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A proposed model for a collaborative approach to dental hygiene research

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Abstract: As dental hygiene responds to the increased need for quality oral health services, dental hygienists seek quality research findings on which to base their practice decisions. However, the amount of research published by dental hygienists, and addressing dental hygiene interventions, remains limited. There are few dental hygienists in Canada working in positions that have time dedicated to research activities. To increase the amount of dental hygiene research, innovative approaches such as collaborative research must be considered. This paper considers measures that facilitate the conduct of collaborative research, and discusses challenges to the process that should be considered during the design. An example of a group investigation is presented, involving dental hygiene educators who collaborated on a research project implemented within their respective educational institutions. A model for a collaborative approach to future research initiatives is proposed. Lessons learned are shared and recommendations are put forward. It is suggested that innovative collaborations such as this may help to increase the body of knowledge for dental hygiene in Canada.

Key words: collaborative research; dental hygiene research; dental hygienists

Introduction

A dominant movement in health care today is that of evidence-based practice. Evidence-based practice addresses the health professional's desire to provide optimum care for clients to achieve the best outcomes, and health-care administration's need for cost-effectiveness. The intent of evidence-based practice is to improve health outcomes (1). As dental hygiene responds to the increased need for quality oral health services,

dental hygienists seek quality research findings on which to base their practice decisions. The amount of research published by dental hygienists, and addressing dental hygiene interventions, remains limited however.

Dental hygiene as a field of practice is maturing, in transition from an occupational model to a professional model (1–6). The Canadian Dental Hygienists Association (CDHA), the national body for dental hygienists in Canada, has adopted a Policy Framework for Dental Hygiene Education in Canada. This policy document has acknowledged that ‘social, economic, political, and technological forces will influence future dental hygiene practice’ (p. 105) (7). It has acknowledged that ‘future dental hygiene practice must respond to an expanding body of dental hygiene theory, changing demographics and oral disease patterns, and the increasing need for quality oral health services’ (p. 105). Dental hygienists must further adapt to innovations in technology (8).

The body of research specific to dental hygiene practice is underdeveloped, and there is a small cadre of researchers further stymied by challenges in access to graduate education. A recent labour survey undertaken by the national dental hygienists organization in Canada found that 14.3% of practicing hygienists have a baccalaureate degree (dental hygiene or other) and 2.1% of practicing hygienists have a graduate degree (dental hygiene or other) (9). There are few baccalaureate programmes in Canada, limiting access to graduate studies and research. There are currently no graduate programmes in dental hygiene in Canada, although several Master of Science in Dental Hygiene (MScDH) programmes do exist in the United States. The lack of access to graduate studies contributes to limiting development of research skills among dental hygienists.

There are few positions in dental hygiene in Canada that provide support and dedicated time for research activities. There are few tenured research-oriented positions and many college faculty positions do not include dedicated research time. Clovis has pointed out that ‘of the literally hundreds of posters and papers presented at Canadian dental hygiene conferences and meetings in the past decade, relatively few seem to achieve publication in peer reviewed journals’ (p. 188) (3). She goes on to note that there are so few dental hygienists in Canada working in positions in which time and resources are available for theory and research development that ‘knowledge production and dissemination in Canadian dental hygiene is virtually accomplished by extraordinary effort on the part of relatively few committed individuals’ (p. 188). To help increase the amount of dental hygiene research available to dental hygienists, innovative approaches to design and implementation of

research projects must be considered. Collaboration among less-experienced and more-experienced researchers at educational institutions may be one strategy for addressing this issue.

Review of literature on collaborative research

Hara and colleagues reviewed definitions of collaborative research and found two common components – working together for a common goal and sharing of knowledge (10). They suggested that sharing meaning, knowledge, resources, responsibility and/or power could potentially lead to building social capital and taking risks and trusting others.

There are many reasons for considering collaborative research. An important one is stronger science (11). Collaboration often brings with it an expanded population of research participants and increased diversity within that group. This suggests a greater possibility that the findings will approximate reality. Collaboration also has the potential for bringing together diverse and complementary skills within the research team. Hara *et al.* (10) have pointed out that ‘The historical trend toward specialization in science has brought a need for multidisciplinary collaboration to bring together the knowledge, skills, and abilities required for the advancement of research. No individual scientist can possess all of the knowledge, skill or time required to make theoretical or applied contributions in more than a very narrow area of research. Researchers often benefit from collaborating to share resources and knowledge’ (p. 953).

There are many strategies that can be implemented to increase the likelihood that collaboration will be successful. Collaborative projects often require additional effort, administrative skill and patience. Green *et al.* (12) point out that pilot testing is important, particularly in large national or international studies. International projects often take longer than anticipated and should incorporate this consideration into planning. They indicate the need for strong, trusting relationships among co-investigators and suggest budgeting for cultivating these relationships through conference calls, meetings and social engagements. They suggest that trivial questions do not justify the effort, but important compelling questions are well worth the effort. Several authors consider the contribution of open communication and close relationships for the success of collaborative projects (10–13).

International collaborations, particularly those between developed and developing countries, benefit from attention to additional details. Musil *et al.* (13) suggest that participation of colleagues in the hosting country is a critical factor for success, as those individuals bring cultural knowledge of existing

systems and resources within their country. When research is planned to take place in a developing country, the collaborators from the more developed countries should be responsible for guiding aspects related to research design for the project, whereas collaborators from the host country should bring their familiarity with the practical issues related to implementation. DuPont (14) points out that medical persons in endemic areas often have insights into diseases in the area and familiarity with the disease processes as they manifest locally.

Human subjects review boards in the United States have become more aware of cross-cultural considerations and consequently include a cultural review (13). Early consideration of requirements of human subjects review boards and granting agencies around protection of human subjects, and the sets of regulations that should be applied in particular or all areas, can prevent unnecessary delays later in the project. Treloar and Graham (15) reported that their study designated each centre to be responsible for negotiating with its own institutional ethics committees. The project coordinators respected each centre's autonomy in this issue and did not impose culturally inappropriate and unnecessary requirements on each site for the sake of consistency alone.

The widespread availability of information and communications technology has enabled partners to collaborate on investigations without regard to geographic locations. Wulf [cited in (16)] coined the term 'collaboratories' to blend the concepts of collaboration and laboratories. When Thomas Jefferson University established the National Center for Dental Hygiene Research (NCDHR), they developed the DHNet based on the collaborative concept (16). Its purpose was to foster dental hygiene knowledge development and dissemination through the use of electronic communications and collaborative research. The DHNet served as the electronic infrastructure for the NCDHR and included a knowledge base and electronic communication system. The Center would bring together and train teams composed of researchers, educators and clinicians. The DHNet provided a mechanism for keeping the teams linked, and for communication with the NCDHR and each other. A separate and secure chat area within the collaborative was provided so that research teams could 'meet' regularly to discuss their work in private. The need for training support was recognized and DHNet training was provided through a 5-day hands-on Summer Research Institute at Thomas Jefferson University. With the DHNet model, collaborative teams were composed of educators and clinicians headed by a research mentor. Although the focus of the NCDHR has shifted, its development and early programmes serve as an example of a collaborative research model for dental hygiene.

Musil *et al.* (13) suggest that identifying the potential contributions of collaborators and developing mutual respect for the knowledge each brings to the project is also crucial to success. They point out that many applications for funding, especially federal projects, require pilot work and/or evidence of prior collaboration among research team members. They also suggest the importance of discussing authorship of publications early in the collaborative process. They propose that discussions such as these present excellent opportunities to model the process of collaboration and scholarship important for faculty in all settings.

Treloar and Graham (15) (p. 931) suggest that large projects might be facilitated if conducted in a stepwise fashion: 'One or two sites could begin as pilot projects. Investigators from the second center could visit and support a third center, and so on.'

Hara *et al.* (10) derived a framework for collaboration and identified factors impacting collaboration. They identified four key factors that impacted collaboration in the research setting: personal compatibility including work style, writing style, work priority, interests, chemistry and complementary expertise; research work connections including match of interests, complementary knowledge skills and abilities; incentives including external (such as prestige, funding, publications) and internal (personal motivation); and socio-technical infrastructure including the use of communications tools to help compensate for the lack of physical proximity. They saw a typology of collaboration ranging along a continuum from complementary participation, which saw the division of project activities into discrete units, to integrative, which saw a fully integrated and shared project. They further saw each of the four key factors ranging along this continuum and suggest that different aspects of each factor may impact each type or category of collaboration.

There are numerous challenges to the process of collaboration. Participating institutions, regions or countries may have differing mechanisms and regulations to assure the ethical conduct of research and the protection of human subjects. If investigators have to meet dual expectations of their own review processes and also to modify or augment them to accommodate the requirements from another region or funding agency, additional time will need to be built into the design to prevent future delays in data collection.

Green *et al.* (12) encountered challenges when new equipment had to be distributed across national boundaries and became subject to tariff and duty regulations. Their grant regulations forbade use of grant funds for taxes and tariffs, and

they did not have alternative sources of funding to cover the additional cost of several thousands of dollars.

Musil *et al.* (13) conducted a collaborative study set in both the United States and Uganda. They identified a number of challenges including uncertain interest of potential participants, reservations about outsiders asking questions, differences in dialect and idiom that challenged the data collection process, additional expenses associated with international work, need to conduct interviews and focus groups in the local language, and need for interpretation of local culture.

Treloar and Graham (15) identified the need for adequate funding to permit time for write-up and publication. They also addressed the need to consider the choice of journal for publication, to ensure that the article would be available to the appropriate target audience and that the article would be indexed/appear in the appropriate databases. Hara *et al.* (10) expressed concern about writing styles, and that they be complementary.

DuPont (14) sees a grander purpose to collaborative research, especially international collaborations. He suggests that more advantaged regions should contribute more to training and developing research capabilities among their foreign colleagues in order to raise the level of general health in less developed regions. He points out that 'It is paradoxical and unsettling that in regions in which the burden of illness is the greatest, health research is given the lowest priority.' (p. 949). He calls on funding agencies and institutions supporting research to increase their support of collaborative research specifically designed to improve world health, and suggests that 'In the long run, little will affect the future of humankind more than raising the health levels of the world's poor.' (p. 950). Large scale issues such as these are seemingly suited to collaborative design approaches.

Hara *et al.* (10) (p. 953) point to 'an increased emphasis on collaboration as a tool of science, and the need for the development of collaboration know-how'. The purpose of this paper is to examine a collaboration that occurred among five Canadian dental hygiene programs and to consider lessons that may be learned from that experience. The process of the experience has been depicted as a graphic model that is proposed for future testing.

Process for original study

The study that was completed as a result of this collaboration sought to identify frequency and prevalence of ethically problematic situations encountered by dental hygiene students during the course of their education. The methods and results of the original study have been reported elsewhere (17). The

study was designed by two faculty members from one institution, with the original intent being to conduct the study within their institution. One of the co-principal investigators attended a Canadian Dental Hygienists Association Code of Ethics task force meeting and mentioned the project to others in attendance. Several expressed interest in participating and were invited to do so. An information package containing the study proposal, application for ethics review and survey instrument was sent to all those expressing interest. The lead institution sought ethics approval from their ethics review committee to conduct the study locally. Dental hygiene faculty members from four other institutions elected to participate and arranged to conduct the study within the ethics guidelines of their own institution. A covering information letter advised students that, if their participation in the study and their recall of ethically problematic situations led to feelings of discomfort, students would be provided with access to confidential student counseling. All collaborators agreed on a timeframe for distribution of the survey questionnaires for consistency within timing in the curriculum, but there was some local flexibility.

Each institution distributed and collected the survey questionnaires. These were subsequently returned to the lead institution and responses to the 12 multiple-choice items were entered into SPSS (a statistical software package) by research assistants. Descriptive statistics from the data were analysed using measures of central tendency, including frequency distributions of variables. Data were combined from all participating institutions. In order to respect confidentiality and to protect the students, data were not analysed by separate institutions but rather as one large group. Text-based data was entered into an electronic word processing file by research assistants. All group members were approached to participate in the analysis of this data and four agreed. Those agreeing were provided with consistent materials regarding the analysis process, received the electronic file and the agreed-upon the process for coding and categorizing was implemented. All input was included.

The co-principal investigators had access to funding from The Fund for Dentistry and funding for summer students to assist with the proposal development and grant application one summer, and to assist with data entry and preparation of the draft manuscript the following summer. The initial draft of the manuscript for the report of the study was prepared by the co-principal investigators, with assistance from the summer research assistants, and circulated to all collaborators for feedback. Feedback was incorporated into the manuscript prior to submitting it for peer review. Abstracts for poster presentations for ADEA (American Dental Education Association) and CDHA

were also circulated to all for feedback, although timing was very tight in some cases. Similarly drafts of poster presentations themselves were circulated to all for feedback and necessary revisions made. The manuscript for the study was subsequently published in the Canadian Journal of Dental Hygiene.

Review and reflection on process

Prior to completion of the project, some of the team members felt there might be some benefit to others from a description of the process followed and the lessons we learned from our experience. The team undertook a review of the process activities and reflected on reasons for participation and benefits of the collaborative process. This review and reflection was not designed as a research project, but rather as an evaluation process to identify useful lessons.

Team members became involved in the research project because several taught ethics in the dental hygiene curriculum and others were interested in this area of study. For several of the team members, having completed the revision of the CDHA Code of Ethics together, there already was good synergy, and having accomplished something together gave confidence in the group's ability to produce together.

One team member participated because their school was not geared up to launch a research project and this project gave them an opportunity to participate, and another wanted to try collaboration with other institutions for the experience. Another saw this as an opportunity to improve the science by increasing the sample size and the diversity of the student population through inclusion of both university and college programmes. Another participant felt that as not all dental hygiene faculty have dedicated research time, and as the participant was fortunate enough to have this dedicated time, she wanted to share and involve others. Her hope was that this example would help others to see that research can be carried out in all locations – collaboration may be necessary to make this happen.

The team members identified a number of benefits from their collaboration. They felt there was a sharing of insight, ideas and expertise on an issue that was important to them. The team was united by a common goal and team members treated each other with great respect. Team members felt the collaboration worked because the project was well planned and the study design was easy to implement in the local settings. The timing was good regarding when it was presented to the students. Entry and analysis of quantitative data was completed in a central location and results shared to the group for feedback. They also felt the collaboration worked because the

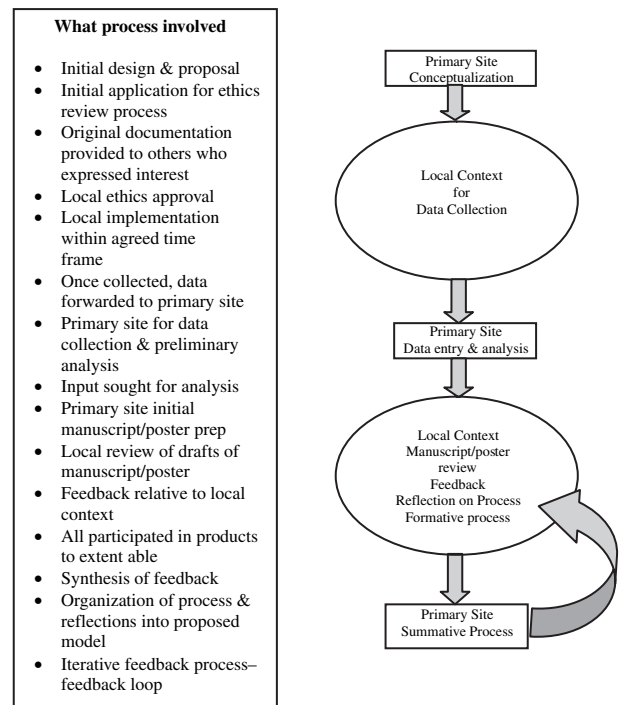


Fig. 1. Process model for collaborative research projects.

study initiators carefully kept the ball rolling at the same time everyone was kept informed of the study's progress. E-mail communication made it easy and kept costs low. There was great participation and commitment by all group members – they did what they said they were going to do, and always responded in a timely manner even when deadlines were sometimes very short.

The description and reflection on the process activities led one team member to develop a graphic to represent the process pictorially. This is shown in Fig. 1. The smaller rectangles are intended to depict activities that took place at the lead institution and the larger circles are intended to depict inclusive activities that took place at all sites. The feedback loop depicts the iterative nature of many of the processes, such as preparation at the lead site, review and feedback from all the local sites, synthesis and incorporation of feedback by the lead site, then back to all the local sites for subsequent review and approval.

Discussion

The team members felt there were many benefits of collaboration, and several reasons for our success. Many of the insights generated through the reflective process were consistent with the findings in the literature. These include the opportunity to participate in a research topic that is important to team members

(10,12,14,15), open communications (10–13), respect for each other (10,12,13), capacity building (13–15), prior knowledge of or communication between team members (10,12,13,15) and use of local processes for seeking ethics review and approval (15). The team's insights were also consistent with Hara *et al*'s (10) four critical factors for collaboration: personal compatibility, research work connections, incentives and socio-technical infrastructure.

For this collaborative research project, the protocols were developed by the lead institution, as the initial intent had been for a small local study. Protocols were subsequently circulated to other participants once they had expressed interest. This circulation of existing protocols is consistent with the usual experience for multicentre clinical trials, where collaborators 'sign on' to an experimental protocol and follow that without deviation (15).

Team members felt this collaborative process resulted in better science, with a larger and more diverse study population (11). Many studies utilizing dental or dental hygiene students, or their clinical patients, are limited to one institution. This approach to inter-institutional collaboration should be encouraged to improve the quality of studies.

Team members felt the collaborative approach supported building capacity among dental hygiene researchers in a supportive environment. This is consistent with a feminist model of research which fosters collaboration over competition. There was a feeling that research in the community college programmes as well as in universities helped remove the perception that research can only take place in the 'ivory tower' of universities. Team members also felt that publication of the study results had a positive effect on the students: 'It definitely is empowering to the students (as well as to faculty) to participate in increasing the knowledge base of dental hygiene'. One team member commented that 'the article...is getting fabulous comments from my students...' suggesting that students may have both been pleased to see their faculty member's participation in the research project and been pleased to see that the study they participated in had been published and their voices have been heard and valued.

Conclusion

It is difficult to predict when, or indeed whether, there will be an increase in the number of dental hygiene faculty positions in Canada with dedicated time and/or responsibility for conducting research. In the interim, partnerships between less-experienced and more-experienced researchers can serve as one strategy for conducting dental hygiene research. Innova-

tive collaborations such as this can contribute to increasing the body of knowledge for dental hygiene in Canada. They can also contribute to building capacity within the body of dental hygiene researchers in Canada. Our experience and the literature, suggest the following important elements for success in collaborative research projects: high interest in the research topic; support for the specified process from all; mutual respect among team members, open communications, strong organizational skills; reliability and commitment to the project; some flexibility in the design to accommodate the local context; and resources that support research, including skilled personnel, in at least one location.

Team members also felt there were additional benefits as individuals, including the joy of networking, working with new colleagues, positive feelings about increasing the body of dental hygiene research in Canada and obtaining publications for inclusion in curricula vitae. Those working in academia have a need for peer-reviewed publications and presentations at national and international levels. This project resulted in two poster presentations, one at a national meeting and one at an international meeting, and two publications.

The collaboration also produced a proposed model that was derived from insights gained through reflection on the collaborative process. There is a need for empirical testing of this model. This would provide confirmation of the strength of the insights, and could lead to further refinement of the model to arrive at one that could be used to guide future collaborative research projects. As dental hygiene continues to incorporate evidence-based approaches to practice, and the need for quality dental hygiene research grows, innovative approaches to research can contribute to meeting that need.

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