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Research utilization among dental hygienists in Sweden – a national survey

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Abstract: Over the last decade evidence-based practice has become increasingly important in health care as an approach to improve patient outcomes. It is vital that dental hygienists, like other health professionals, use research findings to inform clinical practice. The objective of the present study was to investigate the extent of research utilization among dental hygienists in Sweden and to investigate the relationship between level of education and factors related to research utilization. A random sample of 261 dental hygienists in Sweden, 113 with 1 year and 148 with 2-year education, responded to a postal questionnaire covering various aspects of research utilization, i.e. their attitudes towards research, availability and support for the implementation of research findings, use of research in daily practice, their activity in seeking new research findings and their participation in a range of research-related activities. Dental hygienists with 2-year education had a more positive attitude towards research, used research to a greater extent and were more active in seeking new research findings than dental hygienists with 1-year education. Overall, relatively few dental hygienists reported that they implemented research findings in practice; the most frequently reported activity concerned reading research articles in professional journals. The conclusions are that the length of dental hygiene education is a key factor influencing the application of research findings to practice. One-year education appears to be inadequate to achieve evidence-based practice. Moreover, not even two years of formal education guarantees necessary competence in research for evidence-based dental hygiene practice.

Key words: dental hygienists; evidence-based practice; research utilization

Introduction

Over the last decade evidence-based practice has become increasingly significant in their approach to health care to improve patient outcomes. In Sweden, dental hygienists (DHs) are licensed healthcare professionals and are required to base practice on scientific evidence and approved clinical experience. This implies that DHs need to actively utilize research findings, which require the competence to search for scientific evidence, critically appraise that evidence and implement appropriate findings in clinical practice (1–7). The concept of research utilization is viewed as a sub-element of evidence-based practice, which addresses more than just the use of research. Research utilization has several definitions and is suggested to involve: (i) instrumental research utilization as the concrete (direct) application of research, (ii) conceptual research utilization as a more cognitive application of research, and (iii) symbolic research utilization for influencing policies and overall decision making (8). In this paper research utilization is not only viewed as a conceptual, but also an instrumental approach by which specific research-based knowledge is put into practice.

Factors influencing patient outcomes in health care include the professionals' educational level, organizational factors, leadership, quality improvement strategies, professional–patient relationships and staff well-being (9–13). Most of these factors probably influence research utilization as well. In nursing, several individual characteristics have been identified to predict research use: attitudes and beliefs, involvement in research activities, information seeking, professional characteristics and educational level (14). In addition, organizational factors are increasingly discussed as critical for research uptake, such as facilitation support, leadership and availability of resources (2, 7, 15, 16). Obviously, whether research findings are applied to practice is an issue that involves both individual and organizational factors.

Although positive attitudes towards research appear to be common among nurses and linked to research use, some authors claim that positive attitudes are a necessary but not sufficient prerequisite for implementing research (17–21). Reading about research in professional journals has been a commonly reported research-related activity among nurses, while participation in research projects occurs more infrequently (17, 18, 20, 22). Several studies among nurses point to research implementation as an issue bordered with many obstacles and is not easily accomplished (19, 22, 23). However, Humphris *et al.* (18) and Veeramah (21) reported that as many as 67–70% of nursing and midwifery graduates frequently used research findings to inform practice, while Pettengill *et al.* (22) reported 40% and Wallin *et al.* (20) found that 28% of registered nurses in a national sample in Sweden stated that they implemented research findings in clinical practice. Using the Research Utilization Questionnaire (24) several investigators in nursing have calculated a Research Utilization index (based on multi-item scorings on a 1–5 point Likert scale with 5 equalling a high level of research use). Champion and Leach (24) reported an index value of 3.48, Hatcher and Tranmer (25) 3.42, Tranmer *et al.* (26) 2.98–3.46, and finally Wallin *et al.* (20) 3.06–3.33. These findings indicate a moderate commitment to using research in nursing practice.

Level of education appears to be an important predictor of research utilization (7, 17, 18, 24). Chichester *et al.* (27) demonstrated that baccalaureate dental hygiene programmes include a greater amount of evidence-based dental hygiene compared with non-baccalaureate programmes. Baccalaureate students experienced basic research training, learned how to use the library and databases, and encouraged to critically appraise research articles. These may be useful skills for clinical practice, indicated by Veeramahs' (21) finding of a correlation between research knowledge and research utilization among nurses and midwives. In another study, Finley-Zarse *et al.* (28) compared DH educators and DH practitioners on activities for seeking new research findings. Overall, length of education, rather than length of employment predicted literature searching. DH educators used more and a wider variety of research sources, including the Internet, databases and online discussion groups. However, in both groups the most frequently reported sources of information were traditional methods, such as discussions with colleagues, journal reading and continuing education. A similar pattern of knowledge transfer is documented in nursing studies (7, 20).

Dental hygienists training started in 1968 in Sweden as a 1-year programme. However, dental assistant training was required as a prerequisite for entry into dental hygiene programme. In 1977, the programme was categorized as an academic programme, but remained 1 year in duration. In 1991, the training was extended to a 2-year programme and admission was opened for high school graduates. Many educational institutions also started continuing education courses in the major 'oral health science' for DHs with 1-year training. Today it is possible for DHs to earn a baccalaureate and master in oral health science or doctoral degree in medicine, dental or caring sciences at several Swedish universities (29–31). Swedish DH can practice in public dentistry (65% of DHs), private dental offices (35% of DHs), as employees, or independent practitioners (Swedish dental hygienist association member register 2004).

To improve practice and patient outcomes, it is important that DHs, like other health professionals, use research findings in clinical practice (2, 4, 5, 27). Compared with medicine, den-

tistry has less experience of strategies for evidence-based practice (6). Unfortunately, research uptake is an issue, which earlier has been paid very little attention within dental hygiene and dentistry (23). However, lately evidence-based research is gaining interest within dental hygiene (4, 5). To generate more knowledge this is a field of research that needs to be developed in dental hygiene. In the current study the objective was to explore the extent of research utilization among dental hygienists in Sweden and to investigate the relationship between training level and specific factors related to research utilization.

Material and Method

Design

The study was designed as a comparative cross-sectional survey.

Subjects

A computerized random sample of 440 members from the Swedish Dental Hygienists' Association (SDHA) was invited to participate in the study. The SDHA database includes 95% of DHs in Sweden. The response rate was 298 (68%), of which 269 (61%) were currently working as DHs. The respondents were allocated to two groups based on length of education: (i) 1-year basic education extended over 60 European Credit Transfer System (ECTS) comparable with 40 weeks full time studies (1-YE) ($n = 113$, 43%) and (ii) 2-year basic education (120 ECTS) or 1-year basic education and in addition at least 30 ECTS in Oral Health Science (2-YE) ($n = 148$, 57%). Eight respondents did not report basic education and were excluded from further analysis. Among the respondents were four men (1%), reflecting the proportion of male DHs in Sweden. A difference in mean age was observed between the groups. DHs with 1-YE were older (49.0 ± 6.9) than DHs with a 2-YE (36.8 ± 9.4) ($t = 11.6$; d.f. = 258; $P < .0001$). The former had also worked longer as DHs (17.0 ± 4.8) than the latter (5.8 ± 5.9) ($t = 16.4$; d.f. = 259; $P < .0001$). Sixty-five per cent ($n = 169$) of respondents worked in public dentistry, while 31% ($n = 80$) worked in private dentistry. Four per cent ($n = 10$) had combined positions in public and private dentistry, and two respondents did not report their work setting. These 12 individuals were excluded from analyses on work setting. Seventy-three per cent of DHs with 2-YE worked in public dentistry compared with 61% of DHs with a 1-YE ($\chi^2 = 4.0$; d.f. = 1; $P = .046$).

Instrument

The Research Utilization Questionnaire (RUQ), used in nursing (8) covering various aspects of research utilization was employed. The questionnaire was compiled by Humphris *et al.* (18), who in turn based it on the work of Champion and Leach (24) and Pettengill (22). Respondents were asked to:

1 Respond to a number of items related to three different domains (i) their attitudes to research (12 items), (ii) availability and support for the implementation of research findings (eight items), and (iii) research utilization in daily practice (nine items). The attitude index included such statements as: 'I want to base my practice on research' 'I think research is exciting' and 'research is a dull, boring subject.' The availability and support index included statements such as: 'The chief executive supports the utilization of research' 'I have time to read about research while I am on duty' and 'I have access to research findings where I work'. The research utilization index included statements such as: 'I apply research results to my own practice' 'I use research to guide my clinical practice' and 'I seek out research related to my clinical practice'. Respondents rated items on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

2 Complete a scale from 1 to 10 on how active they were in seeking new research (1 = I wait to be told about new research, 10 = I actively seek new research).

3 Indicate their participation in a range of research-related activities (yes/no), 14 items.

4 Indicate the research support resources available for them (yes/don't know/no).

5 Rank (i) nine activities that would make research more useful (from 1 to 9, 1 being most useful), (ii) 10 factors that might discourage use of research findings in practice (1 being most discouraging), and (iii) 10 factors that might be helpful in using research findings in practice (1 being most helpful).

The questionnaire was translated into Swedish and, compared with the original, slightly revised by collapsing the indexes for availability and support into one index. The instrument showed acceptable homogeneity using Cronbach's alpha: attitude 0.78, availability and support 0.71, and research utilization 0.86. This Swedish version was previously used in a study among Swedish nurses (20).

Analysis and statistical procedures

The software Statview 6.0 was used for the analyses. In the three indexes, scaling for negative statements was reversed. Adding each respondent's scores within each domain and divi-

ding that score by the number of items within the domain yielded the respective indexes. Missing items were substituted by the mean value of individual ratings within each index. Group differences on indexes and on respondents' ratings on seeking new research were analysed with unpaired *t*-tests. Because of group differences on age, correlations between age and outcomes of indexes, and between age and research seeking were analysed with Pearson's *r*. Age and number of years working as a DH were strongly correlated ($r = 0.7$; $P < 0.0001$); therefore, no further analysis was conducted on working years. As there was a correlation between length of education and work setting, unpaired *t*-tests based on work setting groups and the outcomes of the indexes, and work setting groups and research seeking were conducted. Group differences on participation in research-related activities were analysed with chi-square tests. Activities reported among less than 15% of respondents were not analysed for differences. Responses on research support resources were dichotomized into two categories: yes versus don't know/no and group differences were analysed with chi-square tests. Resources that more than 50% of respondents reported 'do not know' on were not analysed for differences. Ranking of factors were analysed with the mean for each item and the percentage of respondents top ranking each item. Throughout the analyses a *P*-value of <0.05 was regarded as statistically significant.

Results

Attitudes, availability and support, research utilization and activity in seeking new research

Outcomes from the three indexes (attitudes towards research, availability of research and support for implementation of research, and research utilization in daily practice) are displayed in Table 1. There was a significant difference between the two educational groups on all three subscales.

Table 2. **The correlation (Pearson's *r*) between participants' age and the outcomes of the three indexes, and activity in seeking new research**

	Age
Attitudes	−0.16
Availability and support	−0.06
Research utilization	−0.03
Activity in seeking new research	−0.13

Missing data varied from 3 (availability and support, and research utilization), 5 (attitude) to 12 (activity in seeking new research).

DHs with 2-YE had a more positive attitude towards research, reported more availability and support for research, and used research to a greater extent than DHs with 1-YE (Table 1). A significant difference was also found between DHs working in public dentistry and private dentistry. DHs employed in public dentistry reported more availability of research and support for implementing research findings than DHs in the private sector. No other differences were detected based on work setting (Table 1). DHs with 2-YE reported significantly higher activity in seeking new research than DHs with 1-YE (Table 1). There was a difference in age between the two educational groups. Correlational analyses between age and each of the three indexes, and between age and reported activity in seeking new research revealed no associations (Table 2).

Participation in research-related activities

Regarding the dichotomous item on research use, 36% of the respondents reported that they implemented research findings in practice. The most frequently reported research-related activities concerned reading research articles in professional journals (83%), followed by participating in clinical audit (67%). DHs with 2-YE reported more often than DHs with 1-YE that they shared research findings with their own professional colleagues (Table 3). Several aspects of participation in

Table 1. **Indexes for attitudes towards research, opinions about the availability and support for research implementation, ratings of one's own research utilization in clinical practice and activity in seeking new research across level of education and work setting**

	1-YE	2-YE	*P*-value (*t*-test)	Public dentistry	Private dentistry	*P*-value (*t*-test)
Attitudes towards research (12 items)	3.8 ± 0.6	4.1 ± 0.4	**<0.0001**	4.0 ± 0.5	4.0 ± 0.5	0.891
Opinions about availability and support for implementation of research findings (8 items)	3.0 ± 0.7	3.3 ± 0.6	**0.006**	3.3 ± 0.6	2.9 ± 0.6	**<0.0001**
Ratings of own research utilization in clinical practice (9 items)	3.3 ± 0.8	3.5 ± 0.8	**0.022**	3.4 ± 0.8	3.4 ± 0.8	0.994
Activity in seeking new research	4.4 ± 2.3	5.6 ± 2.2	**<0.0001**	5.3 ± 2.3	4.7 ± 2.4	0.069

Missing data varied from 2 (availability and support, and research utilization), 4 (attitude) to 12 (activity in seeking new research).

Table 3. **Dental hygienists' participation in research-related activities across level of education**

	Percentage responding 'yes'		
	1-YE	2-YE	*P*-value (χ^2)
Reading research articles in professional journals	86	78	0.092
Participating in clinical audit	67	68	0.886
Sharing research findings with your own professional colleagues	53	73	**0.001**
Sharing research findings with other professional colleagues	38	44	0.354
Implementing specific research findings in practice	30	41	0.064

Missing data varied from 3 to 6 on separate items.

conducting research were reported among less than 15% of the respondents.

Available research-related resources

There were significantly more DHs with 2-YE than with 1-YE who reported that they had access to research related resources, i.e. computer services to access the Internet, a library of current journals and research methodology books, a librarian to search for literature and statistical support (Table 4). For several of the resources (eight items) more than 50% answered 'do not know'. Many research-related resources were reported to be available among less than 15% of the respondents.

Factors affecting research utilization

The DHs in both groups made similar rankings of factors that would make research more useful for them. *Exploring how research findings can be used in clinical settings* had the highest ranking in both groups. *Time limitation* was ranked as the outstanding factor obstructing DHs from using research findings in practice. The highest valued factor to be helpful in using research findings was *frequent education sessions on the utilization of research findings* (Table 5).

Table 4. **Dental hygienists' reporting of available research-related resources across level of education**

	Percentage responding yes		
	1-YE	2-YE	*P*-value (χ^2)
Computer services to access the Internet	77	88	**0.017**
A library of current journals and books containing research studies and techniques	38	60	**<0.001**
Consultation from a skilled researcher	31	41	0.123

Missing data varied from 5 to 7 on separate items.

Discussion

A documented difference was observed between those DHs with 2 years of education compared with those with 1 year on many aspects of research utilization. About one-third of DHs (36%) reported that they implemented research findings in practice. To achieve evidence-based dental hygiene in Sweden, it appears necessary to enhance the use of research by DHs in clinical practice.

Length of basic education

This study demonstrated that DHs with 2-YE had more positive attitudes towards research utilization. They were more active in seeking new research, and according to the RUQ, they were also using research to a greater extent than DHs with 1-YE. These results are consistent with other studies on the link between education and research use (7, 21, 27, 28). One-year education appears to be inadequate to attain enough knowledge for making use of research in practice. DHs with 2-YE were also more likely to share research findings with others. A more comprehensive education provides enhanced capacities for critical thinking and research use (27, 28). The highest ranked items for making research more useful focused on critiquing literature and transferring research findings into practice. This data support the need for more comprehensive education for dental hygienists. Similar factors are also highlighted in Veermaha's (21) recent study. Frequent education sessions and a monthly research newsletter were ranked high in facilitating the use of research findings in our study. Such activities appear beneficial in keeping up with current knowledge and technology development.

Table 5. **Ranking of factors affecting research utilization**

	Mean ranking* ± SD	Percentage of respondents ranking the item as number 1
What would make research more useful		
Exploring how research findings can be used in clinical settings	3.0 ± 2.2	36
Involvement in uni-professional research projects	3.8 ± 2.4	20
Learning to critique research	4.1 ± 2.6	21
Obstacles to use research findings in practice		
Time limitation	2.9 ± 2.4	44
Workload pressure	3.6 ± 2.3	11
Insufficient staff resources	4.3 ± 2.5	11
What would be most helpful in using research findings in practice		
Frequent education sessions on the utilization of research findings	3.2 ± 2.2	29
Computerized network at your place of work of current research findings and their suggested uses	3.9 ± 2.8	23
Monthly research newsletter with short descriptions of studies by clinical areas and their application to practice	4.5 ± 3.2	23

*Ranking on a scale 1–9/10, where 1 was most important.
Only the three top ranking factors are presented.
Missing data varied from 17 to 60 on separate items.

Based on the RUQ, the data from the 2-YE participants was comparable with the findings reported in nursing studies (20, 24–26). The dental hygienist profession is relatively new in Sweden (35 years) in relation to the nursing profession (>100 years). In spite of a shorter education and less advanced base of scientific knowledge, the DHs seem to utilize research findings at the same level as nurses (22). However, the reported use of research findings to inform practice was much lower than was reported by Humphris *et al.* (18) and Veeramah (21). In the study by Wallin *et al.* (20) the nurses reported implementation of research findings to a similar extent as the DHs in the current study (about one-third of study participants). In that study the majority of nurses had 2 years or two and a half years education, which is similar to the 2-YE group in our study. Today the undergraduate education for nurses in Sweden is a 3-year programme, in accordance with the rest of Europe. It may be necessary to adjust dental hygiene education to the future education system within the European Union. This implies an undergraduate level of 3-year education comparable with a baccalaureate degree as entry into practice.

Leadership and setting

Many studies point to the importance of leadership support (15, 32, 33). DHs with 2-YE reported more frequently that they had such support and that research results were available for them. A similar difference was also seen between DHs working in public dentistry and DH working in private offices. As more DHs with 2-YE worked in public dentistry compared with the 1-YE group, it is most likely that the difference on support is linked to work setting rather than to education, especially as there were no other differences with regard to work setting. In public dentistry there is often a group of DHs working at each clinic, which encourages intercollegial discussions. Such interactivity is an important vehicle for knowledge transfer among nurses (14, 16, 33). Moreover, the county council runs public dentistry and is more likely to provide practice guidelines and library facilities than private clinics. However, there could also be mutual interaction between dental staff and management in the sense that DHs who are trained in evidence-based practice and have a positive attitude towards research may influence leaders to support research-related activities, which in turn further encourages practitioners to use research.

Facilitators and barriers to research use

In both educational groups, reading research findings in scientific journals was the most frequently reported research-related activity. However, this appears inadequate to implement research findings in practice, which is similar to findings among nurses (19, 22, 23). Forrest and Miller (5) emphasized the importance for practitioners to be able to assess the validity and clinical relevance of published studies. This was also ranked high in our study and is in line with other studies (16, 34). Although critical appraisal is a powerful skill, we believe evidence-based clinical guidelines and systematic literature

reviews are even more important tools to links research and clinical practice (35).

Time limitation was an obstacle to research use as supported by other studies (7, 16, 19–21). Time, workload and staff resources are interactively involved as major management issues. They are factors that highly influence clinical practice. DHs are normally forced to completely fill their calendar with patient appointments and it is unlikely that they will have time to read research papers or reflect over practice while on duty. However, time allocation is an issue of priorities and time restrictions may be used as an alibi not to change practice behaviour. Again, we believe systematic literature reviews and practice guidelines save time, make scientific evidence accessible and serve as tools for evidence-based practice.

Relatively few respondents reported the availability of research-related resources. Some knew that there were limited resources but many were unaware of the resources as indicated by a high frequency of 'don't know' answers. This finding may reflect a lack of relevant training in problem solving and searching for current research or other sources of information, a competence that may not be sufficiently developed even in a 2-year programme. Many reported access to computers and the Internet as facilitating factors similar to the findings by Finley-Zarse *et al.* (28) who found that DHs with a longer education used more knowledge sources.

Methodological issues

There was a relatively low yet adequate response rate (61%) (36). It is possible that the DHs who chose not to respond were the least interested in research and the use of research findings, which indicates that the results in this paper may be biased to being overly positive to research use. In contrast, the respondents' age and gender reflect in general DH population in Sweden, which strengthens external validity. Internal dropouts were relatively few, except on the ranking lists. There was a significant difference between the two educational groups in age and number of years in the profession. This finding reflects reality since the length of the education was changed in 1991 and those with an earlier education (1-YE) are older and have been working as DHs longer. The group difference in age forced us to analyse the correlation between age and main outcomes but no such association could be detected, suggesting that respondents' age did not influenced study findings. This interpretation is supported in the systematic review by Estabrooks *et al.* (7).

The RUQ has been used in several studies (17, 18, 20, 22, 24–26), which indicates some validity and reliability in the tool. Internal consistence, analysed by Cronbach's alpha, was also acceptable. There are, however, problems in measuring research utilization. The concept of research utilization may have been confusing for respondents, as no clear definition is given in the instrument. The current instrument has a broad perspective while it covers many issues related to research use, also including the conduct of research. It is highly possible that this attempt to cover many aspects distracts respondents from answering the central sections on research use. These circumstances make comparisons of results from literature difficult. We agree with Estabrooks *et al.* (8) who claimed that the measurement of research utilization is still highly imperfect and the development of a valid and reliable instrument is urgent.

Conclusions

The length of the basic education of dental hygienists is a factor influencing research utilization. For health professionals who are expected to deliver evidence-based care the development of technology and the rapid growth of knowledge require training investments and skills in research. A 1-year programme appears to be inadequate to obtain necessary skills in research-related issues to practice evidence-based dental hygiene. DHs with 2-year education seem to be better prepared to utilize research findings, but not even that guarantees necessary competence. Some of our findings indicate that there may be a need for 3-year education, in line with the contemporary education system in Europe. Evidence-based practice is, however, not only a matter of education. Contextual factors, especially leadership support, are critical in promoting the time and information resources necessary for enhancing research use in clinical practice.

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