Discussion Paper. Dental Hygienists and Dental Research: A Developing Scene

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Abstract

The aim of this discussion paper is to appraise readers of the development of the profession of dental hygienist around the world and to detail the growing contribution of dental hygienists to research. It explains the rationale for educating and employing dental hygienists and details their numbers in Europe, Japan, North America and South Korea. It goes on to describe the trend to more academic education for dental hygienists in many countries due in part to the need for all dental hygienists to understand research methodology and to be able to appraise critically the research on which their practice is based. It then analyses the 40 "best" abstracts submitted to the International Symposium on Dental Hygiene in 2010. It discusses the reasons why dental hygienists are not employed in some countries. It concludes that:

- Growing numbers of dental hygienists are being employed in a growing number of countries around the world.
- Their education is increasingly leads to a Bachelor's degree.
- The importance of an understanding of research methodology and the acquisition of critical appraisal skills during dental hygiene training has been recognised by many schools of dental hygiene.
- A number of dental hygienists are performing research, often in areas related to general as well as oral health, and are publishing in international peer-reviewed journals.

Key Words: Dental Hygienists, Practice, Education, Research

Introduction

This paper discusses the education, employment and involvement in research of dental hygienists and aims to appraise the reader of developments in these areas. However, at the outset it must be recognised that the education and employment of dental hygienists is by no means universal. Before considering their growing involvement in research, it is therefore worthwhile to consider the rationale for their existence. This is based on a number of factors, including cost-effectiveness, improving access to oral care for the population and quality of care for patients.

General considerations

One way of making health care available to more patients is to delegate tasks to suitably educated groups of health-care workers. This concept has been widely accepted in medicine where, for many years, doctors have delegated tasks to a very wide range of other professionals, such as nurses, radiographers, physiotherapists, and dietitians. In the mid-1970s, it was suggested by the World Health Organization (WHO) that oral health should follow the medical example to a far greater extent than before [1,2].

In common with nurses, physiotherapists and other health-care professionals, dental hygienists undergo shorter training than doctors or dentists. However, if it is well delivered and assessed, the training of dental hygienists should be at least as thorough as that of dentists and to a higher level in a limited number of areas. Furthermore, because dental hygienists are trained to perform only a limited range of oral health care, in many countries, when they graduate they have far more experience in these aspects of oral care than graduating dentists. Thus, the shorter training period and limited range of practice skills cost far less than for dentists and should result in clinicians with excellent skills in a limited number of areas.

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The quality of care provided by any clinician, including dentists and dental hygienists, depends on the quality of education and training that they have received and continue to receive throughout their working lives and their resulting knowledge, skills and attitudes. In order to maintain standards, these three outcomes should be assessed and monitored independently and not by those who have provided the education and training. When this occurs, the quality of patient care can be maintained at a high level.

Dental hygienists worldwide

In many countries, delegation of tasks to dental technicians and dental nurses (chair-side assistants) has been an established way of working for many years. However, it was not true to the same extent for dental hygienists and dental therapists, even though the first dental hygienists were trained over 100 years ago, at the Eastman Dental Clinic in Rochester, New York (state) USA By 2004, there were over 120,000 dental hygienists working in the USA and over 150,000 dentists [3], a ratio of almost one dental hygienist to one dentist. For many years, there has been a similar ratio in Canada, Japan and South Korea [4]. In Europe, the first training school for dental hygienists opened in 1924 in Norway. However, very few were trained until after 1945. Since then, over 20 European countries have opened dental hygienist training schools [5]. Nevertheless, there are still far fewer dental hygienists than dentists in Europe than in North America, Japan and South Korea [4]. By 2007, in the 30 member states of the European Union and Economic Area (EU/EEA) plus Switzerland, there were 30,963 registered dental hygienists and 342,922 active dentists who served a population of 500 million [6]. Only five EU/EEA member states (Belgium, Bulgaria, France, Greece and Luxembourg) reported that they had no registered dental hygienists [6]. However, nine reported that they had fewer than 200 and the only member state with a ratio of dental hygienists:dentists greater than 1:2 was Sweden with 4,526 dental hygienists and 7,541 dentists for a national population of just over 9 million [6]. With the exception of a number of English-speaking countries, such as Australia, Malaysia and New Zealand, and outside North America, Japan, South Korea and Europe, there are very few dental hygienists. For example in 2004, in the five largest countries with emerging economies (Brazil, China, India, Indonesia and the Russian Federation) there were only 21,600 dental hygienists working with 393,000 dentists to care for over 3 billion people [7].

Education and research

For many years in the USA and Canada, it has been accepted that dental hygienists who wish to follow a career as a teacher in schools of dental hygiene will normally undertake a Master's degree. Those who aspire to become a director or head of school usually undertake a doctorate. In these countries, it has also been possible to undertake research over a prolonged period of time and, for some, to be appointed as full professors. It should be remembered that for dental hygienists appointed as full professors, the academic requirements are as stringent as for those appointed in other subjects. This more academic approach in the USA was reflected in the results of a survey published in 2002, which found that 60% of programmes for a Bachelor's degree in dental hygiene included a course on research [8].

Elsewhere in the world, with some notable exceptions, including Canada, the Netherlands, Sweden, and more recently Australia, in general, it has been rare to find Faculty (staff) members of schools of dental hygiene with a Master's degree and research experience. This situation is changing and by 2007, schools of dental hygiene in 13 EU/EEA member states ran Bachelor's degree programmes in dental hygiene. Of these 13, three had introduced or were about to introduce a Master's degree programme [5]. The rationale for this increasing emphasis on a more academic education for dental hygienists and the acquisition of research skills during training is to enable dental hygienists to be able to review critically the research evidence on which their practice is based. It is therefore apparent that there is a need for Faculty members to understand research methodology and critical appraisal of research and educate their students accordingly. This concept has been totally accepted in the Netherlands, where since 2000, the four-year educational programme for oral therapists (dental hygienists with extended skills) has included substantial training in both critical appraisal and the requirement to undertake a small research project during training [9]. It is interesting to note that in the Netherlands, when the four-year programme for oral therapists was introduced, the educational programme for dentists was extended to six years and the numbers of entrants to each programme set at

300 per year [9]. The rationale for this concept is that there will be fewer but better trained dentists and equal numbers of oral therapists to meet the future oral health needs of the Dutch population.

How many hygienists are involved in research?

The question arises how many dental hygienists are actively involved in research? A simplistic approach to this question was to interrogate the MEDLINE/PubMed database using the search terms "dental hygienist and research" and "dental hygiene and research". This revealed 808 papers for the search terms "dental hygienists and research" and 924 for the search terms "dental hygiene and research". This approach revealed that a substantial amount of research on these topics had been published in peer-reviewed journals that met the quality criteria for inclusion in the MEDLINE/PubMed database. However, it did not indicate whether or not the work reported in the papers concerned had been performed by dental hygienists. This suggests that it is very difficult to determine exactly how many dental hygienists are currently involved in research.

The authors of this paper have met several dental hygienists who have presented research findings at international meetings such as that of the International Association of Dental Research (IADR). However, it is far from clear how many of these research presentations, either oral or by poster, ultimately result in publications in peer-reviewed literature that are listed on quality-assured databases such as MEDLINE/PubMed. The 2010 International Symposium of Dental Hygiene (ISDH) enabled some insights into this issue to be gained. The ISDH takes place every three years and is attended by dental hygienists from around the world.

Some recent research by dental hygienists

Over 170 abstracts, requesting either oral or poster presentations, were submitted to this ISDH meeting, of which 146 were accepted and presented. The reviewers from the meeting's scientific committee graded each abstract and selected the best 20 for oral presentation. The next 20 were graded as "top 20" posters and were presented in the same room as that used for the oral presentations. Thirty-nine of the oral and "top 20" poster abstracts were presented by dental hygienists and reported work that they had performed. Thirty-four of these 40 abstracts reported research. The other six reported methodologies. The oral presenters came from the following countries:

Austria	1
Australia	2
Canada	6*
Netherlands	1
New Zealand	1
Sweden	2
USA	7

** 1 was not a dental hygienist*

The presenters of the "top 20" posters came from:

Australia	1
Canada	3
Denmark	1
Japan	1
Netherlands	2
Sweden	8
UK	2
USA	2

By November 2011, papers from ten of the abstracts presented orally had been published in journals listed on MEDLINE/PubMed *(Table 1)* as well as seven of the "top 20" poster abstracts *(Table 2).* Unsurprisingly, seven of these papers were published in journals specifically for dental hygienists (the *International Journal of Dental Hygiene* or the *Journal of Dental Hygiene).* However, others appeared in journals specific to the research topic such as the *Journal of Periodontology, Caries Research* and the *Journal of Child Sex Abuse.* The research topics they reported were from a wide range of areas and frequently related to the interaction of oral health with general health.

Discussion

The beginning of the introduction to this paper suggested that there were good reasons for employing dental hygienists in terms of cost-effectiveness, improving access to oral care for the population and quality of care for patients. To some extent this has been recognised within the EU/EEA Nevertheless, although between 2000 and 2007 there was a 42% increase in the number of registered dental hygienists in the EU/EEA (as opposed to a 13% rise in the number of active dentists) [6], a number of EU/EEA member states employ very few or no dental hygienists [6]. The tendency is that

Table 1. *Oral presentations at ISDH 2010 from which papers listed on Pubmed/Medline have been published*

Name of first author	**Country**	**Title**	**Journal**
Mackie S	Canada	Dental hygienist prescribers in Alberta	J Dent Hyg [10]
Widström E (Luciak-Donsberger C)	Austria	Changes in dentist and dental hygienist numbers in the European Union and Economic Area	Int J Dental Hyg [11]
Knevel RJ	Netherlands	Training rural women to improve access to oral health awareness programmes in remote villages in Nepal	Int J Dent Hyg [12]
Prendergast V (Kleiman C)	USA	Oral health, ventilator-associated pneumonia, and intracranial pressure in intibated patients in a neuroscience intensive care unit	Am J Crit Care [13]
Hopcraft MS (Satur J)	Australia	Utilizing dental hygienists to undertake dental examination and referral in residential aged care facilities	Comm Dent Oral Epidemiol [14]
Hovey A (Schachter CL)	Canada	Practical ways psychotherapy can support physical healthcare experiences for male survivors of childhood sexual abuse	J.Child Sex Abuse [15]
Stensson M	Sweden	Oral health in young adults with log-term controlled asthma	Acta Odont Scand [16]
Cobban SJ	Canada	Dental hygienists' research utilization: influence of context and attitudes	Int J Dent Hyg [17]
Slot DE	Netherlands	The effect of chlorhexidine varnish on root caries: a systematic review	Caries Res [18]
Andersson P	Sweden	The invisible work with tobacco cessation - strategies among dental hygienists	Int J Dent Hyg [19]

Name in brackets is the name of the dental hygienist who presented at ISDH 2010

there are few or no dental hygienists in EU/EEA member states in which there is little Government involvement in, or public finance for, oral health care or where opposition from dental associations or chambers to the employment of dental hygienists is strong. This is surprising because in the USA, where there is very little public funding for oral health care and a strong dental association, both dentists and patients have, for many years, recognised the benefits of employing dental hygienists, both in terms of the quality of care provided and the financial benefits to dentists. Indeed, as long ago as 1984, these benefits were summarised as follows: *Dentists' financial interests are best served by delegating dental hygiene preventive services to the maximum extent possible to licensed hygienists* [26].

It appears that one of the reasons for dentists' fear of employing dental hygienists often arises from a lack of understanding of exactly what tasks they can perform [27,28]. Another can be under- or un-employment of dentists.

The need for all health-care workers to understand research methodology and to be able to appraise critically the research evidence upon which their practice is based was stressed earlier on in this paper. The trend for schools of dental hygiene to offer Bachelor's degrees and, in some cases, Master's degrees reflects that there is a growing understanding of this need. However, in some countries this has not happened yet. Although it can be argued that the sample of 39 dental hygienists who authored the 40 "best" abstracts presented at ISDH 2010 were not necessarily repre-

Table 2. *Papers from the top 20 posters at ISDH 2010 which have been published*

Name of first author	Country	Title	Journal
Lindmark U	Sweden	Sense of coherence and its relationship with oral-related behaviour and knowledge of and attitudes towards oral health	Comm Dent Oral Epidemiol [20]
Einarson S	Sweden	Oral halth impact on quality of life in an adult Swedish population	Acta Odontol Scand [21]
Simmer-Beck M (Gadbury-Amyot CC)	USA	Extending oral health care service to underserved children through a school-based collaboration: part1: a decriptive overview	J Dent Hyg [22]
Jacobsson B	Sweden	Oral health in young individuals with foreign and Swedish backgrounds _ a ten-year perspective	Eur Arch Paediatr Dent [23]
Parker EJ (Steffens MA)	Australia	Self-reported oral health of metropolitan homeless population in Australia: comparisons with population- level data	Aust Dent J [24]
Pau A (Murray S)	United Kingdom	Dental hygienists' self-reported performance of tobacco cessation activities	Oral Health Prev Dent [25]
Van Leeuwne MP	Netherlands	Essential oils compared to chlorohexidine with respect to plaque and parameters of gingival inflammation: a systematic review	J Periodontal [26]

Name in brackets is the name of the dental hygienist who presented at ISDH 2010

sentative of research active dental hygienists from around the world, it was noticeable that two-thirds (26 of the 39) came from Canada, Sweden, or the USA, the three countries with well-developed academic training for dental hygienists and with numbers of dental hygienists with research doctorates.

By November 2011, 17 papers based on the content of the abstracts presented at ISDH 2010 had been published in peer-reviewed journals and included in MEDLINE/PubMed. However, in seven of these 17 publications, the dental hygienist who presented at the ISDH 2010 meeting was not the first author. This may or may not be significant. It is entirely possible that papers arising from presentations at the ISDH 2010 meeting were published in peer-reviewed international journals not listed by MEDLINE/PubMed. However, 44% (17 out of 39) may be seen as an encouraging percentage. It would be interesting to discover the percentage of abstracts that result in the publication of peer-reviewed MEDLINE/PubMed listed papers after the annual IADR and American Association of Dental Research (AADR) meetings.

Conclusions

It can be concluded that:

- Growing numbers of dental hygienists are being employed in a growing number of countries around the world.
- Their education is increasingly leads to a Bachelor's degree.
- The importance of an understanding of research methodology and the acquisition of critical appraisal skills during dental hygiene training has been recognised by many schools of dental hygiene.
- A number of dental hygienists are performing research, often in areas related to general as well as oral health, and are publishing in international peer-reviewed journals

Contributions of each author

- MH planned and co-authored the paper.
- KAE co-authored the paper and analysed the outcomes arising from the 40 abstracts from the ISDH 2010.

Statement of conflict of interests

Marina Harris is a teacher at a school for dental hygienists and therapists and co-organiser of the ISDH 2010.

Kenneth A. Eaton has been the director of a school of dental hygiene and was the adviser to the scientific programme of ISDH 2010.

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