

## IN BRIEF

- Enables readers to appreciate that while dental educational programmes in removable partial dentures are of high quality, there are areas of concern.
- Allows appreciation of the fact that ensuring student competence in removable prosthodontics is a challenging task.
- Gives an understanding of why it is necessary to further develop dental education programmes in removable partial denture prosthodontics to ensure that graduating dental students are best prepared for independent clinical practice.

# The teaching of removable partial dentures in Ireland and the United Kingdom

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**Aim** The aim of this paper is to investigate methods employed for teaching removable partial dentures in dental schools in Ireland and the United Kingdom.

**Materials and methods** A questionnaire was distributed by email in May 2005 to each of the 15 dental schools with undergraduate dental degree programmes in Ireland and the UK. The questionnaire sought information relating to the preclinical and clinical teaching of removable partial dentures (both acrylic and cobalt-chromium based dentures).

**Results** Eleven completed questionnaires were returned. The average duration of a preclinical course in removable partial dentures was 67 hours (range = 24-200 hours). This course was directed by a senior clinical academic alone in eight schools, by a senior clinical academic in collaboration with a dental technician in two schools, and solely by a dental instructor technician in one school. The median number of cobalt-chromium and acrylic removable partial dentures provided by undergraduate dental students was 3 (range = 2-5) and 2 (range = 0-3), respectively. Four schools reported that their patient pool is not entirely satisfactory for clinical teaching of undergraduate dental students.

**Conclusion** Variations were noted between dental schools in both the amount and content of teaching programmes. Experience gained by undergraduate students in dental schools is limited, and appears to be hampered by limited access to patients suitable for undergraduate teaching.

## INTRODUCTION

For some many years it has been recognised that a fundamental problem exists among the dental profession when prescribing, designing, and fabricating removable partial dentures.<sup>1-5</sup> The first studies which re-examined this subject since the introduction of clinical<sup>6</sup> and legal<sup>7</sup> guidelines were performed by the authors during the period 2002-2005 (ie at least five years since the introduction of these guidelines).<sup>3-5</sup> These demonstrated the persistence of a trend towards '...de facto *devolution of prescribing discretion to the technician*...'<sup>3</sup> In an environment in which clinical governance is supposed to flourish, it is clear that there is a problem in this area.

The reasons for the persistence of the problem of inadequate design and fabrication of removable partial dentures were 'traditionally' ascribed to either financial<sup>1,2,8-10</sup> or educational factors,<sup>1,2,9,11</sup> with the former being used as a criticism of the NHS fee structure. In 2006, the authors published the first study which sought to investigate the role of financial and educational factors on the design process for cobalt-chromium removable partial dentures.<sup>12</sup> We found, by comparing samples of written instructions for cobalt-chromium removable partial dentures provided under a number of different fee structures, that there was little difference between the quality of written instructions.<sup>12</sup> This finding is consistent with a similar study of endodontic practice in the UK, which found that increased fees did not equate to increased treatment quality.<sup>13</sup> However, when we investigated the significance of the educational factors, the picture was far more revealing. We examined a sample of vocational dental trainees, who were close to finishing their year of vocational training. Bearing in mind that the purpose of vocational dental training is to provide a link or 'bridge' between dental school and subsequent independent practice, we found that following vocational training, only 15% of trainees felt that their confidence in designing and fabricating cobalt-chromium removable partial dentures had increased, 20% of trainees had not made any cobalt-chromium removable partial dentures during vocational training,

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**Table 1 Staff:student ratio for teaching of the preclinical course in removable partial dentures**

	Median	Range
For the course	1:10	1:8-1:22
For lectures	1:60	1:35-1:160
For tutorials	1:12	1:8-1:22
For lab demonstrations	1:10	1:8-1:22

and only 17% of respondents had received formal teaching, such as organised study days, in this area.<sup>12</sup> Having concluded that many trainees had not received teaching/training in the comprehensive management of the partially dentate adult, we decided to turn our attention to the teaching of removable partial dentures to dental undergraduates. The last study of this kind was published in 1979,<sup>11</sup> which found that there was much agreement between dental schools when teaching removable partial dentures, but principles of removable partial dentures taught in dental school diverged from that in independent practice.

The aim of this paper is to investigate the methods used to teach removable partial denture prosthodontics to undergraduate dental students in Ireland and the United Kingdom.

#### MATERIALS AND METHODS

A questionnaire was distributed by email in May 2005 to the person identified as being responsible for the co-ordination of teaching of removable prosthodontics, in each of the 15 dental schools with undergraduate dental degree programmes in Ireland and the UK. The questionnaire sought information relating to the preclinical and clinical teaching of removable partial dentures (both acrylic and cobalt-chromium based dentures) in each school. The questionnaire design included both 'closed' (where respondents were given a number of possible responses to a statement and asked to identify the most appropriate one) and 'open' statements (where respondents were given some space in which to write a free comment). Subjects investigated in the questionnaire included:

- Duration and timing of the preclinical and clinical courses in removable partial dentures
- The person responsible for directing and delivering pre-clinical and clinical teaching in removable partial dentures
- The staff:student ratios for teaching the preclinical and clinical courses in removable partial dentures
- Teaching of various aspects of removable partial denture provision, such as tooth preparation on patient simulators, use of a dental surveyor, prescription writing, and the teaching of articulators and impression techniques
- Interaction with internal and external laboratories
- Average numbers of clinical treatments completed by students
- Assessment/examination of preclinical and clinical teaching
- Attitudes of respondents to challenges in the teaching of removable partial dentures.

The questionnaire was re-emailed to non-respondents on a number of occasions. Data were entered onto a Microsoft Excel datasheet; results are reported descriptively.

#### RESULTS

Eleven completed questionnaires were returned. It is understood that the questionnaires were completed by a senior member of the clinical academic staff with responsibility for delivering the teaching programme in removable partial dentures in each school.

#### Preclinical teaching of removable partial dentures

##### *Nature of the preclinical course in removable partial dentures*

All respondents indicated that they had a dedicated preclinical course for teaching removable partial dentures. In 9 of the 11 responding schools, this occurred in the third year of the dental degree programme. Of the remaining two schools, the preclinical programme occurred in the first year at one school, and as an introductory module of this programme in the first year at the final school (which was continued/completed in the third year).

The number of hours dedicated to this preclinical course, and the way in which these were distributed was as follows:

**Table 2 Person responsible for a) overall direction of the preclinical course in removable partial dentures (RPDs); b) teaching tooth preparations on patient simulations; c) the use of the surveyor when designing RPDs; d) RPD prescription writing**

Person	Overall preclinical course director	Tooth preparations on patient simulations	The use of the surveyor	RPD prescription writing
Senior Lecturer/Consultant	8 schools	3 schools	1 school	3 schools
Senior Lecturer/Consultant + Technician	2 schools	2 schools	4 schools	4 schools
Technician alone	1 school	2 schools	3 schools	2 schools
Senior Lecturer/Consultant + GDP		1 school		
Lecturer		2 schools	1 school	1 school
GDP alone			1 school	1 school
Technician + GDP			1 school	

- Total course duration: mean = 67 hours (range = 24-200 hours)
- Duration of 'hands-on'/practical component: mean = 54 hours (range = 25-175 hours)
- Duration of didactic teaching component: mean = 13 hours (range = 5-25 hours), which was further broken down as:
  - tutorials (all schools): mean = 9 hours (range = 1-19 hours)
  - formal lectures (10 schools): mean = 4 hours (range = 1-10 hours).

The staff:student ratio for the teaching of this programme is outlined in Table 1. The person with overall responsibility for directing the preclinical course in removable partial dentures is shown in Table 2.

#### *Certain aspects taught in the preclinical course in removable partial dentures*

Ten of the eleven schools reported that their students were taught how to complete tooth preparations on patient simulator units as part of the preclinical course. The person responsible for supervising this part of the programme is identified in Table 2.

All schools reported that their students were taught how to use a surveyor during this course. The mean number of hours spent on this teaching (including lectures, tutorials, practical experience) was 8 hours (range = 2-28 hours). The person responsible for supervising this part of the course is identified in Table 2.

With respect to the teaching of prescription writing for removable partial dentures, all eleven schools taught this by means of tutorials and seminars. The mean duration of teaching time in this format was 2.5 hours (range = 1-6 hours). Additionally, seven schools taught this area via formal lectures, each delivering a one-hour lecture on the topic. The person responsible for delivering this component of the teaching programme is outlined in Table 2.

There was some variation in teaching of the use of articulators within the responding dental schools. While 10 schools taught the use of both semi-adjustable and average value articulators, one school taught the use of an average value articulator alone during this course.

Ten schools reported that they had an examination at the end of the preclinical course. In seven of these schools this examination included both written and practical assessments, in two schools it included only practical assessments, while in one school it took the form of a written examination only. The aspects of removable partial denture design and fabrication examined are reported in Table 3.

#### **Clinical teaching of removable partial dentures**

##### *Nature of the clinical teaching*

Nine schools reported that their students commenced treatment of patients with removable partial dentures in Year 3, in one school students commenced this treatment in Year 2, and in one other school in Year 4. The staff:student ratio for the teaching of this part of the dental school programme is outlined in Table 4.

In nine schools, students had dedicated clinical sessions for the provision and delivery of removable partial dentures.

**Table 3 Aspects of removable partial denture design and fabrication examined: a) at the end of the preclinical removable partial denture course, b) as criterion referenced assessed exercises in clinical removable partial denture provision**

Aspect of RPD provision	Preclinical examination	Criterion referenced assessed exercises
Surveying and design	9 schools	7 schools
Prescription writing	8 schools	7 schools
Mounting of casts	2 schools	0 schools
Tooth preparations	1 school	4 schools
Impression technique	1 school	4 schools
Try-in and delivery	0 schools	3 schools
Tooth arranging	1 school	1 school
Occlusion	0 schools	1 school

\*Some schools selected more than one option

**Table 4 Staff:student ratio for the clinical teaching of removable partial dentures**

	Median	Range
For clinical sessions	1:8	1:6-1:10
For lectures	1:60	1:35-1:160
For tutorials	1:10	1:6-1:16

Clinical supervisors included:

- Senior academic staff/honorary consultant: ten schools
- Lecturer: nine schools
- Visiting general dental practitioner: eight schools.

There was 'paired teaching' for clinical sessions in 7 of the 11 respondent schools.

In six schools students began treatment of partially dentate patients requiring removable partial dentures before treating edentulous patients who required complete dentures. In the remaining five schools, this order was reversed.

In ten schools, there was further teaching of removable partial denture design and prescription writing. Four schools had further lectures on this topic (mean = 5 hours, range = 1-9 hours); seven schools had further tutorials on this topic (mean = 23 hours, range = 1-9 hours). In ten schools it was reported that students used a surveyor when designing their removable partial dentures; in one school this did not happen.

Regarding impression-making techniques at the master impression stage, nine schools taught the use of a special tray and polyvinylsiloxane and six schools taught the use of a special tray and alginate (some schools taught both techniques).

Seven of the eleven respondent schools used both internal and external dental laboratories for fabrication of their prostheses; three schools used internal laboratories only, and one school used external laboratories only.

**Table 5** The 'clinical requirements' or number of items of treatment that the students must have completed prior to graduation

RPD type	Median	Range
Acrylic RPD	2	0-3
Cobalt-chromium RPD	3	2-5

**Table 6** Challenges to the teaching of removable partial dentures identified by the respondents

Lack of suitable patients	7 schools
Lack of adequately trained staff	5 schools
Pressures on teaching time from other sources	4 schools
Increased student numbers	4 schools

\*Some schools selected more than one option

In terms of assessment, nine schools had criterion referenced assessed exercises in clinical removable partial denture provision. In these nine schools, six criterion referenced assessed exercises were 'practical-only', while three were 'written and practical'. Aspects of clinical removable partial denture provision examined in these exercises are reported in Table 3.

The 'clinical requirements', or number of items of treatment that the students must complete prior to graduation, are reported in Table 5. It was reported that in general, students reached these requirements.

Four respondents indicated that they found their pool of patients unsuitable for student treatment. The reasons for this included difficult dental configurations (eg tooth wear), medically compromised patients, unmotivated patients and socially difficult patients.

Respondents were asked to indicate what they considered to be the challenges to the teaching of removable partial dentures over the next few years. The responses to this question are reported in Table 6.

## DISCUSSION

The challenge for modern dental educators is to train dentists who are competent in the delivery of oral healthcare delivery. One such form of treatment, recognised in both the General Dental Council's *First Five Years*<sup>14</sup> and the recent Association for Dental Education in Europe guidelines to promote harmonisation of European dental school curricula,<sup>15</sup> is the rehabilitation of partially dentate adults with removable partial dentures. The findings of this survey indicate that while all schools deliver teaching programmes designed to meet these requirements, it is evident that there are variations between individual schools in the content and delivery of these teaching programmes.

As noted from surveys in other aspects of restorative dentistry, the key source from which many dental practitioners derive their knowledge and skills is their educational experiences gained at undergraduate dental school.<sup>16,17</sup> Lack of clarity, or variations in teaching, could cause confusion in dental graduates. It is evident from the data reported regarding the

preclinical teaching of removable partial dentures, that there is a wide variation in the amount of teaching received by undergraduate dental students. Examples of this include course duration, which in one school was as short as 24 hours, but was as long as 200 hours in another. Another example is the staff: student ratio for laboratory demonstrations – this was as low as 1:8 in one school, but as great as 1:22 in another. These findings are a reflection of the current pressures on contemporary dental education, with increased student numbers and limited availability of suitable staff.<sup>18,19</sup> There was less divergence in the amounts and content of teaching between dental schools in the previous similar survey reported in 1979.<sup>11</sup> It should be noted however that this evidence of variation between schools is not unique to the teaching of removable partial dentures, and has been noted in other areas in contemporary restorative dentistry, such as the teaching of posterior composite restorations.<sup>17,20</sup>

Another finding from this survey is that while the preclinical course in removable partial dentures was directed by a senior clinical academic either alone or in collaboration with a dental technician in ten schools, this course was directed solely by a dental technician in one of the responding schools. In addition, in some schools, responsibility for clinically important components of the programme such as rest seat preparations, use of a dental surveyor, and prescription writing, had been devolved to dental technicians and part-time visiting general dental practitioners (Table 2). It is a cause for concern that responsibility for teaching tooth preparations and prescription writing rested solely with a technician in two schools, and that of teaching the use of the dental surveyor rested solely with a dental technician in three schools. There may be limitations to teaching of clinical procedures that are delivered by non-clinical staff, irrespective of their abilities and knowledge. Pre-clinical courses should be viewed as preparatory courses for clinical practice, not as courses that lack clinical relevance.

In relation to clinical teaching of removable partial dentures, the pressures on teaching programmes are evident. For example there were wide variations in the staff:student ratios, and there was a reliance on part-time visiting general dental practitioners to support the delivery of teaching programmes. While this can be an advantage to the delivery of a teaching programme, introducing alternative approaches to treatment and an appreciation of how to approach treatments in a primary dental care setting, it is important that there is harmonisation of the dental school teaching programme to avoid inter-teacher variation. There is also evidence of reduced numbers of patients available for treatment, as noted by the introduction of paired teaching in 7 of the 11 respondent schools. Notably, more than one in three schools considered the patient pool available for undergraduate teaching to be less than optimal.

A major cause for concern arises in relation to the teaching of removable partial denture design and prescription writing. The amount of preclinical teaching on this subject was as little as two hours in some schools. One school did not have any formal clinical teaching on this topic, and in some schools, the amount of formal clinical teaching in this area was as little as one hour. In four schools, the teaching of this clinically important aspect of the programme was not directed by a senior clinical academic. It seems that two schools do not have any preclinical examination of removable partial denture prescription writing, and four schools do not have any examination of

this in a clinical setting. It is a serious cause for concern, bordering on negligence, that in one school, clinical undergraduate students did not routinely use a surveyor when designing their removable partial dentures.

Another area of concern is that of the numbers of treatments completed by students. It seems that in some schools, dental undergraduates complete as few as two cobalt-chromium removable partial dentures, with the median number of such prostheses provided by students being three. From our previous investigation of vocational dental trainees,<sup>12</sup> we found that the median number of cobalt-chromium removable partial dentures completed during vocational training was two. Making a generalisation, it appears that one half of undergraduates who complete vocational training provide five cobalt-chromium removable partial dentures or less before entering independent practice. This finding alone provides a possible explanation for the apparent divergence from clinical guidelines for prescribing removable partial dentures in general dental practice. It would seem that the reluctance of general dental practitioners to provide or plan removable partial denture therapy may be a reflection of their lack of familiarity with its clinical application during dental school and vocational training.

The publication of the findings of surveys such as this are important and valuable to dental education. Data on current teaching practices and trends can:

- Inform teachers and schools of national curriculum trends
- Highlight contemporary education needs that will best prepare today's students for clinical practice
- Provide evidence when attempting to lever change in dental education programs at local and national levels.

Dental students at both undergraduate and vocational training level need to be prepared to meet the needs of their patients. Clearly this cannot happen where there is variation in the amount and content of teaching, reliance on non-clinical staff for teaching clinically important areas, and when – as a generalisation – one in two students complete less than five cobalt-chromium removable partial dentures prior to entry into independent practice. Now, more than ever, dental school leaders and educators need to be proactive in this area.

## CONCLUSION

This paper has found that while all schools make efforts to ensure that their undergraduate dental students are best

prepared for subsequent independent practices, there are variations in the amount and content of teaching programmes between schools. Such variations are a reflection of the pressures on contemporary dental education. However, efforts must be made to ensure that graduating dental students are best prepared to meet the needs of their patients on entering independent practice.

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1. Basker R M, Davenport J C. A survey of partial denture design in general dental practice. *J Oral Rehabil* 1978; **5**: 215-222.
2. Basker R M, Harrison A, Davenport J C, Marshall J L. Partial denture design in general dental practice – 10 years on. *Br Dent J* 1988; **165**: 245-249.
3. Lynch C D, Allen P F. A survey of chrome-cobalt removable partial denture design in Ireland. *Int J Prosthodont* 2003; **16**: 362-364.
4. Lynch C D, Allen P F. Quality of written prescriptions supplied to dental laboratories for the fabrication of cobalt chromium removable partial dentures in Ireland. *Eur J Prosthodont Restor Dent* 2003; **11**: 176-180.
5. Lynch C D, Allen P F. Quality of written prescriptions and master impression for fixed and removable prosthodontics: a comparative study. *Br Dent J* 2005; **198**: 17-20.
6. British Society for the Study of Prosthetic Dentistry. *Guidelines in prosthetic and implant dentistry*. Quintessence Publishing Company, 1996.
7. EC Medical Devices Directive No. 10. Guidelines to Medical Devices Directive 93/42/EEC for Manufacturers of Custom-Made Dental Devices. Dublin: Department of Health and Children, 1997.
8. Schwarz W D, Barsby M J. A survey of the practice of partial denture prosthetics in the United Kingdom. *J Dent* 1980; **8**: 95-101.
9. Dullabh H D, Slabbert J C G, Becker P J. Partial denture prosthodontic procedures employed by practising graduates of the University of the Witwatersrand, Johannesburg. *J Dent Assoc S Afr* 1993; **48**: 129-134.
10. Barsby M J, Schwarz W D. Laboratory costs of cobalt-chromium partial dentures. *Br Dent J* 1984; **157**: 365-367.
11. Barsby M J, Schwarz W D. A survey of the teaching of partial denture construction in dental schools in the United Kingdom. *J Dent* 1979; **7**: 1-8.
12. Lynch C D, Allen P F. Why do dentists struggle with removable partial denture design? An investigation of educational and financial issues. *Br Dent J* 2006; **200**: 277-281.
13. McColl E, Smith M, Whitworth J, Seccombe G, Steele J. Barriers to improving endodontic care: the views of NHS practitioners. *Br Dent J* 1999; **186**: 564-568.
14. The General Dental Council. *The first five years: a framework for undergraduate dental education*. London: General Dental Council, 2002.
15. Plasschaert A J M, Holbrook W P, Delap E, Martinez C, Walmsley A D. Profile and competences for the European Dentist. *Eur J Dent Educ* 2005; **9**: 98-107.
16. Wilson N H F, Dunne S M, Gainsford I D. Current materials and techniques for direct restorations in posterior teeth. Part 2: resin composite systems. *Int Dent J* 1997; **47**: 185-193.
17. Lynch C D, McConnell R J, Wilson N H F. Teaching posterior composites in US dental schools. *J Am Dent Assoc* 2006; **137**: 619-625.
18. Lynch C D, McConnell R J, Wilson N H F. Challenges to teaching posterior composites in the United Kingdom and Ireland. *Br Dent J* 2006; **201**: 747-750.
19. Kay E J, O'Brien K D. Academic dentistry – where is everybody? *Br Dent J* 2006; **200**: 73-74.
20. Lynch C D, McConnell R J, Wilson N H F. The teaching of posterior composite resin restorations to undergraduate dental students in Ireland and the United Kingdom. *Eur J Dent Educ* 2006; **10**: 38-43.