecturer supplemented by handout notes at the lecture and/or on the web. A more interactive format is used for joint orthodontic/paedodontic case conferences in one school (Manchester); another school (London) also has some joint orthodontic/paedodontic case scenarios lectures.

**Seminars**

All schools except one (London) hold seminars with numbers ranging from 16 (Newcastle) to 48 (Cardiff), with most courses holding 21 to 25 seminars (Table 1).

The duration of seminars range from 30 minutes (Belfast), to 60 to 150 minutes (Newcastle) and 180 minutes (Cardiff), with most around 45 minutes (Table 1). Two schools (Newcastle, Cardiff) have a lot of teaching time allocated to seminars, but the majority of this time is problem based learning (PBL) or case scenario based. Seminars are held in years 3, 4 or 5 of the course (Fig. 1b). The frequency of seminars are either fortnightly (Bristol, Dundee, Glasgow, GKT, Leeds, Sheffield), monthly (Belfast, Birmingham), weekly (Manchester), or blocks (Cardiff, Newcastle).

The format of seminars are either student led (Belfast, Birmingham, Bristol,

**Table 2b Lecture titles**

<p><b>Leeds</b></p> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Introduction.</li> <li>-Development.</li> <li>-Aetiology.</li> <li>-Biology of tooth movement.</li> <li>-Growth and development.</li> <li>-Aims of orthodontics.</li> <li>-Classification of malocclusion.</li> <li>-Local factors.</li> <li>-Crowding and spacing.</li> <li>-Interceptive.</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Choice of appliance.</li> <li>-Anchorage.</li> <li>-Class I.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-Retention and stability.</li> </ul> <p>Yr. 5</p> <ul style="list-style-type: none"> <li>-Cases to refer.</li> <li>-Career in ortho.</li> <li>-Combined ortho.</li> <li>-CLP.</li> <li>-Contemporary orthodontics.</li> </ul> <p><b>London</b></p> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Ortho diagnosis.</li> <li>-Treatment planning.</li> <li>-Aetiology.</li> <li>-Class I.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-AOB.</li> <li>-Crossbites.</li> <li>-Diastema.</li> <li>-Removables.</li> <li>-EOT.</li> <li>-Anchorage.</li> </ul> <p>Yr. 4</p>	<ul style="list-style-type: none"> <li>-Early assessment.</li> <li>Fixed appliances.</li> <li>-Functional appliances.</li> <li>-Ortho for adults.</li> <li>-Unerupted teeth localisation and treatment.</li> <li>-MOS.</li> <li>-Orthognathic surgery.</li> <li>-Scope and limitations of ortho.</li> <li>-Extractions in ortho.</li> <li>-First molar problems.</li> <li>-Retention.</li> <li>-Stability.</li> <li>-IOTN.</li> <li>-Hypodontia.</li> <li>-Clefts.</li> <li>-Also PBL sessions: joint paedo/ortho scenarios 12 hours, may increase.</li> </ul> <p><b>Manchester</b></p> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Cleft.</li> <li>-IOTN.</li> <li>-Examination.</li> <li>-Treatment planning.</li> <li>-Removable appliances.</li> <li>-Fixed appliances.</li> <li>-Revision.</li> <li>-Case conference x 2.</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Development of dentition.</li> <li>-Case conference x 5.</li> <li>-Functionals.</li> <li>-Impacted teeth.</li> <li>-Viva technique.</li> </ul> <p><b>Newcastle</b></p> <p>Yr. 2</p> <ul style="list-style-type: none"> <li>-Cranio-facial growth/development</li> </ul> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Introduction.</li> <li>-Diagnosis.</li> <li>-Occlusion.</li> <li>-Design of removables.</li> </ul>	<ul style="list-style-type: none"> <li>-Biomechanisms of tooth movement.</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Orthodontic assessment.</li> <li>-Class I.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-Functionals.</li> <li>-Fixed.</li> <li>-Eruption.</li> </ul> <p>Yr. 5</p> <ul style="list-style-type: none"> <li>-Extractions.</li> <li>-Missing teeth, extra teeth, mixed dentition.</li> <li>-Anchorage and EOT.</li> <li>-IOTN.</li> <li>-Severe malocclusion.</li> <li>(Ortho/restorative Ortho/surgical).</li> </ul> <p><b>Sheffield</b></p> <p>Yr. 1</p> <ul style="list-style-type: none"> <li>-Orthodontics.</li> </ul> <p>Yr. 2</p> <ul style="list-style-type: none"> <li>-Introduction.</li> <li>-Aetiology, skeletal + soft tissues.</li> <li>-Aetiology local factors.</li> <li>-Patient examination and treatment plan.</li> <li>-Biology of tooth movement.</li> <li>-Removable appliances.</li> <li>-Fixed appliances x 2.</li> <li>-Functionals.</li> </ul> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Extractions.</li> <li>-6's.</li> <li>-Class I.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-Interceptive.</li> <li>-Orthognathic surgery.</li> <li>-Canines.</li> <li>-Cleft.</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Missing incisors.</li> </ul>
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Dundee, Leeds), student led and partly case scenarios (GKT), PBL/case scenarios (Cardiff, Glasgow, Manchester, Newcastle, Sheffield), or mini lectures (Cardiff year 3). Many courses have similar basic seminar titles (Belfast, Birmingham, Bristol, Glasgow, GKT, Leeds) (Tables 3a, 3b). Variations are a larger number of topics (Dundee), few seminars but six patient assessment sessions (Newcastle), PBL and case scenarios (Cardiff – 24 x 1 hour PBL, Manchester – 30 x 60-90 minutes PBL, Sheffield – 21 x 45 minutes case scenarios).

### Clinical teaching

Clinical teaching hours are extremely variable and range from 50 (GKT) to 126 (Newcastle), with most courses having 55 to 70 hours clinical teaching (Table 1). The integrated courses (Cardiff, Manchester) make it difficult to work out clinical hours accurately. These courses are either integrated with paedodontics (Cardiff – 162 hours + 96 hours outreach clinics in final year), or

integrated with paedodontics and dental public health (DPH) (Manchester).

Clinical teaching is held over years 3, 4 and 5, with various combinations at each school (Fig. 3). The frequency of clinical teaching sessions is either fortnightly (Belfast, Bristol, Dundee, Glasgow, GKT, Leeds, London, Manchester, Newcastle, Sheffield year 3), monthly (Birmingham), weekly (Cardiff final year), blocks (Cardiff), or quarterly (Sheffield year 4, 5).

The format of clinical teaching is also very variable with diagnosis, treatment, and observation at 10 schools (Belfast, Bristol, Cardiff, Dundee, Glasgow, GKT, Leeds, London, Newcastle, Sheffield), and diagnosis and treatment only at two schools (Birmingham, Manchester).

The location of clinical teaching on all courses is at the dental school, except one school (Manchester) which uses outreach clinics only, and one school (Cardiff) which uses the dental school with some outreach clinics in the final year.

### Diagnostic clinics

The number of students per clinic ranges from two (Sheffield) to 10 to 12 (GKT and Birmingham) (Fig. 2a). The number of patients per clinic is very variable from school to school ranging from two (Birmingham, Leeds) to 10 (Belfast) (Fig. 2b). In diagnostic clinics, students work in pairs to assess patients, in all schools except two (Manchester, Newcastle) – where students work individually.

### Treatment clinics

Patient treatment varies considerably from removable only treatment (GKT, Leeds, London, Manchester), removable and fixed (Bristol, Cardiff, Sheffield), removable and functional (Glasgow), to removable, fixed and functional (Belfast, Birmingham, Dundee, Newcastle) (Table 1). The number of patients treated per student is also extremely variable, ranging from one (Glasgow, GKT) to six (Birmingham) (Fig. 3). It is difficult to accurately assess patient numbers per student, as students work in

**Table 3a Seminar titles**

<p><b>Belfast</b></p> <ul style="list-style-type: none"> <li>-Delivery of ortho</li> <li>-Referring patients</li> <li>-Ortho emergency</li> <li>-Instructions of wear</li> <li>-Management of removable appliances</li> <li>-Management of fixed appliances</li> <li>-Management of functional appliances</li> <li>-Fixed v removables</li> <li>-Retention</li> <li>-Ortho archwires</li> <li>-Habits</li> <li>-Perio</li> <li>-Adult patients</li> <li>-Restorative/ortho</li> <li>-Medically compromised</li> <li>-Radio graphs</li> <li>-Early loss</li> <li>-Extractions in ortho</li> <li>-IOTN</li> <li>-Unerrupted teeth</li> <li>-3rd molar</li> </ul> <p><b>Birmingham</b></p> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Introduction</li> <li>-Skeletal</li> <li>-Soft tissues</li> <li>-Dental</li> <li>-Assess + T.P</li> <li>-Fixed</li> <li>-Removable</li> <li>-Functionals</li> <li>-EOT</li> <li>-Development of occlusion</li> <li>-Management of mixed dentition</li> <li>-Canines</li> <li>-CLP</li> <li>-Case selection</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Class I</li> <li>-Class II div. 1</li> <li>-Class II div. 2</li> <li>-Class III</li> </ul> <p><b>Bristol</b></p> <p>Yr. 3</p>	<ul style="list-style-type: none"> <li>-Ortho records</li> <li>-Examination of patient</li> <li>-Fit removables</li> <li>-Fit headgear</li> <li>-Fixed appliance x 2</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Spacing and crowding</li> <li>-Aims of ortho treatment</li> <li>-Tooth movement and anchorage</li> <li>-IOTN</li> <li>-Canines</li> <li>-Extractions</li> <li>-Appliance design</li> <li>-Class I</li> <li>-Class II div. 1</li> <li>-Class II 2</li> <li>-Class III</li> <li>-Growth</li> <li>-Functionals</li> <li>-Osteotomy</li> </ul> <p><b>Cardiff</b></p> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Introduction</li> <li>-Appliance design</li> <li>-Appliance fitting</li> <li>-Radiographs</li> <li>-Treatment options</li> <li>-Soft tissues</li> <li>-Treatment planning</li> <li>-Mixed dentition</li> <li>-Functional appliances</li> <li>-Class 1</li> <li>-Class II div.1</li> <li>-Class II div. 2</li> <li>-Class III</li> <li>-Attitudes to ortho</li> <li>-1st molars</li> <li>-Traumatised incisors</li> <li>-Impacted teeth</li> <li>-Limitations of removables</li> <li>-Introduction to fixed</li> <li>-Adult ortho</li> <li>-Ortho/restorative</li> <li>-Orthognathic surgery</li> <li>-Occlusal indices</li> </ul> <p>Year 4 PBL for 1 hour x 24</p>	<p><b>Dundee</b></p> <p>Yr. 4.</p> <ul style="list-style-type: none"> <li>-Ortho patient examination.</li> <li>-IOTN.</li> <li>-Space analysis.</li> <li>-Diagnosis.</li> <li>-Treatment planning.</li> <li>-Appliance design.</li> <li>-Crossbites anterior.</li> <li>-Crossbites posterior.</li> <li>-Extractions.</li> <li>-Class I.</li> <li>-Local causes of malocclusion.</li> <li>-Canines.</li> <li>-Extractions.</li> <li>-EOT and anchorage.</li> <li>-Space maintenance.</li> <li>-Serial extractions.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-Fixed, introduction to.</li> <li>-3 revision sessions.</li> </ul> <p>Yr. 5.</p> <ul style="list-style-type: none"> <li>-Space assessment x 2.</li> <li>-Extractions.</li> <li>-Extractions for II, III.</li> <li>-Removables design.</li> <li>-Removables to retract.</li> <li>-Removables for crossbites.</li> <li>-Supernumeraries.</li> <li>-Missing teeth.</li> <li>-Canines.</li> <li>-Extractions of 7 and 8.</li> <li>-Fixed, pre-adjusted edgewise.</li> <li>-Fixed v Removables.</li> <li>-Impacted lower 5, first molars, second molars.</li> <li>-Referral options.</li> <li>-Fraena.</li> <li>-Referral letter writing.</li> <li>-Revision.</li> </ul>
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pairs in many schools, and patients rotate in one school (Dundee).

Students observe postgraduate treatment clinics in all schools except two (Birmingham and Manchester). A case report on a postgraduate patient observation is prepared in one school (Cardiff).

**Laboratory teaching**

There is no laboratory teaching now in four schools (Dundee, GKT, Leeds, London). In the remaining schools, the hours of laboratory teaching range from nine hours (Birmingham) to 60 hours (Bristol) (Table 1). The timing of the laboratory course is very variable and takes place in year 3 (Belfast, Birmingham, Bristol, Manchester, Newcastle, Glasgow – removable appliances), in year 5 (Glasgow – fixed appliances), in year 4 (Cardiff), or in year 2 (Sheffield). The format of laboratory teaching is modules

(Birmingham, Bristol, Cardiff, Glasgow, Manchester), one term only (Belfast, Sheffield), or fortnightly (Newcastle).

The content of the laboratory courses is extremely varied with removable appliances only (Bristol – removable appliances are marked as part of in course assessment), fixed appliances only (Cardiff), removable appliances and fixed appliances (Belfast, Birmingham, Manchester, Newcastle, Sheffield, Glasgow – lab grade marked as in course assessment year 3, 5). A removable appliances typodont course is held in two schools (Glasgow, Manchester), and a fixed appliances typodont course is held in four schools (Belfast, Birmingham, Cardiff, Manchester).

**Assessment**

Internal assessments contribute to the BDS

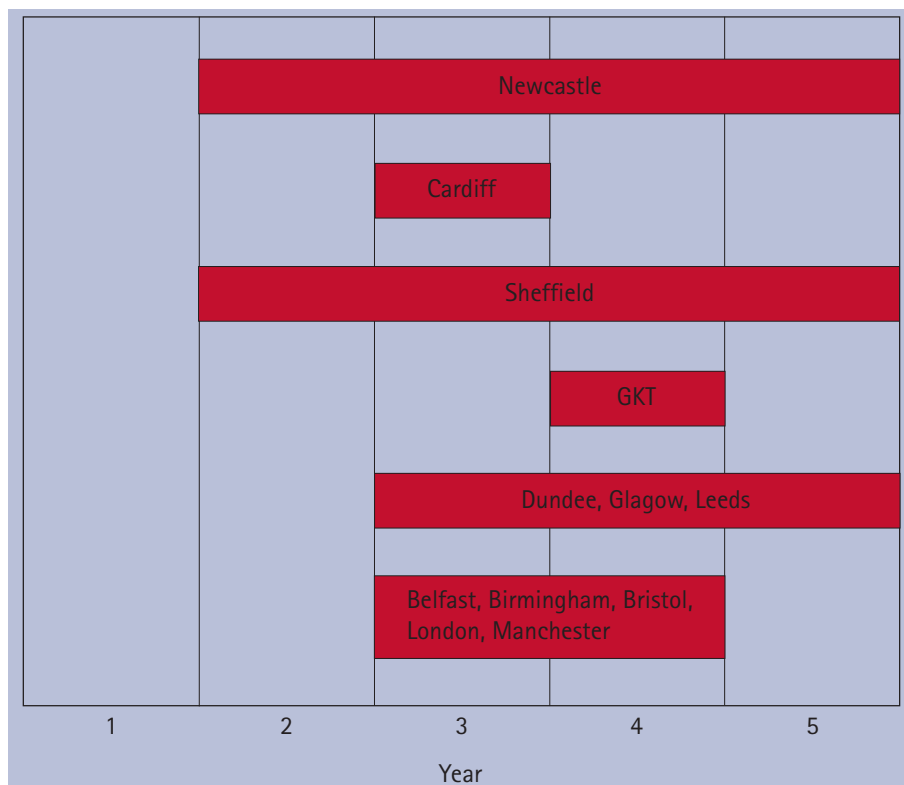
mark in seven of the dental schools (Birmingham, Bristol, Dundee, GKT, London, Manchester, Sheffield), but not in the remaining five (Belfast, Cardiff, Glasgow, Leeds, Newcastle). Both assessments and their percentage contribution to BDS (0 to 40%) are extremely varied, with no common pattern across the courses.

**BDS examination**

All schools have one essay question in a written BDS examination except for two schools that have two essay questions (Belfast and Bristol). The written BDS examination is held in year 5 in all schools except Dundee, where there is one question in both year 4 and year 5 examinations. Six schools also have a short answer paper, in year 5 (Birmingham, Glasgow, Newcastle, Sheffield), in year 4 (London), or years 3 and 4 (Dundee). All schools hold

**Table 3b Seminar titles**

<p><b>Glasgow</b></p> <ul style="list-style-type: none"> <li>-Introduction to orthodontics.</li> <li>-Physiology of tooth movement.</li> <li>-Removables design.</li> <li>-Examination of patient.</li> <li>-IOTN.</li> <li>-Cephalometrics.</li> <li>-Diagnostic + treatment planning.</li> <li>-Extractions.</li> <li>-Development and occlusion.</li> <li>-Aetiology of malocclusion x 2.</li> <li>-RA design and management.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-Functionals.</li> <li>-Interceptive.</li> <li>-Fixed.</li> <li>-Ortho in GDS.</li> <li>-Cleft.</li> <li>-Examination technique/feedback.</li> </ul> <p><b>GKT</b></p> <ul style="list-style-type: none"> <li>-Clinical diagnosis.</li> <li>-Radiographic assessment.</li> <li>-Treatment planning and appliance design exercises.</li> <li>-Treatment planning exercises for class I crowding.</li> <li>-Treatment planning exercises for class I spacing.</li> </ul>	<ul style="list-style-type: none"> <li>-Treatment planning exercises for class II div. 1.</li> <li>-Treatment planning exercises for class II div. 2.</li> <li>-Treatment planning exercises for class III.</li> <li>-Treatment planning exercises for crossbite.</li> <li>-Treatment planning exercises for AOB.</li> <li>-Extraoral traction.</li> <li>-Functional appliances.</li> <li>-Soft tissues.</li> <li>-Uninterrupted maxillary canine.</li> <li>-Fixed v removable appliances.</li> <li>-Referral to specialist and IOTN.</li> <li>-Timing of treatment, interceptive, adult.</li> <li>-Tooth movement, retention, stability.</li> <li>Revision.</li> </ul> <p><b>Leeds</b></p> <ul style="list-style-type: none"> <li>-Introduction + case assessment.</li> <li>-Impressions.</li> <li>-Interceptive ortho.</li> <li>-Removables design.</li> <li>-Removables adjustment.</li> <li>-Radiographs.</li> <li>-Anchorage.</li> <li>-IOTN + referral to specialist.</li> <li>-Canines.</li> <li>-6's loss and space maintenance.</li> <li>-Retention.</li> <li>-Functionals.</li> </ul>	<ul style="list-style-type: none"> <li>-Ortho emergencies.</li> <li>-Treatment of dental trauma.</li> </ul> <p><b>Manchester</b></p> <ul style="list-style-type: none"> <li>-Development.</li> <li>-Growth.</li> <li>-Development of dentition.</li> <li>-Diagnosis.</li> <li>-Clinical orthodontics.</li> </ul> <p><b>Newcastle</b></p> <p>Yr. 2</p> <ul style="list-style-type: none"> <li>-Cranio-facial growth and development.</li> </ul> <p>Yr. 3</p> <ul style="list-style-type: none"> <li>-Impressions.</li> </ul> <p>Yr. 4</p> <ul style="list-style-type: none"> <li>-Fitting and adjusting URA.</li> <li>-Ortho assessment.</li> <li>-Treatment planning.</li> <li>-Treatment planning class I.</li> <li>-Class II div. 1.</li> <li>-Class II div. 2.</li> <li>-Class III.</li> <li>-Supernumeraries + hypodontia.</li> </ul> <p>Yr. 5</p> <ul style="list-style-type: none"> <li>-Patient assessment x 6.</li> </ul> <p><b>Sheffield</b></p> <ul style="list-style-type: none"> <li>-Case scenarios.</li> </ul>
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**Fig. 1a Lectures – position in course**

maximum of four (Manchester). Consultants are involved in all schools except two (GKT, Manchester), and FTAs in all schools except three (Cardiff, GKT, Sheffield). Other teaching staff are specialist registrars (Belfast, Dundee, Newcastle), clinical assistants (GKT, Sheffield), senior dental officers (Cardiff, Leeds, London), and associate specialists (Glasgow, London, Newcastle) specialist practitioners (Belfast, Birmingham, Bristol, London, Sheffield) (Table 1). Many schools complain of shortage of staff for undergraduate teaching.

**Changes to course in last three years in hours, length and form**

Reductions to courses are reported in two schools (Dundee, GKT). Two schools have moved to more integrated courses (Cardiff, Manchester). A change to no seminars and more lectures has occurred in one school (London), whereas a change to more seminars is reported in another (Newcastle).

**—in clinical teaching**

A reduction in clinical teaching hours has taken place in three schools (Dundee, GKT, Glasgow). Six schools have reduced student patient treatment, and placed emphasis on diagnosis (Bristol, Dundee, Glasgow, GKT, Leeds, London) with fewer patients treated and students working in pairs (Bristol, GKT, Leeds). Two schools have introduced observation of postgraduate treatment clinics (GKT, Sheffield). There has been an alteration to more fixed appliance patient treatment by students in three schools (Belfast, Newcastle, Sheffield).

a clinical BDS examination (Manchester uses patient records only). The number of students per year taking the clinical BDS examination (in year 5) varies from either all students (Belfast, Bristol, Glasgow, Leeds), one in three students (Cardiff, GKT, London), one in four students (Dundee), one in five students (Birmingham), or one in seven students (Sheffield). Additional

examinations are a clinical viva (Manchester – year 4), a case presentation (Bristol, Newcastle – all students, Cardiff – optional), or an OSCE (Birmingham, Dundee, London) (Table 1).

**Staffing of undergraduate teaching**

The number of academic teaching staff range from one or two per course to a

**-in laboratory teaching**

Drastic changes have been reported with laboratory teaching removed in four schools (Dundee, GKT, Leeds, London), and reduced in one school (Birmingham). Other changes to laboratory teaching have been to include a fixed appliances course (Belfast), to increase the fixed appliance course (Newcastle), and to include a removable appliances typodont course (Manchester).

**-in assessment and examination**

Assessment has been reduced in one school (London), and modified in five schools (Belfast, Bristol, Dundee, GKT, Leeds).

**-in staffing**

Staffing levels have reduced in five schools (Bristol, Dundee, Glasgow, GKT, London), and increased in one school (Sheffield). There has been an increase in NHS staff involved in three schools (Birmingham, Leeds, Newcastle).

**Changes to the course in last three years due to FFY document<sup>1</sup> or other pressures**

Changes to the course have taken place due to FFY document<sup>1</sup> or other pressures in six dental schools (Belfast, Cardiff, Dundee, Glasgow, GKT, Leeds). These changes have either been due to FFY document<sup>1</sup> only (Cardiff), due to FFY document<sup>1</sup> and staff shortages (Belfast, Leeds), due to university pressures (Dundee, Glasgow), or due to university pressures (FFY cited) and staff shortages (GKT).

**Future changes to the course in the next few years**

Future changes include increased clinical time (Belfast), use of outreach clinics (Dundee, Leeds), and use of GDP centre (Cardiff). New courses are developing in four dental schools (Cardiff, GKT, Leeds, London), with the development of very integrated courses at two dental schools (Cardiff, London). One course is currently under review (Manchester), and examinations are under review in one course (Belfast).

**DISCUSSION**

The wide variation found in the 12 orthodontic courses was unexpected. With the number of students per year ranging from 55 to 155 in UK dental schools, it might be expected that differences in numbers of dental students may necessitate different approaches to teaching. However, the method of teaching did not appear to have any obvious correlation to the size of the student year. For example, those schools that had stopped seminar teaching and increased lecture teaching did not have the largest number of students. The most com-

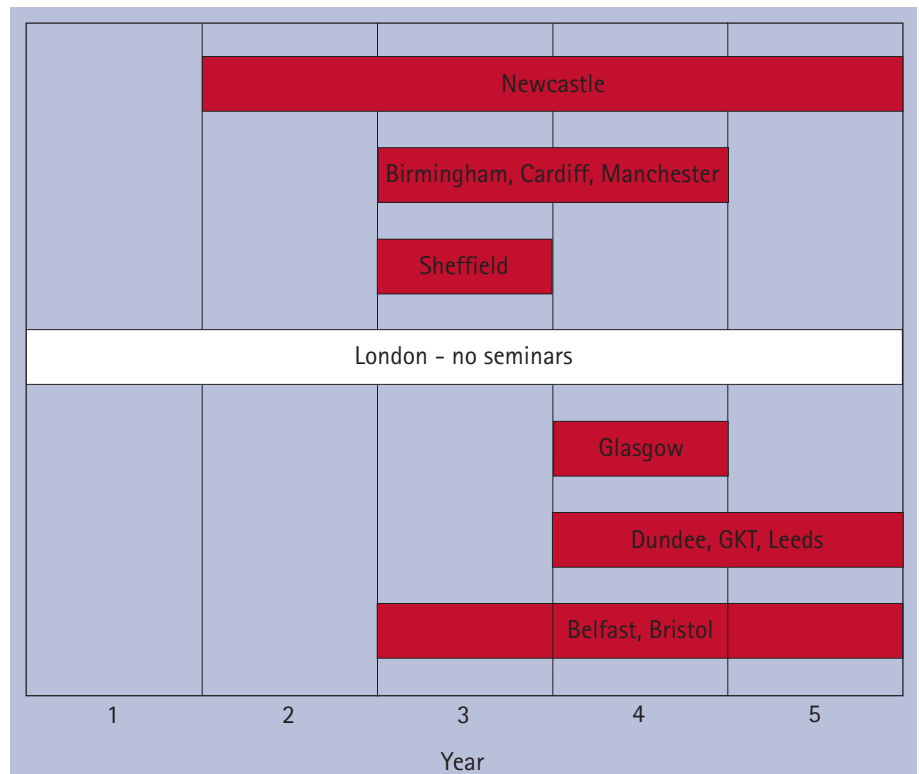


Fig. 1b Seminars – position in course

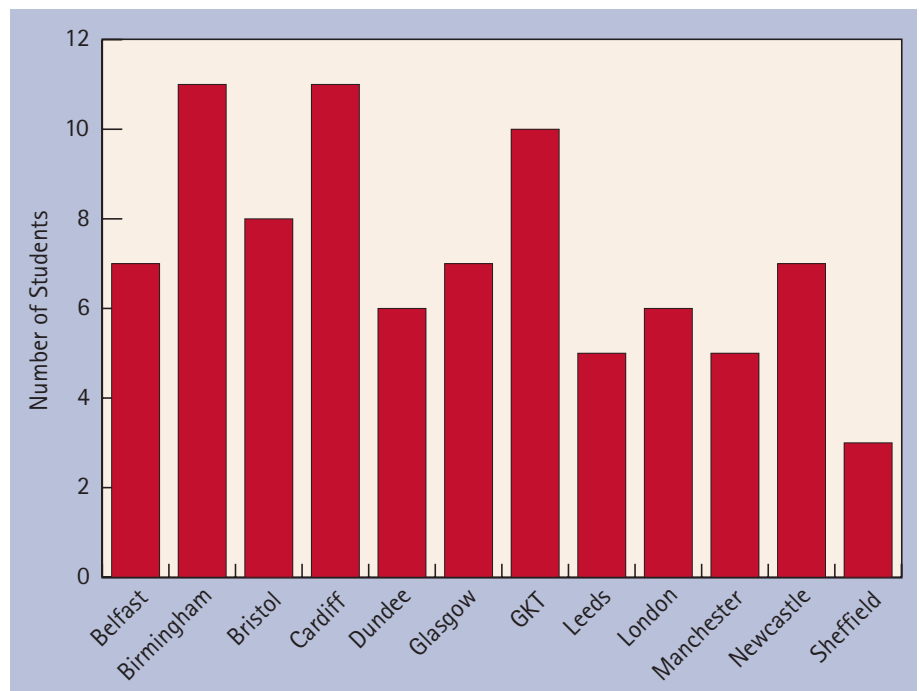


Fig. 2a The number of students per diagnostic clinic

mon form of teaching appears to be fortnightly sessions using all methods of teaching, lectures, seminars, diagnostic and treatment clinics and laboratory teaching. The lecture and seminar content of the course need to be combined to give an overall view, as some courses prefer one to the other as a teaching method. However, the majority of courses are still using both lectures and seminars. Surprisingly, very few courses are using topic teaching,

and only two courses are integrating lectures with paedodontics or dental public health to any great extent. The introduction of case conferences/case scenarios has occurred in lectures in two courses, and in seminars in half of the courses. A large amount of teaching time is allocated to seminars with PBL in four schools, where time for self-directed learning in orthodontics is possible. Other schools with less course hours in orthodontics would not be

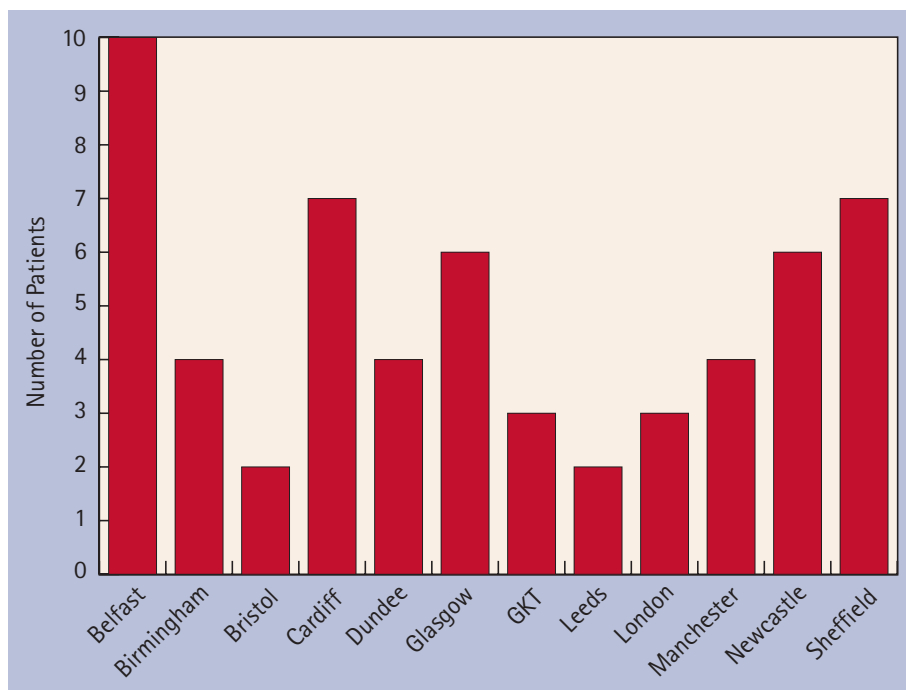


Fig. 2b The number of patients per diagnostic clinic

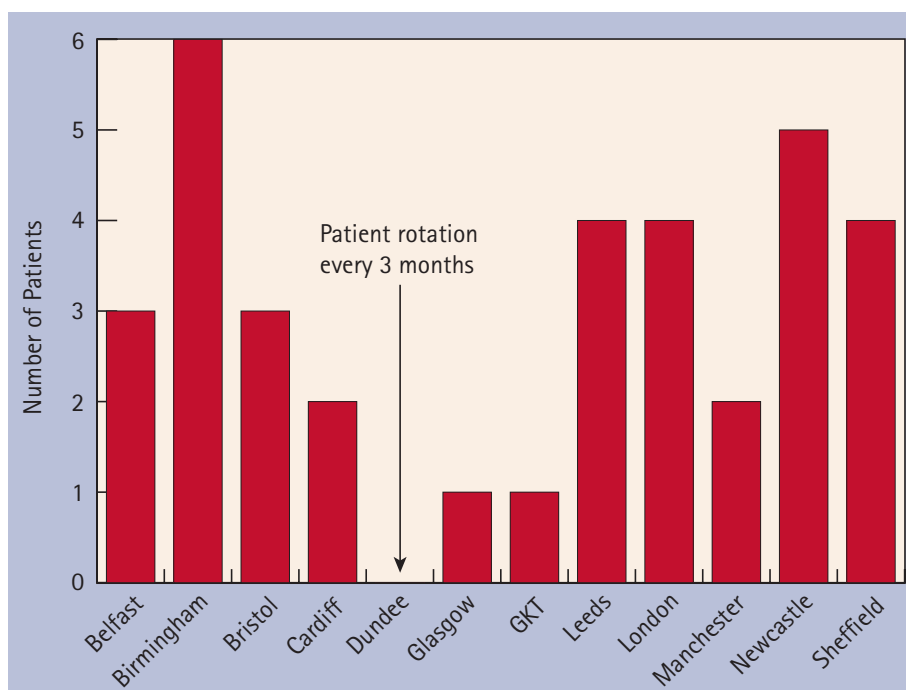


Fig. 3 The number of patients treated per student

able to allocate the necessary time required for this form of teaching.

It is in the two practical sides of the course, clinical and laboratory teaching, where the most extreme variation in courses occurred. Clinical teaching varied both in clinical hours (ranging from 50 to 126), and in content, with student patient treatment ranging from none to removable, functional, and full fixed appliances. Similarly, laboratory teaching varied in hours (ranging from 0 to 60), and in content, ranging from removable appliance wire bending to fixed appliance typodont courses. Half the courses now have no lab-

oratory teaching, whereas other courses have introduced removable appliance and fixed appliance typodont courses.

There was no pattern of common internal assessments across the schools, with inconsistent areas of assessment and percentage contribution to BDS. The BDS examination written paper question was common to all schools, although the number of orthodontic questions varied. However, a BDS clinical examination in orthodontics/child dental health was not taken by all students in all schools, and additional BDS examination components of a short answer question paper (SAQ),

case presentations or OSCE also existed in some schools.

Staffing levels in most schools were surprisingly low, with a large variety of staff involved in teaching in different schools. The ratio of academic teaching staff to students was remarkably low, with most schools only having one or two academic staff involved in undergraduate teaching. In some courses, teaching was mainly by academic staff, some courses had a high level of NHS consultant staff involvement, and others had a variety of part-time staff providing teaching. Many schools reported staff shortages for orthodontic undergraduate teaching.

Considerable changes to the courses have taken place in the last three years, with reductions in some courses reported in form and content, in assessment and examination, and in staffing levels. Clinical hours have been reduced in four schools, and patient treatment undertaken by students reduced in six schools, with an emphasis now placed on diagnosis. Post-graduate observation has been recently introduced in three schools, and now takes place in all schools except two. Conversely, however, in three schools there has been an alteration to more fixed appliance patient treatment undertaken by students. Assessment has either been reduced or modified in most schools in the last three years, and six schools have had a reduction in orthodontic staffing levels.

Different schools, therefore, appear to be moving in different directions, particularly with regard to patient treatment undertaken by students and laboratory courses. Changes may be due to a change in teaching outlook, but it is evident that in some circumstances, the availability of clinical or laboratory space, or teaching staff, may pressurise or force changes to occur. The greater involvement of NHS staff in undergraduate teaching has been as a direct result of shortages of clinical academic staff available. The proposed increase in numbers of undergraduate students and further training programmes, will place undergraduate teaching under still more pressure. Changes to the course have taken place in six schools in the last three years due to *The First Five Years* GDC document<sup>1</sup> or other pressures such as university pressures or staff shortages. Further changes are likely with new courses developing in four dental schools and two courses currently under review.

**CONCLUSIONS**

Comparison of undergraduate orthodontic courses in UK dental schools is now possible. An unexpected wide variation exists in course hours and content, and in student assessment and examination,



showing a lack of harmonisation of undergraduate teaching within the UK. Considerable changes have taken place in the last three years, with half of the courses affected by *The First Five Years* GDC document<sup>1</sup> and university pressures, resulting in reduction in courses in hours and content, and in staffing. It is evident that more guidelines are needed to safeguard clinical

content and student assessment, and prevent any further changes impinging on teaching and course quality of undergraduate orthodontics in UK dental schools.

*This questionnaire survey was carried out on behalf of the University Teachers Group (UTG) of the British Orthodontic Society (BOS). The questionnaire was approved by the UTG Chairman Professor Nigel Hunt, and UTG Secretary Dr Friedy Luther, and the*

*results were presented to the meeting of the UTG (2004). I would like to thank the 12 orthodontic course leaders for their co-operation in completing the questionnaires, and for their support in providing information of their courses.*

1. General Dental Council. *The First Five Years – A framework for undergraduate dental education. General Dental Council (GDC) regulations*. 2<sup>nd</sup> Ed. 2002.
2. Rock P. Survey of undergraduate orthodontic teaching 1997. Presentation at UTG meeting, 1997.