REVIEW ARTICLE / VUE D'ENSEMBLE

Academic Dental Librarianship in Canada: Taking Stock, Planning the Future

Natalie Clairoux[1], Martin Morris, and Helen L. Brown

Abstract: The Oral Health Interest Group/Groupe d'intérêt en santé buccale of CHLA/ABSC, established in 2016, aims to act as a source of networking for dental librarians in Canada, conduct research, and advocate for the specialty. In the present article, the first produced by OHIG, the authors describe the current landscape of academic dental librarianship in Canada using data resulting from an informal consultation of all OHIG members. Examples of distinctive practice are highlighted through a series of vignettes, and the overview is set in context through a literature review of dental librarianship, focussing on Canadian contributions to the speciality. The article concludes with the authors' reflections into possible directions the specialty may take over the next few years, noting the importance of increased embedded collaboration with faculty and the need to develop new skills, for example, to support research data management and new trends in scholarly communications.

Introduction

When Inez Bowler published her *Elementary Manual of Dental Library Practice* in 1934 [1], she was seeking to shape a nascent field in which there were "librarians at dental schools who have no professional training, and who stand in need of elementary instruction…", and to demonstrate the value of professional librarians to the field of dentistry and oral health.

In 2016, over 80 years after Bowler's work, dental librarians across Canada came together to form the Oral Health Interest Group/Groupe d'intérêt en santé buccale (OHIG) of the Canadian Health Libraries Association / Association des bibliothèques de la santé du Canada (CHLA/ABSC). In this paper, OHIG members have collaborated to provide a Canadian-oriented overview of our field by conducting interviews and subsequent follow-ups with academic dental librarians at every dental school in Canada, and by supporting these findings with a comprehensive literature review. We aim to fill the gap in recent literature on dental librarianship, particularly in Canada, demonstrate how Canadian academic dental librarians have integrated themselves into dental education and research, and highlight examples of their innovative approaches.

For the literature review we searched five bibliographic databases (PubMed, CINAHL, Embase, LISA and LISTA), in French and English, using a combination of subject headings and keywords to represent the concepts of 1) dentistry, oral health, dental students, evidence-based dentistry, or dental schools, and 2) libraries or librarians, and limiting results to the last 10 years. We also hand searched the meeting proceedings of the Medical Library Association (MLA) and CHLA/ABSC, from 2012 to 2016, using the terms dental, dentistry or oral.

Data for this paper were gathered through a series of semi-structured interviews with every academic dental librarian in Canada. Interviews were conducted between January and August 2017, with follow-up

Natalie Clairoux. Librarian, Bibliothèque de la santé, Université de Montréal, Montréal QC https://orcid.org/0000-0002-6720-7415
Martin Morris. Liaison Librarian, Schulich Library of Physical Sciences, Life Sciences and Engineering, McGill University, Montréal QC https://orcid.org/0000-0002-5659-2995
Helen L. Brown. Reference Librarian, Woodward Library, University of British Columbia, Vancouver BC https://orcid.org/0000-0002-8437-9702
[1]Corresponding author (email: natalie.clairoux@umontreal.ca)

This article has been peer-reviewed.

email or phone conversations to gather further information where this was considered necessary. The response rate was 100%.

It is the hope of OHIG members that this paper will contribute to the ongoing scholarly communication on librarian integration in academic health sciences education and provide useful examples of practice, which may be adopted by our colleagues.

Context

More than 500 students graduated from one of Canada's 10 accredited dental schools in 2016-2017 [2],

earning either a Doctor of Dental Surgery (DDS) or Doctor of Dental Medicine (DMD) degree; school locations are shown in Figure 1 [3]. Each of these schools is supported by at least one dedicated dental librarian. Almost half of the accredited dental schools also offer accredited programs in dental hygiene which, while sharing the same focus on evidence-based practice, information literacy, and critical appraisal of the evidence, also have unique collections and instructional needs. Since not all of the dental schools offer these programs, many of our comparisons will focus solely on DDS or DMD degrees.

Figure 1. Location, Doctoral Degree and Targeted Entering Class Size of Doctoral Dental Programs in Canada

Interactive view: https://tinyurl.com/CanDentSchools
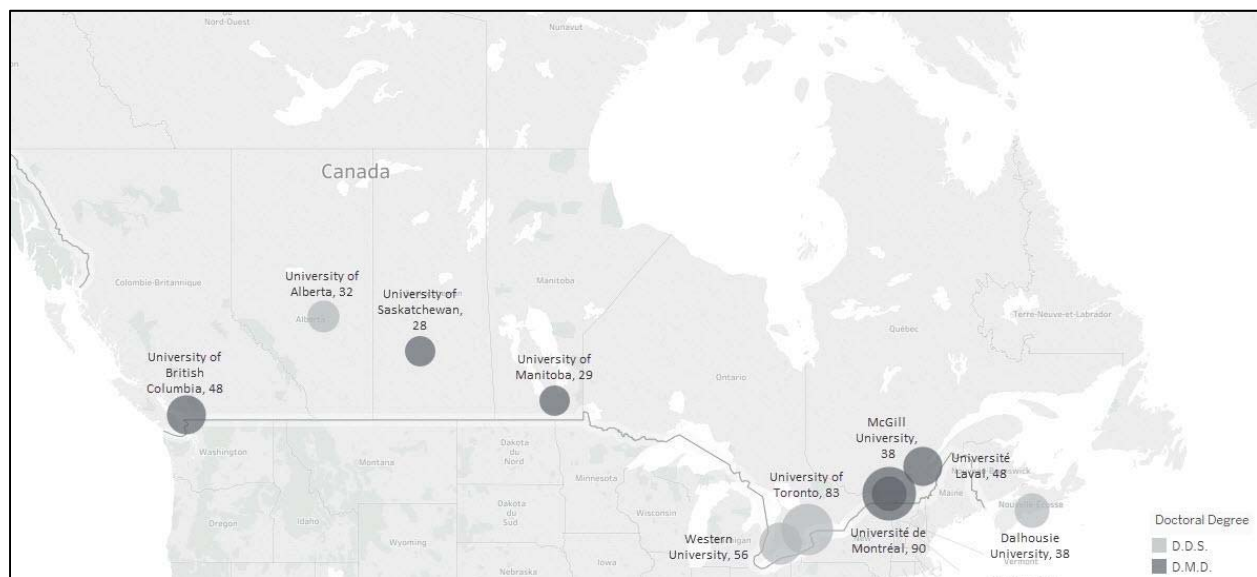
Librarian integration into academic dental education is supported by the Commission on Dental Accreditation (CDAC) [4], and Competency 4 of the Association of Canadian Faculties of Dentistry's Conceptual Education Framework (ACFD) [5]. The CDAC requires that, to obtain accreditation for a DDS/DMD program, dental schools must provide an accessible, professionally administered library, which is responsive to and supports the teaching and research activities of the program, and provides access to electronic and other multimedia sources.

The ACFD Framework includes two components, "Employ information technology appropriately for patient care" and "Apply the principles of evidence-based decision making into practice," which require knowledge, skills, and abilities that may be acquired

via library instruction, such as searching and evaluating the scientific literature, as well as critical appraisal of the retrieved evidence.

Fifteen librarians currently provide liaison services to dentistry and dental hygiene programs in Canadian universities. Six schools rely on a single person, while at other universities liaison responsibility is shared among a number of librarians. For example, at the University of Alberta liaison responsibilities are shared among three sessional librarians who have cross-appointments with other research organizations. Other medical departments may also be included in a dental librarian's portfolio; at McGill University for instance, the dental liaison also serves eight other medical departments.

Vignettes in Context: Showcasing Academic Dental Librarianship in Canada

Academic liaison work has traditionally been defined as a blend of collection development, reference, and information literacy (IL) instruction [6], although in many areas of practice this has since extended to include advanced support for research, such as knowledge syntheses, and scholarly communications. Dental librarians have made and continue to make significant contributions to all of these areas.

Traditional Information Literacy Instruction

It is now well established that librarian involvement in health sciences education improves search skills and facilitates the integration of research evidence into clinical decision-making [7]. Brown and Malenfant noted that "collaborative academic programs and services involving the library enhance student learning" in their assessment of library services [8].

Liaison Vignette #1

Librarian Support for a Dental Hygiene Debate Assignment at the University of Manitoba

The University of Manitoba offers the province's only dental hygiene program. In the mandatory HYGN 2362: "Community Health II" second-year course, students in small groups of 3-4 debate a subject taken from a list of controversial topics, such as dental tourism. They must use a variety of information sources to support their point of view, including journal articles and books, but mainly Internet resources, especially patient information websites. In 2009, the professor requested the assistance of the dental hygiene librarian to improve the quality of assignments. Building from a first-year evidence-based practice course, the librarian focuses on grey literature searching and critical appraisal skills. For instance, citation tracking measurements are useful in discussing whether usage rates are indications of the significance of the information. The one-hour session then translates into "just-in-time" learning as students come to the librarian's office to discuss the sources they have found and receive a second opinion on the value of the information provided.

Dentistry undergraduates are often first introduced to searching the library catalog during orientation sessions offered at the beginning of the academic year, and librarians are using creative ways to make these encounters meaningful to students. Library orientations favouring a user-centered approach that includes active learning appear to be the most engaging and effective, as reported for an undergraduate dental curriculum [9] and for a postgraduate dental residency [10]. At the University of Toronto, Zahradnik and Buda prepared a voluntary orientation that included a library tour, a series of 14 online instructional videos, a quiz, and an "Amazing Race" scavenger hunt [11]. Matsoukas et al. tested a novel marketing approach by providing USB flash drives pre-loaded with library promotional materials to incoming medical and dental students [12]. Similarly, as a University of Minnesota dental hygiene masters curriculum moved online, students were introduced to their librarian using a head-shot video [13].

Liaison Vignette #2

Library Research Orientations for Foreign Dentists at Dalhousie University

Dalhousie University offers a 2-year Doctor of Dental Surgery (DDS) Qualifying Program for individuals with a dentistry degree issued outside the Canadian educational system who wish to practice in Canada, the United States, or Australia. The dental librarian meets the students twice during their first summer attending the program. First, a general library orientation is provided in a 1-hour session that addresses library card registration, simple searching in the library catalog, description of library services, and other library locations. A 2-hour "Finding the Evidence" session then introduces students to the concept of Evidence-Based Dentistry and to the pyramid of evidence sources, with a focus on Registered Controlled Trials and finding current and (or)valid research. The librarian points out that students may be using their own expertise to evaluate the quality of research studies. The session then covers PubMed searching (use of MeSH, advanced search functions, NCBI account and (or) saving searches, Boolean operators, and how to use them). If time permits, there is an introduction to Dentistry and Oral Science Source (DOSS via EBSCO), as well as Cochrane systematic reviews.

Cobban and Seale reported on the instruction of information literacy skills to dental hygiene students at the University of Alberta. Their hands-on computer laboratory session "stressed the importance of analysing a problem, formulating a soundly constructed question from which relevant concepts and keywords can be selected, searching in appropriate sources, and evaluating the results of the search " [14]. Librarians introduced students to a variety of search engines and information sources, including the PubMed database. Such "one-shot sessions" may include a graded assignment to improve student attention, as described at Université de Montréal [15]. Other modes of information literacy instruction reported in dental libraries include regular drop-in sessions set in an informal environment and tailored to the participant's needs [16]. A range of hybrid models may also be used, such as the flipped instruction techniques reported by Clifton and Jo, where periodontics residents reviewed online content prior to a series of six 1-hour face-to-face sessions [17].

Assessment of IL programs is also a common task for dental librarians. Guo et al. were able to demonstrate, using pre- and post-test measures, that dental hygiene students' knowledge and skills in health information literacy improved significantly after an initial session of library instruction [18]. Similarly, Lawrence and Levy used a self-administered combination pre-test and post-test listing 18 skills and concepts taught in a MEDLINE class; more than 90% of participants admitted that they had learned more about using MeSH subject headings in a search and how to combine sets of results [19]. Using a different angle, Storie and Campbell investigated the actual outreach of their IL program at University of Alberta's Faculty of Medicine and Dentistry. They discovered that the program was not reaching everyone who could benefit from instruction, and that some users would prefer interactive web-based tutorials as the main mode of delivery [20].

Currently across Canadian universities, core librarian support includes instructional activities that range from one-on-one consultations to co-teaching courses with dentistry faculty, and from orientations for incoming first year students to collaboration on faculty-led research. Table 1 summarizes the instructional activities and supports provided at each of the ten Canadian universities with accredited dental schools.

In many of the libraries a dedicated librarian specializing in that field handles support and instruction on topics such as scholarly communications or copyright, while other services, such as drop-in sessions on database searching, are geared towards audiences from multiple faculties. Many dental librarians may teach topics such as using bibliographic management tools upon request in a dentistry class, in addition to general bibliographic management classes offered through another library department. For example, the UBC Library Research Commons offers frequent workshops as well as one-on-one consultations on RefWorks, Zotero, and Mendeley, but the liaison librarians also provide demonstrations in class and one-on-one support by appointment. Every dental librarian provides individual or small group consultations and a number of librarians also provide office hours to support students.

Most dentistry and dental hygiene librarians provide either guest lectures or "one-off" sessions to some classes while collaborating with dentistry and dental hygiene instructors in a more integrated way for other classes. For our purposes, we counted collaborative teaching as classes in which the librarian is considered a co-instructor and is more integrated into establishing and delivering course content and (or) grading assignments, as opposed to visiting the class to provide a guest lecture.

Table 1. Library Instructional Activities in Canadian Dental Faculties

Instructional Activities	Dalhousie	Laval	McGill	Montréal	Toronto	Western	Manitoba	Saskatchewan	Alberta	British Columbia
Orientation sessions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Instruction on database searching	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Instruction on evidence-based dentistry	✓	-	✓	✓	✓	-	✓	✓	✓	✓
Instruction on knowledge synthesis	✓	✓	✓	✓	-	-	✓	-	✓	✓*†
Instruction on scholarly publishing and research impact	-	-	✓	✓	✓	-	✓†	✓	✓*†	✓
Instruction on bibliographic management	-	✓	✓	✓	✓†	✓	✓	✓	✓*†	✓
Instruction on copyright	✓†	-	-	✓	✓†	-	✓	-	✓†	✓†
Drop-in seminars	✓	-	✓	✓	✓	-	✓†	✓†	✓	✓†
Instruction or professional development for Faculty	-	-	✓*†	-	✓†	✓	✓	✓*	✓	✓*†
Collaborative teaching with dentistry Faculty	-	-	✓	✓	✓	✓	✓	✓	✓	✓
Library research skills included in graded assignments	-	-	✓	✓	✓	✓	✓	✓	✓	✓
One-on-one or small group consultations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Office hours	-	✓	✓	-	✓	-	✓	-	✓*	-

* By request

† Provided by other librarians or library departments

Liaison Vignette #3

Embedded Dental Librarian Instruction at McGill University

For approximately the first 14 months of their undergraduate degrees, dental and medical students at McGill follow the same courses in a block of modules called Fundamentals of Medicine and Dentistry. In 2014, the Faculty of Dentistry modified this, and dental students now take separate courses in research through a series of four modules, one taken each year. The motivation for this change was to provide training in research and evidence-based dentistry which more closely aligns with the future clinical needs of dental graduates.

These modules take students through the entire research process, from providing a basic understanding of research in their first year, to completion of a small research project in their fourth and final year. The creation of these modules has provided an excellent opportunity for the library to not only increase its embedded instruction but also to widen the range of content offered. In addition to concepts such as the pyramid of evidence, the librarian introduces the following distinct concepts:

- DENT 125 – students first hear about qualitative and quantitative research, receive an overview of the history of medical research, and learn about the roles of inductive and deductive thinking in research;
- DENT 225 – use of the patient-centred care model (Mead, 2000) to derive research ideas;
- DENT 425 – students receive instruction through 3 workshop or lectures in the appraisal of randomized controlled trials and systematic reviews, and must complete a graded assignment in which they critically appraise a systematic review for quality and clinical applicability.

This instruction continues to evolve. Beginning in 2018, the librarian will be working with the Faculty of Dentistry on a new project in which the whole class will learn about systematic reviews by helping to produce a real, publishable review during their second and third years.

Liaison Vignette #4

Library Instruction for Dentistry Residents in Remote Health at Université Laval

Université Laval's Multidisciplinary Dentistry Residency program includes a mandatory 4-week internship in a remote area; when available, the location may be an indigenous community in Northern Quebec. The program lasts 1 year and maximum enrolment is 6 students. Residents participate in a 3-hour face-to-face library instruction session that introduces library services and resources, including mobile point-of-care resources, as well as searching for articles in PubMed using keywords or controlled vocabulary. In addition, the dental librarian presents specific resources from the National Library of Medicine's Arctic Health website (http://arctichealth.nlm.nih.gov/home) such as the Arctic Health Publications Database and the Circumpolar Health Bibliographic Database, as well as the Aboriginal Health Search Filter page on HLWiki (http://hlwiki.slais.ubc.ca/index.php/Aboriginal_health_search_filter).

Liaison Vignette #5

On-Demand Lunch Hour Seminars at the University of Alberta

A few times a year, an administrative assistant at the School of Dentistry requests lunch hour seminars from the library to add to the professional knowledge of interested faculty members and graduate students, especially when some needs are not met by the central library system's regular workshop schedule. One-hour seminar topics range from library orientation to RefWorks and literature searching basics, are tailored to include dentistry content and typically attract 10 to 15 participants. This on-demand model requires that the dental liaison occasionally receive training to teach specialized topics, such as research data management. An interesting outcome of this training is that in turn, health sciences librarians were solicited to teach research data management in a Masters of Library and Information Science course.

Evidence-Based Dentistry Instruction

The rise of evidence-based dentistry (EBD) instruction has transformed dental librarianship. The introduction of EBD content into the dental curriculum has led to dramatically increased librarian involvement in instruction; in fact it is such a common part of contemporary dentistry librarianship that a survey of institutions offering the DDS or DMD degree in Canada and the United States found that three-quarters of responding librarians taught aspects of EBD [21]. The most common role included teaching EBD literature searching skills to students, often in collaboration with dental faculty.

Similarly, as in other health and non-health related fields there is increasing interest in understanding and performing systematic reviews, which provides opportunities for librarians to support students, faculty, and research teams through collaborative teaching, general workshops, consultations, and dedicated services. The split between formal and informal instruction (consultations) is often determined by the level of the research, with graduate students and faculty receiving far more consultations and undergraduates receiving classes and general reference desk support.

Swanberg et al.'s systematic review of health librarianship literature found that the most popular methods used to teach evidence-based practice were formal presentations or seminars, small group discussions, and (or) one-on-one instruction [22]. Dental librarians' perspectives on EBD instruction methods primarily focus on two angles. Firstly, there are practical approaches such as the one described by Stellrecht which incorporate EBD instruction within an embedded clinical librarianship service. It provides "point-of-need reference assistance to clinical faculty in resolving patient treatment questions and enriches dental education by developing students' EBD skills" [23]. Secondly, dental librarians are contributing to the design and evaluation of virtual instructional evidence-based practice modules, designed either with an interprofessional scope [24, 25] or aimed at future dentists. Notably, MacEachern et al. describe how "a didactic evidence-based dentistry (EBD) course was reconstituted as a set of twelve online modules that were embedded into the school's intranet site, opening up the EBD content to all clinically active faculty and students, regardless of their enrolment status in the course" [26].

Yet, several authors point out that the actual information-seeking behavior of practising dentists does not reflect the searching strategies they were taught and denounce the lack of integration of EBD across the whole curriculum [27, 28]. Accordingly, the roles of dental librarians in teaching EBD may be further expanded. Lubker and Pellefrini suggest that dental librarians and faculty could build stronger relationships and reinforce their collaboration by attending EBD training together [29].

Liaison Vignette #6

Dental Public Health Evidence Based Dentistry Modules at the University of Toronto

Librarians at the University of Toronto provide a library instruction session that is integrated into the DEN207 undergraduate course and counts for 5% of the students' final grade in the class. DEN207 is based on an evidence-based care module developed by the Course Director, Dr. Amir Azarpazhooh and colleagues, and outlined by the series of JADA articles on "A Practical Approach to Evidence Based Dentistry." The modules aim to help students develop and apply skills in evidence-based dental practice by developing critical appraisal skills and communicating results. There are 5 tutorials in the first part of this course, covering appraisal of primary studies: Harm, Diagnosis, Therapy, and Research Synthesis. The last tutorial "Finding evidence-based dental literature in a clinical setting" is conducted by the librarians.

The tutorial is 3 hours long and follows the following format: "Finding evidence-based dental literature in a clinical setting" lecture (40 minutes); hands-on session on PubMed and point-of-care resources (35 minutes); break (15 minutes); in-class group assignment (1 hour); and reporting back from groups on how they completed one question of the assignment (30 minutes). During the hands-on session, 6 science librarians provide support. Assignments are submitted at the end of class and graded by the 2 dental librarians. The lecture and assignment for tutorial 5 can be found here: http://guides.library.utoronto.ca/dentalpublichealth.

The final deliverable of the course is a critical appraisal of a study. The students use the 5 tutorials to learn how to find literature, critically appraise studies, and communicate their findings.

Liaison Vignette #7

Application of Dental Research to Clinical Decision Making at the University of Saskatchewan

The first year of the DMD program focuses heavily on integrating library research into practice. Students begin with a 1-hour orientation and continue with 5 sessions in March and April as part of the full year DENT 210: "Application of Dental Research to Clinical Decision Making" course.

The 5 course-integrated library instruction sessions cover the following topics:

1) The Scholarly Publication Cycle, Defining your Research Question, Keyword Databases;
2) Keyword Databases (cont.), Controlled Vocabulary Databases;
3) MEDLINE and Embase, Citation Search;
4) Searching the Grey Literature, Citation Managers;
5) Class assignment, which is worth 20% of the final mark.

Collection Development and Maintenance

In the late 19th century, dentistry developed from a trade to a profession and dental schools were gradually established across the country. The dental literature bloomed during this period and libraries were called in to collect, organize and disseminate this new knowledge [1]. Collection development in today's dental libraries is naturally very similar to that in other health fields, but a number of dental librarians also use more targeted approaches to ensuring collections are complete and up-to-date, and have made useful contributions to this area of our practice.

Two prominent examples from the literature stand out here. Buda and He at the University of Toronto have developed a toolkit to clean up and improve catalogue records, and increase retrieval and collection usage [30], while members from the Dental Section of MLA have worked to update a reference list of required dental texts, a useful tool both for new dental academic liaisons and faculty [31].

Liaison Vignette #8

Collection Updates at Université de Montréal

A former dental liaison at Université de Montréal designed Syllabo, an in-house EndNote database listing all required texts for DMD course syllabi. At the end of each semester, library technicians systematically look for new editions required in upcoming courses, then make purchasing recommendations. They also email professors to inform them when changes occur to the course reserve, and provide a hyperlinked reference to the book's record in the catalog, which may be easily included in course syllabi.

Dental collection management has advanced as new tools have become available. Cox has leveraged the potential of citation analysis to orient collection development (an approach later taken up by Gao [33]) to identify any gaps between the library collection and the literature cited in dental theses produced at her institution [32]. A heavy reliance on journal materials was observed, often dating as far back as 25 years, suggesting that "libraries supporting advanced dental education programs should be prepared to provide access to a longer backrun of journal resources."

Liaison Vignette #9

Collection Development Informed by Citation Analysis at Université de Montréal

Does the library's journal collection reflect the actual needs of our dental researchers? This question was answered using citation analysis of recent publications. A literature search performed in February 2017 identified 108 journal articles published in 2015 or 2016 by authors affiliated with UdeM's Faculty of Dentistry. Next, 4520 citations were extracted from 94 of these papers to constitute the reference dataset. Citations were then classified as journal articles (94% of all documents cited); conference abstracts (2%); or books, monographs and other resources (4%).

Cited articles were published in 1202 different journals, and more than half of cited journals were mentioned only once. The analysis then focused on the set of journals cited 5 times or more, which comprised 186 titles representing 63% of all article citations. It was found that 95% of those highly-cited journals were either included in UdeM Libraries' collections or freely available online, suggesting adequate serials support to the Faculty of Dentistry's research needs. Nevertheless, the dataset included an unavailable journal that was cited 48 times. As a result, a survey was sent to faculty members to propose a new subscription and to determine candidates for a concurrent cancellation.

Reference

In his pioneering 1934 article *Reference Problems of the Dental Librarian*, Denton stated: "The primary function of the reference librarian should be educational–to teach the applicant how to use bibliographical tools, and under some preliminary supervision, to make his own bibliography" [34]. Dental librarians still devote a significant portion of their time to one-on-one consultations, but reference services now include other less traditional formats. McClellan first described the implementation of integrated virtual reference in an academic library system serving a dental school [35].

Excitingly, technology now allows librarians to provide reference "on the fly" at the point of need with iPads and other supporting technology, allowing the librarian to serve their public outside the walls of the library. Stellrecht reported that liaison librarians were able to answer questions in dental clinics and faculty offices using this approach [36]. Such "embedded librarians" have been introduced with success in other academic settings as well, where "dental students felt that assistance from librarians improved their literature searching skills and projects and increased their confidence in completing research" [37]. Specialized reference services increasingly include knowledge syntheses support, which is thoroughly detailed below.

Newer Roles for Academic Dental Librarians: Scholarly Communications and Research Collaboration

In addition to the traditional trio of liaison activities, new roles are expected from information professionals as libraries redefine their services around a user-centered model [38]. Academic liaisons should be able to "effectively support teaching, learning, and research; identify opportunities for further development of tools and services; and connect students, staff, and faculty to deeper expertise when needed" [6]. Additional core competencies are required to fulfill these tasks, such as a strong foundational knowledge of scholarly communication models, collaboration skills, leadership and management abilities, as well as knowledge and capability in information technologies [39, 40].

Of course, dental libraries supporting scholarly communications and research activities is not new. The Wilson Dental Library at the University of Southern California has for over 45 years provided a current awareness service that allows users to keep up with recent research and share relevant articles with students or colleagues [41]. Nevertheless, competencies and services related to publishing and research appear to be increasing in importance. To begin with, some librarians actively promote the advantages of open access publishing to their dental faculty [42, 43]. Many Canadian universities host open access repositories, and Dalhousie University, McGill University, Université de Montréal, University of Toronto and Western University currently highlight separate collections of publications from dental faculty. Another interesting project in this area of expertise is a collaboration between the dental liaison and the College of Dentistry at the University of Manitoba to build a restricted-access repository of dental clinic images [44]. Also, copyright is another facet of publication that has an implications for dental libraries: according to research conducted by Doubleday and Goben, 88% of surveyed U.S. dental schools would benefit from additional copyright training from their institution [45].

Next, disciplinary needs assessments as well as cultivating relationships with research teams are essential elements of building successful research data management (RDM) services in academic libraries [46]. RDM can be broadly defined as "best practices for organizing data storage and curation." In this regard, Buda and Pecoskie started a conversation on RDM at the University of Toronto's Faculty of Dentistry. Interviews with six administrative or laboratory managers allowed the gathering of qualitative information on data management practices, such as an openness to "receiving assistance for archiving and preserving data" and the "need to maintain some control over the data, or else be guaranteed of [its] safety" [47].

Finally, dental liaisons at the University of Alberta collaborated with a faculty member on a funding request from the Network for Canadian Oral Health Research to host a week-long Summer Research Institute-Systematic Review Workshop and participated as part of the teaching team [48]. McGowan and Williams also provide an example of a dental librarian's collaboration on a research grant application; in this case to fund a research study on the effectiveness of EBD curricula [49].

Liaison Vignette #10

Supporting Dental Hygiene Community Fieldwork at the University of British Columbia

Students in the Bachelor's Degree in Dental Science program collaborate with a local organization and elementary school, under the supervision of their course instructor, Prof. Diana Lin, to develop and deliver culturally appropriate oral health promotion. The library instruction session and research guides for this class enable the students to gather information about the organization and the community using statistical resources such as the BC Community Health Data Profiles and Statistics Canada Census Profiles, which they use to complete a situational analysis. Students also explore resources such as the Canadian Language Benchmarks and Middle Years Development Instrument to support the development of appropriate health education programs, and use PubMed to find research on program delivery.

In third year, students build on previous library instruction with a class on copyright, types of literature, and using images, music, and other media to support their debate arguments, knowledge translation, and community oral health promotional projects. Unlike general library and EBD classes in Dental Hygiene and Dentistry programs, these classes support students in developing and producing programs, handouts, and posters based on research and knowledge of the community, effectively bridging the gap from being consumers of knowledge to being knowledge producers.

Knowledge Synthesis

In terms of supporting research, a wealth of literature exists to demonstrate the value of librarian contributions to knowledge syntheses such as systematic reviews, whether as expert searchers [50], methodologists [51], information managers [52], or co-authors. Knowledge syntheses have been a core focus for health librarians since the early days of the evidence-based medicine movement and one of the principal ways in which we have been able to demonstrate the continued relevance of health sciences librarianship. Two significant, recent contributions co-authored by Canadian dental librarians in this field aim to establish and formalize the role of the librarian in scoping reviews [53], and provide evidence that librarians improve reporting in systematic reviews [54].

A recent survey of dental libraries in the U.S. and Canada found that 86% of librarians surveyed actively participate in systematic reviews by creating and conducting searches, while 45% feature an official systematic review support program, system, or service at the library [55]. Dental librarians in Canada offer a variety of different kinds of support for knowledge syntheses, and these are summarized in Table 2. Usually, support levels are formalized in agreement between all health sciences librarians at an institution.

Dalhousie University and McGill University libraries have implemented the most structured and formalized models for knowledge syntheses support across the country. Dalhousie University (https://libraries.dal.ca/research/literature-search-services.html) offers both paid and unpaid support models. Funded systematic reviews are subject to the paid service, which includes search development, translation, and implementation (including services such as deduping of articles). For unfunded reviews, the library requests authorship (or at least an acknowledgement); such reviews are also subject to a longer wait time. If authorship or an acknowledgement is not available, the library will offer a consult for the initial search, and review final strategies.

Table 2. Knowledge Syntheses Support in Canadian Dental Libraries

Support	Dalhousie	Laval	McGill	Montréal	Toronto	Western	Manitoba	Saskatchewan	Alberta	British Columbia
Systematic Review Searches	✓	-	✓	✓	✓	-	✓	✓	✓	✓
Formal Knowledge Syntheses Service	✓	-	✓	-	In process	-	In process	-	✓	-
Join Grant Applications	-	-	✓	-	-	-	✓	✓	✓	✓
Co-Authorship on Papers	✓	-	✓	✓	-	-	✓	✓	✓	✓
Beyond Systematic Reviews - Scoping, HTA, etc. Searches	✓	-	✓	✓	-	-	✓	✓	✓	✓

McGill University (http://libraryguides.mcgill.ca/sysrevservice) offers a formalized systematic review service with different levels of support for faculty and students. For faculty-led systematic reviews the library offers to support the entire process, including production of all search strategies, advice on methodology, and writing parts of the final manuscript; for this level of support the librarian should be granted authorship. Student-led projects attract a more limited service (up to 5 hours support) which usually extends to working together on the initial search strategy, which they then translate, and advising on the methodology.

Several libraries, such as at University of Toronto and Université de Montréal, offer unofficial assistance with creation and review of search strategies for systematic or other reviews for Dentistry faculty members. Requests are supported with one-on-one consultations and do not have official service guidelines. There currently is an initiative at the Gerstein Science Information Centre at the University of Toronto to provide a formal service for peer-review of search strategies, and the Dentistry Library is involved in its development.

At Western University, being part of a systematic review team is considered an academic activity for librarians. Individuals may choose to participate on a team in order to provide librarian expertise to the project. Otherwise, support is mainly consultative in nature.

The library at University of British Columbia does not offer a formal systematic review service, but does provide educational support and guidance on knowledge synthesis research. Librarians participate as team members and authors on systematic reviews if time and interest permit. The library also offers frequent workshops outlining the process and additional workshops on advanced searching.

Discussion and Conclusion

What might the next few years have in store for academic dental librarianship in Canada? This article has so far provided an overview of the current landscape of Canadian academic dental librarianship; it therefore seems appropriate to now consider how the specialty might develop in the near to medium term future. It is of course impossible to be sure what the near future may bring for the specialty, nevertheless the overview provided above, along with the literature covering the broader profession [56], highlights various influences which are likely to be significant. These influences fall into three broad categories: 1)

extending our existing contributions, 2) developing new areas of expertise, and 3) formalising the work of dental librarians.

Extending Our Existing Contributions

Embedded librarianship is here to stay. For health librarians, this manifests itself largely through our participation in dental education and by our membership on research teams undertaking knowledge synthesis projects such as systematic reviews and, increasingly, scoping reviews. Both of these areas of work offer opportunities for dental librarians to further embed ourselves, as well as to broaden our contribution and branch out into new areas.

We believe it is both desirable and likely that dental librarians will continue to offer progressively more complex and advanced content in our teaching. As both the Canadian and U.S. Commissions on Dental Accreditation prepare the next updates to their requirements [57], we expect to see an increased focus on integration of evidence-based dentistry into the dental curriculum, and believe this will be a major driver for more complex and advanced instruction from dental librarians. In our view, the aspects of EBD that are particularly suited to librarian involvement are critical appraisal of studies, and the fostering of a deeper understanding of research methodologies such as systematic reviews. An interesting example is McGill University's plan to teach the latter through the production of a publishable systematic review involving the entire student cohort. Considering that the literature contains evidence that practicing dentists do not seek information using the methods taught to them at University [27, 28], we believe there are also opportunities for dental librarians to embed themselves within the continuing dental education offerings at their respective institutions.

Dental librarian contributions to knowledge synthesis work vary significantly by institution across Canada, and we believe a degree of harmonization of offered services is likely to take place over the next few years. As Dalhousie, Alberta, and McGill Universities have discovered, when faculty and students become aware of how librarians can contribute decisively to knowledge syntheses projects, the demand for that assistance grows quickly and ultimately requires management with a formalized policy. In addition to our practical work on knowledge syntheses projects, we hope to also see more theoretical contributions to knowledge syntheses methodology from dental librarians, such as through

empirical research into the impact of librarian participation in these projects.

Developing New Areas of Knowledge and Expertise

The Canadian vision for research data management is slowly coming to fruition, as different provincial collaborations mature (the most prominent being in British Columbia and Ontario), partnered by the national Federated Research Data Repository (FRDR), which will soon enter production [58]. While data librarians have so far necessarily dominated this work, there are now clear opportunities for partnerships and collaborations with liaison librarians, such as dental librarians. The immediate opportunities we see are in targeted outreach and promotion work to dental faculty, participation in data reference interviews at the beginning of research projects, and using our specialized knowledge to assist with data description during the curation process both as data is ingested and when planning for use and reuse of the data. Gaining familiarity with RDM platforms such as Dataverse and FRDR will also become more important. The Medical Library Association has sponsored a systematic review to research aspects of this rapidly developing role, demonstrating its importance to medical librarianship.

The other significant new area that emerges from the literature and from observation of our own practice is involvement in scholarly communication. The promotion of open access publishing among faculty has much in common with the promotion of open access to research data, in particular work linked to promotion and education. As our literature review and personal experience show, knowledge among our faculty and students of factors such as the Tri-Council Policy on Open Access and the avoidance of publishing in predatory journals is low and the role for librarians in combatting this lack of knowledge is obvious.

Formalization of Our Role

The Association of College & Research Libraries Information Literacy Competency Standards for Nursing, published in 2013, aim to "guide librarians and nursing faculty in creating learning activities that will support the growth of information literacy skills over the course of a program of nursing education and for lifelong learning," and to "provide a framework for faculty and students of nursing at the associate, baccalaureate, master's, and doctoral levels in the development of information literacy skills for evidence-based nursing practice" [59]. OHIG members believe that there would be significant

benefits in the development of a similar set of guidelines for dental education in collaboration with our colleagues in the United States, as this would both provide a customized framework for the specialty while also formalising and crystallising our role in dental education and providing a roadmap for future contributions.

In this paper, the first scholarly contribution of the Oral Health Interest Group/Groupe d'intérêt en santé buccale of CHLA/ABSC since the group was founded last year, we have sought to describe the current landscape of Canadian dental librarianship, and to predict both how the specialty might naturally develop over the next few years, and how dental librarians might work to shape the specialty's future to benefit both dental librarians and the oral health professions. As dental librarianship is, of course, a subspecialty of health librarianship, we hope that this paper might serve as a useful source of ideas and inspiration to our colleagues across health librarianship, and look forward to seeing how the profession progresses over the next few years.

Acknowledgements

Statement of Competing Interests

No competing interests declared.

References

1. Bowler I. An elementary manual of dental library practice. Ann Arbor: University of Michigan; 1932. vii, 181 p.

2. American Dental Association. 2016-17 Survey of dental education: report 1 - academic programs, enrollment, and graduates. 2017. In: Surveys of Dental Education [Internet]. Available from: http://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/2016-17_SDE1_final.xlsx?la=en.

3. American Dental Education Association. ADEA official guide to dental schools. Washington, DC: American Dental Education Association; 2015.

4. Commission on Dental Accreditation of Canada. Accreditation requirements [Internet]. 2013 [cited 2017 Feb 13]. Available from: https://www.cda-adc.ca/cdacweb/en/accreditation_requirements/.

5. Association of Canadian Faculties of Dentistry. ACFD educational framework for the development of competency in dental programs [Internet]. 2016 [cited 2017 Sep 18]. Available from: https://acfd.ca/about-acfd/publications/acfd-competencies/.

6. Jaguszewski JM, Williams K. New roles for new times: transforming liaison roles in research libraries: Association of Research Libraries; 2013. Available from: http://www.arl.org/component/content/article/6/2893.

7. Perrier L, Farrell A, Ayala AP, Lightfoot D, Kenny T, Aaronson E, et al. Effects of librarian-provided services in healthcare settings: a systematic review. J Am Med Inform Assoc. 2014;21(6):1118-24. doi: 10.1136/amiajnl-2014-002825.

8. Brown K, Malenfant KJ. Academic library impact on student learning and success: findings from assessment in action team projects. Chicago: Association of College and Research Libraries; 2017. Available from: http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/value/findings_y3.pdf.

9. Ford PJ, Hibberd K. Creating effective and engaging information literacy programmes for the dental curriculum. Eur J Dent Educ. 2012;16(1):e41-e6. doi: 10.1111/j.1600-0579.2010.00671.x.

10. Kettell E. Extreme makeover: library orientation for postgraduate dental residents. Med Ref Serv Q. 2011;30(2):189-99. doi: 10.1080/02763869.2011.562806.

11. Zahradnik T, Buda M. Scaling new heights: embedded librarians adapt orientation to service enrollment increase. In: Canadian Health Library Association / Association des bibliothèques de la santé du Canada, editor. CHLA 2014 Contributed Papers/ABSC Congrès 2014 Communications libres; 2014 June 16-20; Montréal, QC: Journal of the Canadian Health Libraries Association; 2014. 35(2): 80-95.

12. Matsoukas K, Meret A, Oliver JT, Purcell M. Customized USB flash drives used to promote library resources and services to first-year medical and dental students. Med Ref Serv Q. 2011;30(2):107-19. doi: 10.1080/02763869.2011.562769.

13. Theis-Mahon N. The master's of science in dental hygiene is going online: supporting online learning from the start. In: Medical Library Association, editor. Medical Library Association 2015 Annual Meeting Poster Abstracts, Medical Library Association; Austin, TX: Available from: http://www.mlanet.org/d/do/1924.

14. Cobban SJ, Seale LN. A collaborative approach for improving information literacy skills of dental hygiene students. Int J Dent Hyg. 2003;1(1):49-56. doi: 10.1034/j.1601-5037.2003.00005.x.

15. Clairoux N, Desbiens S, Clar M, Dupont P, St-Jean M. Integrating information literacy in health sciences curricula: a case study from Québec. Health Info Libr J. 2013;30(3):201-11. doi: 10.1111/hir.12025.

16. Funnell P. Drop-in sessions as an effective format for teaching information literacy: a case study in the Medical and Dental Libraries at Queen Mary University of London. J Info Lit. 2015;9(2):62-83. doi: 10.11645/9.2.1982.

17. Clifton S, Jo P. A journey worth taking: exploring a hybrid embedded library instruction model through three distinct cases. Med Ref Serv Q. 2016;35(3):305-18. doi: 10.1080/02763869.2016.1189784.

18. Guo RR, Calley K, Peterson T. Comparisons of learning outcomes and self-reflections in dental hygiene students. In: Medical Library Association, editor. Proceedings, 114th Annual Meeting, Medical Library Association; May 16-21, 2014; Chicago, IL: J Med Libr Assoc; 2015. p. E1-E22, P-8.

19. Lawrence JC, Levy LS. Comparing the self-described searching knowledge of first-year medical and dental students before and after a MEDLINE class. Med Ref Serv Q. 2004;23(1):73-81. doi: 10.1300/J115v23n01_07.

20. Storie D, Campbell S. Determining the information literacy needs of a medical and dental faculty. J Can Health Libr Assoc. 2012;33(2):48-59. doi: 10.5596/c2012-011.

21. Gu X-M. Librarians' roles in evidence-based dentistry education: a review of literature and a survey in North America. Med Ref Serv Q. 2010;29(4):331-48. doi: 10.1080/02763869.2010.518918.

22. Swanberg SM, Dennison CC, Farrell A, Machel V, Marton C, O'Brien KK, et al. Instructional methods used by health sciences librarians to teach evidence-based practice (EBP): a systematic review. J Med Libr Assoc. 2016;104(3):197-208. doi: 10.3163/1536-5050.104.3.004.

23. Stellrecht E. Clinical librarian in outpatient dental clinics: implementing a new service to assist dental clinicians at the point of need. In: Medical Library Association, editor. Proceedings, 113th Annual Meeting, Medical Library Association; Boston, MA: J Med Libr Assoc; 2014. p. E1-E22.

24. Stellrecht E, Aronoff N, Grabowski J, Zafron ML, Lyons AG, Glogowski MF, et al. Evaluating the impact of evidence-based practice online learning modules on interprofessional education (IPE). In: Medical Library Association, editor. 116th Annual Meeting, Medical Library Association; Toronto, ON, Canada: J Med Libr Assoc; 2017. p. E1-E20.

25. Hinton EG, Clark SB. Designing a library resource module for an interprofessional curriculum. In: Medical Library Association, editor. 116th Annual Meeting, Medical Library Association; Toronto, ON, Canada: J Med Libr Assoc; 2017. p. E1-E20, P-62.

26. MacEachern MP, Townsend W, Zeylikovich I, Bayne SC, Fitzgerald M, Mangrulkar RS. Transforming traditional informatics sessions into curriculum-integrated online learning modules: Two case studies from an academic health sciences library. In: Medical Library Association, editor. Proceedings, 113th Annual Meeting, Medical Library Association; Boston, MA: J Med Libr Assoc; 2014. p. E1-E22, P-290.

27. Straub-Morarend CL, Wankiiri-Hale CR, Blanchette DR, Lanning SK, Bekhuis T, Smith BM, et al. Evidence-based practice knowledge, perceptions, and behavior: a multi-institutional, cross-sectional study of a population of U.S. dental students. J Dent Educ. 2016;80(4):430-8.

28. Isham A, Bettiol S, Hoang H, Crocombe L. A systematic literature review of the information-seeking behavior of dentists in developed countries. J Dent Educ. 2016;80(5):569-77.

29. Lubker IM, Pellefrini JM. Collaborative instruction for information retrieval and appraisal skills in evidence-based practice models for dental hygiene students. In: American Dental Education Association, editor. ADEA Annual Session & Exhibition; March 18-21, 2017; Long Beach, CA: Journal of Dental Education; 2017. p. 190-240, P-188.

30. Buda M, He H. Collection inventory in a Canadian academic dentistry library. J Can Health Libr Assoc. 2012;33(3):123-6. doi: 10.5596/c12-029.

31. Medical Library Association. Dental Section [Internet]. 2017 [cited 2017 July 6]. Available from: http://www.mlanet.org/p/cm/ld/fid=524.

32. Cox JE. Citation analysis of graduate dental theses references: implications for collection development. Collection Management. 2008;33(3):219-34. doi: 10.1080/01462670802045558.

33. Gao W. Information use in communication research: a citation analysis of faculty publication at the University of Houston. Behavioral & Social Sciences Librarian. 2015;34(3):116-28. doi: 10.1080/01639269.2015.1062585.

34. Denton GB. Reference problems of the dental librarian. Bull Med Libr Assoc. 1933;22(2):77-84.

35. McClellan CS. Live reference in an academic health sciences library. Internet Ref Serv Q. 2003;8(1-2):117-26. doi: 10.1300/J136v08n01_10.

36. Stellrecht E, Chiarella D. Targeted evolution of embedded librarian services: providing mobile reference and instruction services using iPads. Med Ref Serv Q. 2015;34(4):397-406. doi: 10.1080/02763869.2015.1082372.

37. Blake L, Ballance D, Davies K, Gaines JK, Mears K, Shipman P, et al. Patron perception and utilization of an embedded librarian program. J Med Libr Assoc. 2016;104(3):226-30. doi: 10.3163/1536-5050.104.3.008.

38. Rockenbach B, Ruttenberg J, Tancheva K, Vine R. Library Liaison Institute final report: American Research Libraries; 2015. Available from: http://www.arl.org/publications-resources/3803-library-liaison-institute-final-report.

39. Canadian Association of Research Libraries. Core competencies for 21st century CARL librarians 2010. Available from: http://www.carl-abrc.ca/doc/core_comp_profile-e.pdf.

40. Medical Library Association. MLA competencies for lifelong learning and professional success [Internet]. 2017 [cited 2017 July 13]. Available from: http://www.medlib-ed.org/competencies.

41. Hughes AM, Glueckert JP. Providing dental current awareness to faculty and residents. Med Ref Serv Q. 2014;33(1):29-38. doi: 10.1080/02763869.2014.866480.

42. Clairoux N, Clar M, Sauvé D. Diffuser en libre accès: une habitude à prendre pour maximiser l'impact de vos publications! Montréal, Québec: Direction des Bibliothèques, Université de Montréal; 2016. Available from: http://hdl.handle.net/1866/13344.

43. Somerville MM, Wirrell J, Paris M. What is the University of the Pacific Scholarly Commons and how can it benefit the dental school? [Presentation]. University of the Pacific, Arthur A. Dugoni School of Dentistry 2016. Available from: https://works.bepress.com/mickel-paris/4/.

44. Access Conference. Sharing the unshareable - dental clinic images in a university image repository [Online video, 14 min 22 sec]. 2012 [cited 2017 Aug 31]. Available from: https://youtu.be/M-RFXNmw8sI.

45. Doubleday AF, Goben A. Exploring faculty knowledge and perceptions of copyright at U.S. dental schools: a pilot study. J Dent Educ. 2016;80(11):1308-18.

46. Henderson ME, Knott TL. Starting a research data management program based in a university library. Med Ref Serv Q. 2015;34(1):47-59. doi: 10.1080/02763869.2015.986783.

47. Buda M, Pecoskie C. The library and the lab: exploring research data management at the University of Toronto's Faculty of Dentistry Toronto, ON: University of Toronto; 2016. Available from: http://hdl.handle.net/1807/73697.

48. Flores-Mir C, Pacheco-Pereira C, De Luca Canto G, Elyasi M, Saltaji H. Oral Health Research Methods Summer Institute: a systematic review methodology workshop. J Can Dent Assoc. 2015;81:f17.

49. McGowan R, Williams J. Jumping in: collaborating on an evidence-based dentistry research grant. In: Medical Library Association, editor. Proceedings, 114th Annual Meeting, Medical Library Association; Chicago, IL: J Med Libr Assoc; 2015. p. E1-E22.

50. Medical Library Association. Role of expert searching in health sciences libraries: Policy Statement by the Medical Library Association adopted September 2003. J Med Libr Assoc. 2005;93(1):42-4.

51. Beck C. Research partner and search methodology expert: the role of the librarian in systematic reviews. In: Raju R, Adam A, Johnson G, Miller C, Pietersen J, editors. The quest for deeper meaning of research support. Cape Town: University of Cape Town Libraries; 2015. p. 90–104.

52. McGowan J, Sampson M. Systematic reviews need systematic searchers. J Med Libr Assoc. 2005;93(1):74-80.

53. Morris M, Boruff JT, Gore GC. Scoping reviews: establishing the role of the librarian. J Med Libr Assoc. 2016;104(4):346-54. doi: 10.3163/1536-5050.104.4.020.

54. Meert D, Torabi N, Costella J. Impact of librarians on reporting of the literature searching component of pediatric systematic reviews. J Med Libr Assoc. 2016;104(4):267-77. doi: 10.3163/1536-5050.104.4.004.

55. Stellrecht E, McGowan R, Lubker IM, Schvaneveldt N, Arnold S, Cortez E, et al. A comprehensive summary of services and resources provided by librarians in support of dental schools in the U.S. and Canada. In: American Dental Education Association, editor. ADEA Annual Session & Exhibition; March 18-21, 2017; Long Beach, CA: Journal of Dental Education; 2017. p. 190-240, P-111.

56. Ferracane JL, Garcia RI, Ajiboye AS, Mullen C, Fox CH. Research and Dental Education: An AADR Perspective on the "Advancing Dental Education: Gies in the 21st Century" Project. J Dent Res. 2017;96(10):1073-5. Epub 2017/08/22. doi: 10.1177/0022034517723566.

57. Catalanotto FA. Expected Changes in Regulation and Licensure: Influence on Future Education of Dentists. J Dent Educ. 2017;81(9):eS11-eS20. Epub 2017/09/03. doi: 10.21815/jde.017.028.

58. Portage Network. The Federated Research Data Repository [Internet]. Ottawa, ON: Portage Network; 2017 [cited 2017 Sep 20]. Available from: https://portagenetwork.ca/frdr-dfdr/.

59. Phelps SF. Designing the Information Literacy Competency Standards for nursing. Med Ref Serv Q. 2013;32(1):111-8. Epub 2013/02/12. doi: 10.1080/02763869.2013.749720.