

# The teaching of implant dentistry in undergraduate dental schools in the United Kingdom and Ireland

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## IN BRIEF

- Newly qualified dentists are more likely to have patients requesting information on implants and also have to assess and manage restored cases.
- Implant dentistry education in the UK and Ireland is far behind many parts of Europe, America and Canada.
- Dental schools want to increase teaching of implant dentistry so that future graduates will enter practice with a greater level of knowledge in this field.

**Objectives** The objective of this paper is to describe the contemporary teaching of dental implantology to dental undergraduates in the United Kingdom and Ireland. The paper also aims to assess the attitudes of dental school educators in relation to future trends in dental implant training for dental undergraduates. **Methods** An online questionnaire relating to current and future possible trends in dental implantology education was developed and distributed to Heads of Division/Departments of Restorative Dentistry, or equivalent, in each of the 15 dental schools with undergraduate dental programmes in the United Kingdom and Ireland. The questionnaire included both 'open' and 'closed' style questions. **Results** All 15 dental schools invited to participate in this survey responded. Of the 15 schools, two do not provide any training for their undergraduate dental students in relation to implant dentistry. The teaching is mainly delivered in lecture-based or phantom head room settings (eight of the 13 implant-teaching schools). Only four schools allow their students to interact clinically with implant patients. All schools anticipate an increase in dental implant teaching in the next five years, however, there is much variation in the scope and nature of this increase. **Conclusions** The teaching of dental implants in the UK and Ireland has increased since the time of previous surveys. It would seem prudent for this theme of teaching to further increase in order to best prepare graduating students for independent clinical practice.

## INTRODUCTION

The use of dental implants is an established form of treatment for partially dentate and edentate adults. The use of dental implants is based on osseointegration, and a number of clinical studies support their subsequent long term prognosis.<sup>1</sup> The use of dental implants avoids the biological complications of, for example, preparing adjacent teeth as bridge abutments.<sup>2,3</sup> Some studies have demonstrated that the occurrence of pulpal necrosis following preparation of abutment teeth for fixed bridgework can be as high as 30% at ten years.<sup>3</sup> As a result implantology is seen as an

increasingly contemporary, integral and important component of the practice of dentistry within the UK.

Previous surveys of dental implant education in UK and Irish dental schools were completed in the 1990s.<sup>4,5</sup> At the time of those surveys all schools provided some teaching, mainly in the form of a small number of lectures. Very few dental school programmes involved students attending implant treatment planning clinics, surgical placement sessions, or prosthodontic rehabilitation sessions.<sup>4</sup> In 1999, Young *et al.*,<sup>5</sup> reported that at four of the UK and Irish dental schools, only a select number of students were directly involved in clinical implant treatment. It was reported that this involvement simply included basic familiarisation with the principles of oral implantology and the factors that determine which patients should be referred for consultant advice. The authors of this particular study acknowledged that the use of dental implants was increasing and they hoped that universities would respond to this by increasing the availability of teaching to undergraduates.<sup>5</sup>

In 2002, The General Dental Council (GDC) document *The first five years*<sup>6</sup> included some guidance on the teaching of dental implants to undergraduate dental students. It states: '*The provision of dental implants and implant-retained crowns and bridges requires a team approach. The student should understand the principles of implant therapy and see implants being maintained within healthy tissues.*' Clearly, information recorded in the 1999 survey demonstrates that educational practice at the time falls short of the General Dental Council's recommendation.<sup>5</sup>

Internationally, the situation is somewhat different to that reported in the 1999 UK survey.<sup>5</sup> A survey of European dental schools completed in 2002 indicated that 75% of responding schools had established implant dentistry programmes, but only 37% reported that their undergraduate students gained clinical experience in the restoration of implant cases.<sup>7</sup> Studies conducted in the United States have revealed that 20% of predoctoral (undergraduate) programmes have included implant dentistry in their curriculum since the 1970s.<sup>8</sup> In the

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## Refereed Paper

Accepted 20 August 2008

DOI: 10.1038/sj.bdj.2008.1027

©British Dental Journal 2008; 205: 609-614

1990s curriculum guidelines were produced for predoctoral implant dentistry, which were published by the American Association of Dental Schools (AADS).<sup>9</sup> By the early 1990s one survey indicated that 65% of respondent US dental schools taught dental implants.<sup>10</sup> In 2005 it was reported this figure has increased to that of 86% of US dental schools.<sup>11</sup> A further study published in 2006 indicated that 97% of dental schools in the US and Canada had a didactic instruction course relating to dental implants, and 86% provided some clinical implant experience for their students.<sup>12</sup>

The dental implant market both worldwide and within the UK continues to expand,<sup>13</sup> and in conjunction with this patient awareness, expectations and demand for such treatment increases. It is inevitable that more newly graduating dentists will encounter patients either requesting implant restorations or those requiring maintenance of implant supported restorations. A great number of implant training courses are available to UK general dental practitioners on a postgraduate or continuing education basis; however, there is great variation in the level of training, quality, and duration within these courses. They range from one-day courses to higher degree level qualifications. There is clearly a need for newly qualifying dentists in the UK to be provided with a solid educational foundation in implant dentistry prior to graduation.

The aim of this paper is to describe the contemporary teaching of dental implantology to dental undergraduates in the United Kingdom and Ireland. The paper also aims to assess the attitudes of dental school educators in relation to future trends in dental implant training for dental undergraduates.

## MATERIALS AND METHODS

An online questionnaire consisting of 35 questions was developed to assess the level of teaching in implant teaching at an undergraduate level from the dental schools of the UK and Ireland. The online questionnaire was constructed using software developed by Bristol University (Bristol Online Surveys, Bristol, UK). Both 'open' and 'closed' styled questions were included. The questionnaire

**Table 1 Teaching formats used in undergraduate implant programme. (n = 15)**

Teaching format used	Number of schools	Percentage
Lecture programme	9	60%
Phantom head training	8	53%
Symposium	5	33%
Patient treatment	4	26%

**Table 2 Recommended textbooks for undergraduate implant programmes**

1. Palmer R. Clinical Guide Series. *A clinical guide to implants in dentistry*. BDJ Books, 2000.
2. Worthington P, Lang B R, LaVelle W E. *Osseointegration in dentistry: an introduction*. London: Quintessence Publishing Co Ltd, 1994.
3. Hobkirk J, Watson R M, Searson L. *Introducing dental implants*. Churchill Livingstone, 2003.
4. Zarb G A, Bolender C L, Eckert S, Jacob R et al. *Prosthodontic treatment for edentulous patients: complete dentures and implant supported prostheses*, 12<sup>th</sup> ed. Elsevier, 2003.
5. Swenson M G, Zarb G A. *Boucher's prosthodontic treatment for edentulous patients*, 11th ed. Mosby, 1997.
6. Meechan J G, Underell J M, Thomson P J, Greenwood M et al. *Minor oral surgery in dental practice*. London: Quintessence Publishing co Ltd, 2006.
7. Walsmley A D, Walsh T F, Burke F J T, Shortall A C C et al. *Restorative dentistry*, 2<sup>nd</sup> ed. Churchill Livingstone, 2007.

**Table 3 Available resources for providing an undergraduate implant programme (n = 13)**

Resource	Number of respondents (schools)	Percentage
Selected papers	8	61%
Video/DVD	7	54%
Blackboard available seminars	3	23%
Internet based programmes	2	14%
CAL programmes	2	14%
Other*	1	7%
None	3	23%

\*One school had a clinical set up for teaching groups of six students as well as comprehensive material.

was developed and pre-piloted within the Cardiff Dental School.

In July 2007, an email was sent to the restorative dentistry heads of departments in the 15 UK and Irish dental schools, providing them with the html link for the questionnaire. Topics included:

- Current level of teaching of dental implants at their institution
- Planned changes in this teaching during the subsequent 12-month period
- The respondent's perception of what dental implant training/education for undergraduates would be like at their institution in five years' time.

It is understood that the responses were completed by the restorative dentistry heads of department or by a senior

clinical academic with teaching responsibilities relating to implant dentistry.

The Bristol On-line Surveys software (Bristol University) program permitted collection and analysis of the data. Descriptive statistics are reported.

## RESULTS

Completed questionnaires were received from all 15 invited dental schools.

### Current teaching

Thirteen schools (87%) reported that they provide training in implant dentistry for their undergraduates.

Eight schools (53%) said that there were requirements within their curriculum for undergraduates to receive implant training. For those schools providing training most stated it occurred in the 4<sup>th</sup> and/or 5<sup>th</sup>

years, however, six schools also included this teaching in their 3<sup>rd</sup> year programme. Of the 13 schools that included implant dentistry training in their curricula, teaching was provided by both the restorative dentistry and oral and maxillofacial surgery departments in eight schools (61%), or solely provided by the restorative dentistry staff (n = 5 schools; 38%). When asked which mono-specialities of restorative dentistry were involved in the programme five schools stated it was provided from prosthodontics, four schools stated it was provided by prosthodontics and periodontology and one school stated it was provided by prosthodontics and operative dentistry. One school did not distinguish between mono-specialities, and stated it was run by a restorative-consultant lead programme. One school did not answer this question and one stated that as well as the prosthodontics department being involved they had a consultant in implantology.

Table 1 describes the mode of delivery of dental implant teaching to dental undergraduates. Eight teaching schools (53%) had a phantom head component to their course in conjunction with either a symposium or lecture programme. Four of the responding schools (27%) incorporated patient treatment into their teaching programme. There was also variation in the numbers of sessions devoted to implant teaching programmes:

- seven schools (47%) devoted between four and six teaching sessions
- three schools (20%) included between one and three sessions
- three schools (20%) had more than six teaching sessions
- two schools (13%) as already stated had no dedicated teaching.

Seven of the 15 schools (46%) students gained experience of treatment planning patients for implants. In seven schools (46%), students observed restoration of dental implants. In five schools (33%), students observed live implant surgery. Seventy-three percent of schools (n = 11) do not provide direct clinical experience of restoring dental implants for their undergraduates. The four schools providing this experience reported that they expected their students to provide restorative treatment for either one, or perhaps

**Table 4 Type of support received by implant companies for the provision of implant training for undergraduate implant teaching (n = 15)**

Type of support	Number of respondents (schools)	Percentage
Provision of simulated models for surgery and implant restoration	7	46%
Provision of implants	5	33%
Provision of restorative components	3	20%
Laboratory funding support	2	13%
Funding for clinical staff	1	7%

**Table 5 Implant companies principally involved in supporting undergraduate programmes**

Implant company	Number of respondents (schools) supported
Nobel Biocare	7
Straumann	4
Astra	2
Dentsply	2
3i Biomet	1

**Table 6 Views of respondents on possible changes within existing prosthodontics teaching programmes in response to the development of teaching programmes in implant dentistry**

Area of prosthodontics	Decrease as a result of implant programme	Stay the same	Increase as a result of implant programme
Removable prosthodontics	27%	66%	7%
Fixed conventional prosthodontics	27%	73%	0%
Resin retained bridgework	7%	93%	0%
Occlusion	0%	93%	7%

two cases. The types of such cases undertaken were either edentulous removable cases or single unit cases. Only one school allowed the placement of dental implants by their undergraduates and these were for either edentulous cases or for single missing unit cases. No schools, however, had any measures of competency, for restoring dental implants, within their undergraduate programmes.

Nine schools had recommended texts on dental implants as part of their undergraduate reading lists. These are listed in Table 2. Respondents were also asked to list what educational resources they had available to undergraduate students relating to dental implants and these are listed in Table 3.

Sixty percent of schools indicated that they received support from implant companies for the provision of implant training. Tables 4 and 5 details the level of support and companies involved.

Only 20% of dental schools had arrangements for patients to contribute to the cost of treatment.

### Future plans for dental implant undergraduate training – next 12 months

One of the two schools not currently teaching dental implants planned to introduce this teaching within the next 12 months. Four dental schools plan to introduce undergraduate experience in restoring dental implants within the next year. No other schools planned to introduce clinical experience of surgically placing implants.

### Current challenges to the provision of implant training at an undergraduate level

Each dental school was asked what challenges have there been to introducing/developing a teaching programme

in implant dentistry. The answers were varied, but commonly included:

- funding issues (11 schools)
- lack of available time within existing teaching curricula (seven schools)
- insufficient numbers of suitably trained staff available for teaching (five schools).

Schools were asked to identify what components of fixed or removable prosthodontics teaching programmes they felt would increase or decrease to accommodate the introduction and development of a teaching programme in implant dentistry. Responses are summarised in Table 6.

## Future predictions for implant undergraduate training – 5 years' time

When asked if schools thought there will be clinical requirements relating to implant placement/restoration for undergraduates in five years' time seven schools felt this would be the case, while the other eight felt it would not. Respondents were asked to anticipate the types of implant restorations they thought undergraduates would/should be involved in restoring in five years' time. Only one school reported that they thought no undergraduates would be involved in restoring implants in five years' time. Responses are summarised in Table 7. Only three schools thought undergraduates would/should be surgically placing implants in five years' time. One school thought they would/should be placing implants for edentulous fixed cases and single unit cases the other schools thought they should be involved in single unit cases, short span bridge work cases and edentulous removable cases. The other school thought they would/should be placing implants for edentulous removable cases and single unit cases. All schools were asked what components of fixed or removable prosthodontics teaching programmes would they anticipate changing within the next few years as a consequence of the development of a teaching programme in implant dentistry. The responses are outlined in Table 8.

## DISCUSSION

The challenge for contemporary dental educators is to produce, on graduation,

**Table 7 The type of implant restorations dental schools thought undergraduates will be/should be involved in restoring in five years' time**

Type of restoration	Number of respondents (schools)	Percentage
Implant overdenture with ball or stud attachment	12	80%
Single tooth anterior	8	53%
Implant overdenture with bar attachment	5	33%
Simple implant retained bridges	6	40%
Single tooth posterior	4	27%
None	1	7%

**Table 8 The components of fixed or removable prosthodontics teaching that respondents felt they may see increase or decrease to accommodate the introduction and development of a teaching programme in implant dentistry in five years' time expressed as a percentage**

Area of prosthodontics	Decrease as a result of implant programme	Stay the same	Increase as a result of implant programme
Removable Prosthodontics	40%	60%	0%
Fixed Conventional Prosthodontics	33%	67%	0%
Resin Retained Bridgework	13%	87%	0%
Occlusion	0%	80%	20%

a dentist who is 'fit to practise' in an independent setting. This has become a more difficult task in recent times, with a wider range of clinical dental skills and techniques to choose from, a more crowded undergraduate dental curriculum, often increasing numbers of dental undergraduate students, and decreasing numbers of clinical teaching staff. Educational guidelines, such as those of the UK GDC<sup>5</sup> and the Association for Dental Education in Europe,<sup>14</sup> recognise that the rehabilitation of partially dentate adults and the restoration of edentulous spaces is an important component of dental undergraduate training, and that the new dentist, on graduation should be skilled in this subject.

As well as stating in the GDC document *The first five years* that 'The student should understand the principles of implant therapy and see implants being maintained within healthy tissues' it also states that students should 'have knowledge of how missing teeth should be replaced, choosing between the alternatives of no replacements, bridges, dentures or implants' and 'be familiar with dental implants as an option in replacing missing teeth.'<sup>16</sup> Despite this only 46% of the responding schools enabled students

to gain experience of treatment planning for dental implants. It would seem that involving undergraduates in such clinical exercises would be necessary to facilitate gaining such knowledge as well as improving their familiarity with dental implants as an option in replacing missing teeth. The results of this study indicate that in some schools at least, educational practices are 'falling behind' what is recommended by the UK General Dental Council.

With the falling numbers of edentulous adults, and associated increase in the numbers of partially dentate adults,<sup>15</sup> it is clear that the restoration of edentulous spaces will become a more common part of the range of services offered by dental practitioners in years to come. Driven by their continued predictability and increasing popularity,<sup>1,2</sup> there will be increased pressures on dental practitioners to provide dental implants or to be involved in maintaining patients with dental implants. The same may be true for the management of the edentulous patient, as it has been established that the treatment of choice for the edentulous mandible is two implants and an overdenture.<sup>16</sup>

It is accepted that the clinical techniques used by dental practitioners



is shaped in the main, by their exposure to concepts and techniques while at dental school.<sup>17,18</sup> However, this survey has indicated that the teaching of dental implants in the UK and Ireland, while promising, is still quite limited. Consequently, it is perhaps a sobering thought to consider that the graduating dental class of 2008 may well continue to practise dentistry into the 2050s. This somewhat limited teaching, where it occurs, is mainly didactic/lecture-based, with some hands-on training in phantom head rooms. Direct clinical interaction with dental implants in a clinical setting occurs in only four schools. However, some dental students do see procedures being performed, and this is to be encouraged as it increases the understanding of the complexity of dental implant placement and restoration. It is heartening to note a multi-disciplinary approach to dental implant teaching in over 60% of respondent schools, with teaching being undertaken jointly between the restorative dentistry and oral surgery specialities; this practice has the potential to bring benefits to the students understanding of successful dental implant therapy.

The perceptions and plans of current dental educators for the next five years are revealing. All schools anticipate an increase in the amount and content of teaching of implant dentistry over the coming five years, however, there is much variation in the scope and content of this increase between the individual schools. Forty percent of schools anticipate a decrease in the teaching of removable prosthodontics to accommodate increased implant dentistry teaching over the next five years. Most schools regard the common challenges to improving/ increasing teaching of implant dentistry to include:

- lack of available time within existing teaching curricula
- funding issues
- insufficient numbers of suitably trained staff available for teaching.

These are commonly occurring problems in dental education, having been encountered and noted in previous surveys of teaching in, for example,

removable partial dentures.<sup>19</sup> Notwithstanding this, it is important that dental school curricula remain evidence-based and keep pace with current developments in clinical practice. It is not in the best interest of the new dentist if the clinical environment they experienced at dental school has lagged behind the new clinical settings that they enter on graduation.

Unfortunately, despite this survey identifying the improvement in dental implant education in UK and Ireland undergraduate programmes, the situation is still somewhat behind the level being provided in schools in the US and Canada. Whilst 27% of responding schools in the UK and Ireland stated undergraduates currently gained clinical experience of restoring dental implants, Petropoulos *et al.*,<sup>12</sup> found that 86% of responding schools (70% response rate) in the US and Canada received experience of restoring implants. One school in the current survey allowed students to surgically place implants whilst in the US and Canada 74% of responding schools provided clinical experience in surgical placement of implants.

Although 60% of responding schools stated that they received support from implant companies for their undergraduate programmes, eleven schools felt that funding issues were a challenge to providing undergraduate implant training.

Eighty-five percent of responding US and Canadian schools received free dental implant components from implant companies. In comparison, the UK and Ireland dental schools do not attain such levels of support. Only 33% of schools are provided with some implants and 20% are provided with restorative components. It is clearly necessary that those involved in dental implant education develop stronger relationships with dental implant companies to increase the level of funding thereby enabling improvements in future training to be achieved.

Collection of information on teaching trends, and reporting in this fashion, provides useful information for dental educators, such as defining a current local/national standard against which individual dental schools may compare

their own teaching programmes, and to encourage educators to 'press for change' in situations where the content of their own programmes is less than the current standards. Dental implants, and the teaching of dental implants, will be a rapidly evolving part of dental practice of the next few years. Importantly, improvement and development of dental implant teaching programmes should always occur in keeping with current best clinical evidence.

## CONCLUSION

While this study has revealed variation in the amounts of teaching of dental implants between individual dental schools, it appears that the overall amount of teaching has increased since the time of previous surveys. It would seem prudent for this theme of teaching to further increase in order to best prepare graduating students for independent clinical practice.

*The assistance of Mrs Clare Davies (Senior Computer Officer) in the development of our questionnaire and utilisation of the Bristol Online Survey software is gratefully appreciated. We thank our colleagues in the dental schools of the UK and Ireland who completed the questionnaire.*

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