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Introducing dental hygienists in general practice to research – an in-practice evaluation programme in the United Kingdom

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Abstract: *Aim:* To introduce dental hygienists (DHs) in the UK to the principles of research through a practice-based product evaluation programme. *Methods:* The programme consisted of an initial training and orientation day with presentations on evidence-based practice, research methods and the structure of research papers. The programme and its aims were explained in detail, and participants were briefed on the methods to be used. Participants then recruited seven to ten patients from their practices (offices), carried out a baseline assessment of: plaque, gingival health, calculus and staining at anterior teeth, and gave the patients a questionnaire asking about their teeth and then provided a 3-month supply of a test toothpaste. About 10 weeks later, a follow-up assessment of the same variables was performed and the questionnaire was repeated. A second training day followed during which the DHs provided feedback of their experiences and received training in literature searching and critical appraisal of literature including interpretation of results. *Results:* Sixty-five DHs attended the first training day; 31 were able to recruit sufficient patients and attend the second training day. The DHs recruited 168 patients who received baseline and follow-up assessments. All the variables improved overall. Feedback from the DHs was very positive, and patients expressed delight with the care they had received. *Conclusions:* Qualitative feedback for participating DHs suggests the programme met its aim and could be used in the future as a mechanism for helping DHs who want to increase their understanding of research methodology.

Key words: dental hygienist; in-practice research; product evaluation

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Introduction

The need for health care workers to be able to understand research methodology and to appraise critically the scientific literature on which their practice is based has been recognized (1). A recent investigation of the MEDLINE database using the search terms *dental hygienist and research* and *dental hygiene and research* yielded 808 and 924 papers, respectively (1). From this search, it was apparent that, with the exception of a number of countries including Australia, Canada, Sweden, the Netherlands and the United States, few dental hygienists (DHs) had been involved in published research, and when they had, it usually took place in or was organized by a dental school or other university department. Very few papers have reported research that had taken place in the 'real world' of dental offices/

general dental practices/dental cabinets, where the vast majority of oral care is delivered and where most DHs work.

Although schools of dental hygiene in many countries include training in critical appraisal of the scientific literature and some understanding of research methods in the curriculum (2), in the United Kingdom (UK), this has been a recent development. A recent national survey of DHs indicated that although 50% would like to be involved in research (3), judging by publications in peer reviewed journals by UK DHs, it appears that currently very few have any research skills. This view is further supported by the fact that at the 2010 International Dental Hygienist Symposium held in Glasgow, only 10 of the 170 abstracts submitted were authored by UK DHs (3).

The British Society of Dental Hygiene and Therapy (BSDHT) has recognized this deficiency and in combination with Oral-B/Procter & Gamble devised and ran the programme described in this paper as one initial step to address it.

Between September 2011 and January 2012, DHs in the UK took part in a programme that involved basic training that provided an appreciation of research methods and an in-practice product evaluation of a toothpaste,* which had been introduced to the UK market early in 2011. The programme was a collaboration between the BSDHT and *Oral-B*, which was entitled *Clinical Research Orientation. The Initial Steps*. All BSDHT members were given the opportunity to take part. This paper describes the programme and presents its major findings.

Aims

The aim of the programme reported in this paper was to introduce dental hygienists to the principles of research through a practice-based product evaluation programme. Within this overall aim, secondary aims were to develop DH's understanding of: the spectrum of clinical research, the implementation of research findings into the context of practice, how to consider new products critically, and how scientific evidence and clinical judgement function together.

Methods

DHs were recruited to the programme by means of a notice in the BSDHT journal – *Dental Health* (4) – and invitations from the toothpaste manufacturer's representatives when they visited dental practices. The programme consisted of three phases. They were:

Phase 1 – Initial training
Phase 2 – Data collection
Phase 3 – Follow-up with further training

Phase 1 – Initial training

This took place at a central location (Birmingham) on a Saturday in September 2011. The participants heard a series of presentations from experienced researchers and editors on evidence-based practice, research methods and the structure of research papers. The nature of the programme and its aims were explained in detail, and they were briefed on the methods that they were to use. The areas that were covered were:

- Techniques for selecting suitable patients and confirming their agreement to take part in the study.
- The patient assessment and data recording.
- Providing the toothpaste
- How to perform the follow-up assessment
- The mechanism for sending the data forms and questionnaires to the programme's co-ordinator.

They were then requested to recruit between seven and ten patients who were over 18 years of age and who would be visiting them for treatment and were willing to return for a review within eight to 12 weeks of their initial appointment. Only anterior teeth were assessed, that is 13–23 and 33–43. The reason for this was to focus upon easily visible areas recognizing the restriction of time within the existing practice circumstances.

The inclusion criteria for the patients were as follows: in good general health and not taking antibiotics or anti-inflammatory medication, a Basic Periodontal Examination (BPE)† score of 2 or 3, moderate to high levels of plaque with over 35% of tooth surfaces involved, and at least one of the following conditions: interdental bleeding, staining present at lower anterior teeth, supra-gingival calculus at lower anterior teeth, self-reported dentinal sensitivity and self-reported oral malodour.

At each patient's initial visit, the DHs explained the project and confirmed the patient's willingness to participate and return within the required time frame. As the programme included a product evaluation conducted in the form of a variation of a clinical audit and was not a research study, it was deemed unnecessary to obtain ethics approval. However, all patients were given full information verbally about the product evaluation to allow them to make an informed decision about whether or not to agree to take part in it. The DHs then completed an initial assessment of patients, which included details of the patient's age, gender, smoking status and all the features listed above as inclusion criteria. They then carried out a standard assessment of plaque, gingival health, calculus and staining all at anterior teeth (Figs 1 and 2). These four variables were recorded at the buccal and palatal/lingual surfaces (sites) of the 12 anterior teeth for plaque and gingival health and of the anterior sextants for calculus and staining. Thus per patient, there were 24 sites for plaque/gingival health and four sites for calculus/staining recorded. The DHs also collected a patient questionnaire, which the patients completed during this initial visit and provided each patient with product information about the toothpaste. The DHs were instructed to perform the clinical assessment 'in the same manner as you would normally do'. This approach was chosen to facilitate

*Oral-B Pro Expert, Oral-B, Procter & Gamble, The Heights, Weybridge, Surrey, KT13 0XP, UK.

†BPE scores 2 and 3 are the same as those for CPI (i.e. 2 = the presence of calculus or other plaque retention factors and 3 = pockets of between 3.5 and 5.5 mm) (5).

1 Plaque assessment

Record 1 score buccal and 1 palatal/lingual for each tooth using the key listed.

B						
	13	12	11	21	22	23
P						
L						
	43	42	41	31	32	33
B						

N = No plaque
G = Plaque along the gingival margin
E = Plaque extending beyond the gingival margin

2 Gingival Assessment:

Record 1 score buccal and 1 palatal/lingual for each tooth using the key listed.

B						
	13	12	11	21	22	23
P						
L						
	43	42	41	31	32	33
B						

H = Healthy gingiva
M = Moderate inflammation, swollen red
S = Severe inflammation, swollen red and bleeds easily

Fig. 1. Professional assessment for plaque and gingivitis.

3 Calculus assessment:

Record the score for calculus assessment for the 13–23 and 33–43 regions using the key listed.
Record 1 score buccal and 1 palatal/lingual for each region listed.

B	
	13–23
P	
L	
	43–33
B	

N = No calculus
G = Calculus along gingival margin
E = Calculus extending beyond the gingival margin

4 Stain assessment:

Record the score for stain assessment for the 13–23 and 33–43 regions using the key listed.
Record 1 score buccal and 1 palatal/lingual for each region listed.

B	
	13–23
P	
L	
	43–33
B	

N = No stain
G = Stain along gingival margin
E = Stain extending beyond the gingival margin

Fig. 2. Professional assessment for calculus and stain.

consistency of evaluation within clinicians. No other attempts were made to alter clinician habits or to facilitate consistency between clinicians.

The initial patient questionnaire consisted of six questions on the topics of: toothpaste currently used, frequency of tooth brushing, value placed on tooth brushing, satisfaction with current toothpaste, self-reported assessment using a visual analogue scale of levels of plaque, bleeding gums, stain build-up, calculus build-up, tooth sensitivity and bad breath, and rating of characteristics of current toothpaste. Participating DHs were asked to ensure that they did not influence the patients while the patients completed the patient questionnaire and ideally were not in the same room when this was carried out.

Although there was no opportunity to calibrate the participating DHs, the importance of consistency when performing the assessments was stressed. Clinicians were asked to adhere as closely as possible to their normal manner of assessment to maintain as much consistency as possible.

Phase 2 – Data collection

Between September and December 2011, the participating DHs recruited patients and performed an initial assessment as previously described. Patients were given three large tubes of toothpaste, and were asked to continue with their oral hygiene as previously, using their existing toothbrush and any other oral hygiene devices that they had been using. The patients were asked to return before 15 December for a follow-up assessment. Each patient's history was updated, and they were asked if they had used only the test toothpaste. During the patient assessment, plaque, gingival health, calculus and stain were assessed (Figs 1 and 2). The patient completed the same patient questionnaire form used at the initial appointment again with the DH ideally out of the room. All forms were then sent to the project coordinator and were analysed by an independent agency – Pauly Consult GMBH 61440 Oberursel –Weisskirchen, Germany.

Phase 3 – Follow-up and further training

In mid-January 2012, a follow-up day was held again at Birmingham. All DHs who had taken part in the programme were invited. During the follow-up day, they provided feedback on their experiences and self-perceived knowledge gain and worked in small groups with a facilitator who recorded the information. Six weeks before the follow-up day, they had been sent four papers to review and instructions on how to critically appraise scientific papers. During the afternoon, again working in small groups with a facilitator, they critically analysed two of the papers and discussed their findings in a plenary session. They also heard a presentation from a dental editor on how to search for scientific literature. The pooled information that they had collected was summarized and presented to them to illustrate the collective changes that had taken place in the patients who had attended both for a baseline and a follow-up assessment.

Results

The participating DHs

A total of 65 DHs attended the first training day and agreed to participate in the programme.

Of these, 31 returned data to the coordinator and attended the follow-up training day.

The participating DHs came from all parts of the UK. They all worked either full or part-time in a general dental practice. When questioned during the initial training day, very few DHs claimed to have had any previous experience of either product evaluation or research.

The patients

The number of patients recruited to the programme was 205, all of whom received an initial assessment and completed the initial patient questionnaire. Of these 168 (82%) patients were reassessed at a follow-up appointment.

The mean age of the 168 patients was 47.7 years, ranged 19 –82 years. They were predominantly female (65%). As for smoking, 127 (76%) answered no, 23 (14%) yes and 18 (11%) did not answer this question.

Points raised by DHs during debrief in January 2012

Participants made the following points during a verbal debrief and in written feedback:

> 'Patients responded very well and really felt that they were "special"'.
> 'Helped me look more critically at patients' mouths being more focused on changes'.
> 'Having a system with standardized forms made assessment easier'.
> 'If it is this much work to do a non-research in-practice evaluation, how much more complex is it to do clinical research?'
> 'Not enough time between initial training and deadline for submitting results to coordinator'.
> 'Now understand the need to evaluate literature and know how to critically appraise'.
> 'Made my day-to-day work much more interesting'.
> 'When can we be involved in "proper research"'.
> 'This "research-like project" has opened my eyes – I qualified in 1980 and now I am more aware how difficult it is to write a paper. I have more appreciation of the papers I will read in the future'.
> 'I will make my patients more aware of what toothpastes they are looking for, I now understand that some toothpastes can help with specific issues'.
> 'The programme elevated our status as hygienists as a profession and with our patients'.
> 'The programme motivated my patients to such an extent that one went and purchased an electric toothbrush purely as a result of being on the trial'.
> 'I value and appreciate the time and investment made by the programme supporters'.

During the first training day, while explaining the concepts behind the data collection forms and consistency in the way they were to be completed, much discussion arose with many ideas emerging on how the forms might have been formatted and the best way to complete the assessments. At the end of this session, the comment was made "if it is so difficult to get all of us to agree, how difficult is it for clinicians to follow a set protocol in a study, especially if there is more than one centre"?

Results from the patient questionnaire

The answers from the 168 patients, who also attended the follow-up visit, to the questions in the patient questionnaire at first appointment are reported in Table 1.

At baseline, plaque was recorded at 2340 sites, gingival inflammation at 2238 sites, stain at 398 sites and calculus at 335 sites.

Toothpaste used

With regard to toothpaste used, at the first visit of the 168 patients, 112 (66%) reported using Colgate, 17 (10%) Sensodyne, 16 (9%) Aquafresh, 5 (3%) Macleans and 18 (12%) other toothpaste of whom 2 (1%) reported using Oral-B.

Table 1. **Initial baseline assessment**

Variable	
Moderate to high plaque levels (>5% teeth)	102 (50%)
Interdental bleeding	108 (53%)
Stain present	107 (52%)
Calculus present	125 (61%)
Self-reported dentinal hypersensitivity	41 (20%)
Self-reported oral malodour	16 (8%)

At the follow-up visit, 156 (93%) of the 168 patients who attended reported that they had used only the toothpaste provided since their first visit, 8 (5%) said they had not used only the toothpaste provided and 4 (2%) did not answer this question.

Tooth-brushing frequency

Self-reported tooth-brushing frequency of the patients at the initial and follow-up appointments is at Table 2

Overall changes in plaque levels, gingival inflammation, presence of calculus and presence of stain

The overall changes in plaque scores, gingival inflammation, presence of calculus and presence of stain, in terms of sites are reported the Figs 3–6. There was improvement at 77% of sites for plaque levels, 75% of sites for gingival inflammation, 77% for calculus and 79% for stain. Self-reported improvements were also noted for sensitivity (60%) and breath odour (58%).

Discussion

It must be stressed that the programme reported in this paper was not research, but an introductory educational programme that aimed to give DHs an understanding of the main processes involved in research and an introduction to skills such as critical appraisal of research papers and literature searching. The qualitative feedback and comments from the DHs were therefore deemed to be of particular importance in evaluating the programme.

The quantitative data were collected by uncalibrated DHs and were purely used to describe trends to the DHs during the second day's training. There was no intention of statistically analysing the data based on the nature of the study. As previously stated, the aim of the programme was to introduce DHs with no previous experience to the general principles of research and not to perform a research study or clinical trial.

The patients who were recruited did not receive any additional treatment, over and above that which they would have normally received. The programme was a practice-based evaluation in which calibration was not performed and the product was, at the time, new to the United Kingdom and previously unknown to both the DHs and the patients. An earlier practice-based toothpaste evaluation performed in the USA (6) drew attention to the role of such a programme in complementing laboratory and clinical research. It should be remembered that there may be a doubt about the validity of self-reported patient data as patients may give answers that they think will please the clinicians involved rather than what they really think. However, to minimize this possible tendency, the DHs were asked to ensure that they were not in the room when the patients completed their questionnaires. There is of course no way of knowing if this happened in all cases and, if it did, the extent to which it biased the patient's answers. A further factor to consider is that there was a limited time period for the DHs to recruit patients and complete both a baseline and a review assessment. Indeed, many reported that it was difficult or impossible to do so. This appeared to be the main reason why only 31 of the original 65 DHs returned data and attended follow-up training. For future research, a longer programme time should allow DHs to complete both baseline assessments and follow-ups.

In view of these limitations, the numerical results should be interpreted with great caution as they have not been derived from a structured research study. They can only be discussed in general terms. However, it can be seen that between the baseline assessment and the follow-up 10 weeks later, sites where there had been plaque, gingival inflammation, calculus and stain were improved: 77% of sites for plaque, 75% of sites

Table 2. **Self-reported tooth-brushing frequency**

Frequency	Baseline	Follow-up
<1× per day	3 (1%)	1 (1%)
1× per day	13 (8%)	7 (4%)
2× per day	128 (77%)	133 (80%)
3× per day	19 (11%)	19 (11%)
>3× per day	3 (2%)	3 (2%)
No answer	2	5 (3%)
Total	168	168

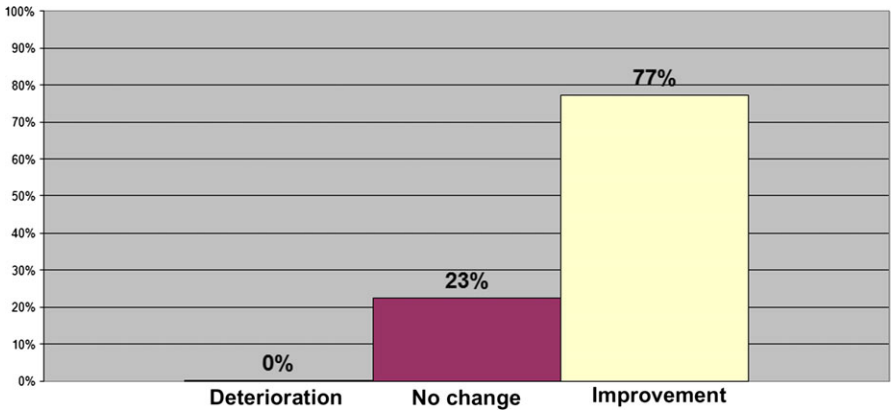

Fig. 3. Overall changes in plaque scores at sites where plaque was present at baseline.

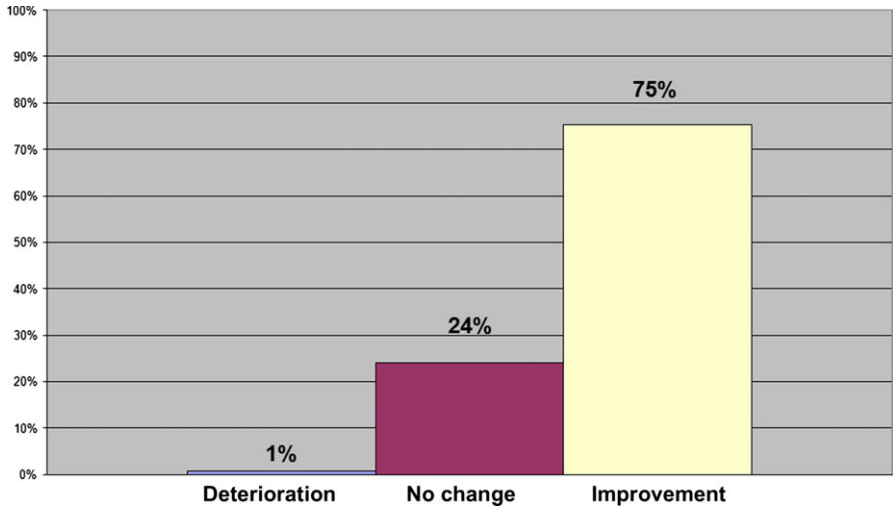

Fig. 4. Overall changes in gingival inflammation at sites where gingival inflammation was present at baseline.

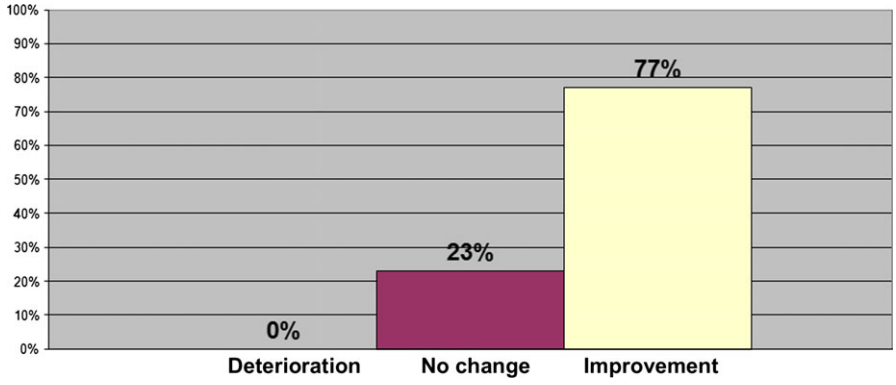

Fig. 5. Overall changes in presence of calculus at sites where calculus was present at baseline.

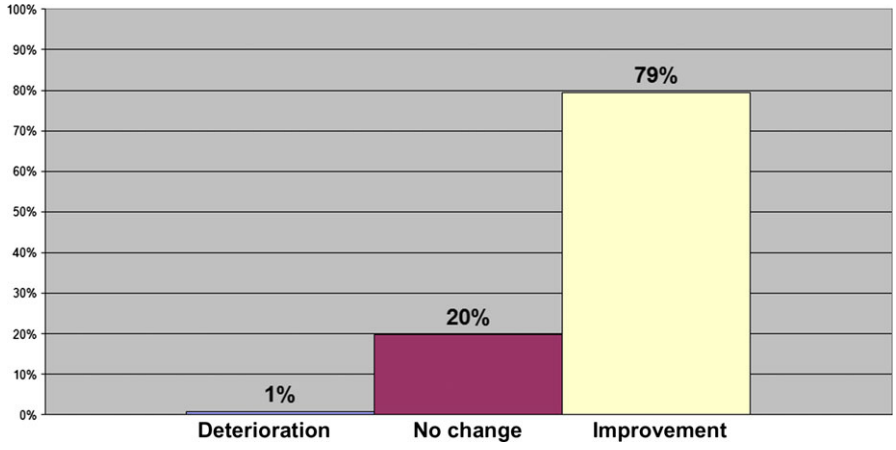

Fig. 6. Overall changes in presence of stain at sites where stain was present at baseline.

for gingival inflammation, 77% of sites for calculus and 79% of sites for presence of stain. While the DHs did not record whether or not a prophylaxis was conducted at the initial visit, it is surmised that patients showing a reduction in calculus received a prophylaxis and had little calculus build-up. As most patients generally clean their anterior teeth more effectively than their posterior teeth, it is therefore plausible that the clinical parameters would have been worst around the posterior teeth and that many of the patients had poor oral hygiene.

It was gratifying to see that 93% of the patients who attended for both visits reported that they had used the test toothpaste throughout the period between the first and second visits. While it is possible, patients improved their oral hygiene, thereby influencing their oral health condition, due to their participation in the program, the clinical benefits of the

toothpaste used in the programme have been demonstrated in numerous randomized, controlled clinical trials (6).

Lessons learned and recommendations for the future

The feedback from the DHs, who attended both training days and who returned data for their patients, was very positive. Their enthusiasm and will to learn was most noticeable at both training days. Apart from gaining an insight into research methodology and product testing, they also found that they enjoyed their work more and many commented how the patients who were recruited to the evaluation really appreciated the extra time that was given to them and felt 'special'. This finding has previously been reported for practice and hospital-based research and can be seen to be a practice builder and to enhance patient care (7–9).

The programme has led to the establishment of a cohort of enthusiastic DHs who could be asked to take part in future in-practice product evaluations. It is to be hoped that the DHs concerned will be given a chance to develop their interest in research further. The National Institute for Health Research's Clinical Academic Training Pathways Internships (10) offers an opportunity to Allied Health Professionals (including DHs) who work for the NHS to undertake research training.

Conclusions

The qualitative feedback for the participating DHs suggests the programme met its primary and secondary aims. This type of programme could be used in the future as a mechanism for helping DH's acquire skills in research methodology and to form a cohort of DH's, which could take part in future product evaluations.

Clinical relevance

The clinical relevance of the DH training and product evaluation reported in this paper is that it provides an example of how DHs with no previous research experience can be introduced to the basic concepts of research while working in their usual clinic (office). It also demonstrates how the oral health care industry can collaborate with a national DH association to improve the skills and knowledge of DHs and engage DHs in understanding research at their place of work.

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Conflict of interests

Kenneth Eaton and Jeanie Suvan were commissioned by Oral-B to advise, plan and oversee the programme. Saurabh Saraf and Anja Rist are employees of Oral-B/Procter & Gamble UK.

Author Contributions

Kenneth Eaton trained the DHs who took part in the programme, advised and wrote this paper. Jeanie Suvan designed the programme, advised and trained the DHs who took part, reviewed and revised the paper. Saurabh Saraf and Anja Rist supervised the administrative aspects of the study, and reviewed and revised the paper.

References

1 Harris M, Eaton KA. Discussion paper: dental hygienists and research: a developing scene. *Oral Health Dent Manag* 2011; **10**: 219–224.
2 Luciak-Donsberger C, Eaton KA. Dental Hygienists in Europe: trends towards harmonization of education and practice since 2003. *Int J Dent Hygiene* 2009; **7**: 273–284.
3 Eaton KA, Harris M, Ross MK, Arevalo C. A survey of dental hygienists in the United Kingdom in 2011 – Part 5. critical appraisal, research and continuing professional education. *Ann Clin J Dent Health* 2012; **2**: 16–20.
4 Lewis H. Editorial. *Dent Health* 2010; **49**: 4.
5 British Society of Periodontology. *Basic Periodontal Examination (BPE)*, 2011. Available at: www.bsperio.org.uk (accessed 10 September 2012).
6 Sensabaugh C, Sagel ME. Stannous fluoride dentifrice with sodium hexametaphosphate: review of laboratory, clinical and practice-based data. *J Dent Hygiene* 2009; **83**: 1–9.
7 Braunholtz DA, Edwards SF, Lilford RJ. Are randomised controlled trials good for us in the short-term? Evidence for a trial effect. *J Clin Epidemiol* 2001; **54**: 217–224.
8 Majumdar SR, Roe MT, Peterson ED, Chen AY, Gibler WS, Armstrong PW. Better outcomes for patients treated at hospitals that participate in clinical trials. *Arch Intern Med* 2008; **168**: 657–662.
9 NHS Confederation for London. *Being a Good Research Partner: The Virtues and Rewards*. London: NHS Confederation; 2010. Available at: http://www.nhsconfed.org.Publications/Documents/HSRN_briefing_270.pdf (accessed 13 April 2012).
10 National Institute for Health Research. *NIHR/CNO Clinical Academic Training Pathways for Nurses, Midwives and Allied Health Professionals*. Available at: www.nihr. ac.uk/faculty/Pages/research_training_programmes.aspx. (accessed 10 September 2012).