

RESEARCH ARTICLE / ARTICLE DE RECHERCHE

A cross-sectional survey on academic librarian involvement in evidence-based medicine instruction within undergraduate medical education programs in Canada

Zahra Premji,⁺ Kaitlyn Fuller and Rebecca Raworth

Abstract: Introduction: The purpose of this study was to determine the range of involvement of Canadian academic medical librarians in teaching evidence-based medicine (EBM) within the undergraduate medical education (UME) curriculum. This study articulates the various roles that Canadian librarians play in teaching EBM within the UME curriculum and also highlights their teaching practices. **Methods:** An electronic survey was distributed to a targeted sample of academic librarians currently involved in UME programs in Canadian medical schools. **Results:** Twelve respondents (including one duplicate response) representing ten schools responded to this survey. Seven of 10 respondents were involved in EBM instruction, 3 of 10 institutions had a dedicated EBM course. Librarians were involved in a variety of roles, and often co-created and co-delivered content along with medical school faculty, and were present on course committees. They used a variety of educational strategies, incorporated active learning, as well as online modules. **Discussion:** The data highlighted the embedded nature of EBM instruction in undergraduate medical education programs in Canada. It also showed that librarians are involved in EBM instruction beyond the second step of EBM; acquiring or searching the literature.

Introduction

Academic librarians are involved in information literacy (IL) instruction in a variety of ways and to varying extents [1]. Information literacy is defined as a “set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning” [2]. Academic medical librarians are often involved in teaching evidence-based medicine (EBM) within the undergraduate medical education (UME) curriculum. Evidence-based medicine is described by Sackett et al. as the

“conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research” [3].

EBM is often described as a five-step process: ask, acquire, appraise, apply, and evaluate [4]. All of the Canadian medical education programs include within their curriculum the various roles that make up the CanMEDS framework, which contain a key competency specifically relating to EBM, “integrate best available evidence into practice” [5]. Furthermore, the Medical Council

Zahra Premji. PhD, MLIS, Research and Learning Librarian, University of Calgary, Calgary, AB

Kaitlyn Fuller. MLIS, Education and Liaison Librarian, University of Toronto, Toronto, ON

Rebecca Raworth. Medical Librarian, University of Victoria, Victoria, BC

⁺Corresponding author (email: zahra.premji@ucalgary.ca)

This article has been peer-reviewed.

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of Canada (MCC) also has an objective about understanding and practicing EBM which can be found in the Scholar Role Objective 2 of CanMEDS [6]. These national organizations demonstrate and emphasize the importance of EBM in the Canadian medical education landscape.

Medical librarians have a history of fostering information literacy skills and supporting EBM in the curriculum in a variety of formats [7]. For example, Gagliardi et al. [8] investigated an EBM course which was eventually incorporated into the program, and which was co-developed and co-taught by librarians and clinical faculty. A 2014 review by Maggio and Kung [9], focused on how medical students were being trained to locate literature for EBM, and showed that librarians were involved in the instructional activities in 9 of the 12 studies reported. Maggio, Durieux, and Tannery [10] interviewed 9 librarians, 4 of whom were from Canada, asking them to describe from their own perspective and the librarian's role in EBM curriculum. This qualitative study found that librarians identify with the roles that Dorsch & Perry [11] outlined in their review, with those roles consisting of curricular design, curricular development, curricular assessment, professional development and educational training [10].

Nevius et al. [1] surveyed the 157 accredited medical schools in the United States and Canada and received responses from ten of the Canadian libraries. However, their research was interested in all library-related instruction (curriculum-integrated as well as non-curriculum related instruction) carried out by academic librarians in medical schools, and their survey data dates back to 2015.

Results from a 2011 survey examining EBM instruction in US and Canadian medical education curricula [12] showed that librarians are frequently involved in EBM instruction in the first two years of medical school programs. A review published in 2012 investigated the role of librarians in the instruction and assessment of learning in EBM and asserted that there is

literature demonstrating that health sciences librarians are collaborators in curriculum development, instruction, assessment, as well as in medical research [11]. To our knowledge, there are no recent (within the last five years) studies which focus on Canadian academic medical librarians and their roles in teaching EBM within the UME curriculum.

As a result, this study is interested in highlighting the involvement of Canadian academic medical librarians in teaching EBM within the UME curriculum, as well as showcasing the variety of roles that librarians play in teaching EBM within the UME curriculum. Our objective in gathering and sharing this information is to provide a record focused on the Canadian context and to highlight any similarities, differences, or trends among librarians teaching EBM in UME at Canadian institutions. We hope that the results of this survey will be useful to Canadian UME librarians who are either looking for some evidence on what their peers across Canada are doing with regard to EBM instruction within the UME curricula, or who may be interested in changing their own practices or advocating for something different than what they are currently doing.

Methods

An electronic survey was created using a tool called LibWizard by Springshare. The electronic survey was distributed to a targeted sample of academic librarians via email lists. In order to be eligible to participate, an individual had to be an academic librarian involved with 1 of the 17 UME programs in Canada, as of April 30th, 2018. Given that some questions in the survey asked about the institution or medical program as a whole, only one response per institution or per site, was desired. This was done in order to prevent overestimation of an effect or trend by duplicate data. If the institution had distributed sites, these distinct sites would not be considered duplicate data and would therefore be included in

the results because librarian involvement may vary across different sites.

Participants were recruited through email lists, including the Canadian Health Library Association (CHLA) email list, the Canadian Academic Medical Education Liaisons Special Interest Group (within CHLA), and the Association of Faculties of Medicine of Canada (AFMC) Network on Libraries email list. Additionally, after the survey had been open for two weeks, recruitment emails were sent directly to the email addresses of the relevant health sciences or medical libraries. In total, the survey was open for just over one month (April 30th - June 6th, 2018).

The 23-question survey (Appendix 1) was developed by the co-investigators and contained a combination of open-ended and closed structured questions, including multiple choice selections, and was available in English only. Adaptive questioning was used to guide participants down one of two pathway options, based on whether they participated in EBM instruction at their institution or not. This survey was developed using the definitions in the *Guidelines for Reporting Evidence-based Practice Educational interventions and Teaching* (GREET) [13]. Specifically, the term formal instruction was defined as “any learning activity where the intent is to facilitate the learning of skills or knowledge” [13]. We also defined a formal environment as being one that is part of the curriculum that each student in the program is exposed to. This would include, for example, a tutorial session within a course. In contrast, a meeting with a librarian for a research consultation or an optional workshop would not be considered a formal educational intervention, as per the definition above.

Prior to distribution, the survey was piloted by three academic librarians from different institutions and following the pilot, some suggested adjustments were made.

Consent was obtained from participants before they entered the survey, by way of an electronic letter of consent, in which participants were told the purpose of the survey, what kind of data was

being collected, the length of the survey, and who the investigators of the project were. Participation in the survey was completely voluntary and there were no incentives provided.

Data was exported from LibWizard and cleaned by the principal investigator before data was analyzed, specifically, removing identifying information, such as what university the respondent was from. When dealing with an institution with more than one site, such as medical schools that operate on a distributed model, if more than one response was retrieved from the same institution but from different sites, both responses were retained. This was done because different sites of a medical school could have varying roles for librarians despite having the same curriculum, and we wanted to provide a comprehensive representation of librarian involvement in EBM in UME curriculum.

Data was exported to Excel and only shared with co-investigators for the purpose of analysis, and then was deleted. The principal investigator is the only investigator retaining access to the data, and will store the data until June 2025, after which time it will be destroyed. The data was retained in case a longitudinal approach to this study was desired at a later date by the authors.

This study was approved by the relevant ethics boards at the University of Calgary (REB18-0006), the University of Toronto (HPR-00007920), and the University of Victoria (protocol number 18-081).

Results

We received a total of 12 responses, representing librarians from 10 different institutions, equaling a 59% response rate in terms of institutions who potentially could have participated. However, the initial data gathered included one instance of duplicated data, because there were two librarians who responded from the same university and the same site. This duplicate data was removed by the principal investigator, so that each site's data would only be counted once. In this case, the data received first (based on

submission time stamp) was retained. We did not have an issue of conflicting responses from the duplicated responses. The remaining 11 responses from 11 librarians involved in UME programs at 10 unique institutions and 11 unique sites are included in the analysis below.

Demographics of the Respondents

Survey respondents had varying years of experience as a medical librarian: 2 respondents (18%) had 0-2 years, 1 respondent (9%) had 3-5 years, 2 respondents (18%) had 6-10 years, and 6 respondents (55%) had more than 10 years of experience as a medical librarian. It should be noted that our survey did not ask for years of experience as a UME librarian, therefore it is possible that respondents had years of experience as a medical librarian working in other roles but were relatively new to their role as a UME librarian. When categorized based on familiarity with the curriculum, 10 of 11 (91%) respondents stated they were either familiar or very familiar with the medical curriculum at their institution. These demographics were gathered to determine if years of experience or familiarity with the curriculum were factors in the level or depth of involvement in EBM instruction.

EBM in Canadian Medical Education

All 11 respondents (100%) reported that their institution offers formal EBM training. Respondents were asked at what stage in the medical program the formal EBM instruction took place. Four respondents (36%) stated that EBM instruction happened during pre-clerkship (typically year 1 and year 2), 4 (36%) stated that it

was woven throughout the 4-year curriculum and 1 respondent (9%) selected clerkship (typically year 3 and year 4). Two respondents (18%) selected both pre-clerkship as well as clerkship; respondents could select more than one response.

Our survey asked whether EBM was taught as a stand-alone course. Only 3 out of 11 respondents (27%) indicated that EBM is taught as a stand-alone course at their institution.

Out of the 11 respondents, 7 (64%) stated they participate in formal EBM instruction. Since participation in EBM instruction was a required criterion to go on to complete the remaining questions in the survey, the remaining data presented is from those 7 participants representing 7 unique institutions. Based on a cross-comparison of the responses from questions 4 and 8, and questions 3 and 8 in the survey respectively, familiarity with UME curriculum and years of experience did not appear to be associated with involvement in EBM (Figure 1 and Figure 2). For example, Figure 1 shows that 2 of 7 (28.6%) respondents who stated being familiar with the UME curriculum were not currently involved in teaching EBM, and 1 of 3 (33.3%) respondents who reported being very familiar with the UME curriculum were not involved in teaching EBM. From the limited data available, being more familiar with the UME curriculum did not increase the likelihood of being involved in teaching EBM. However, due to the small sample size, statistical analysis or validation of this finding is not possible.

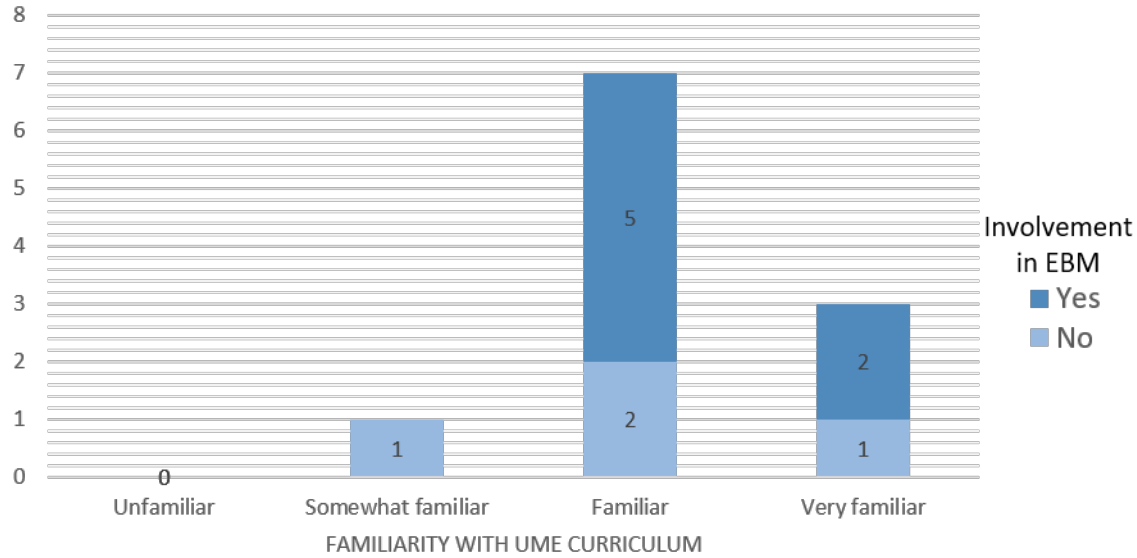


Fig.1: Familiarity with UME curriculum and involvement with EBM

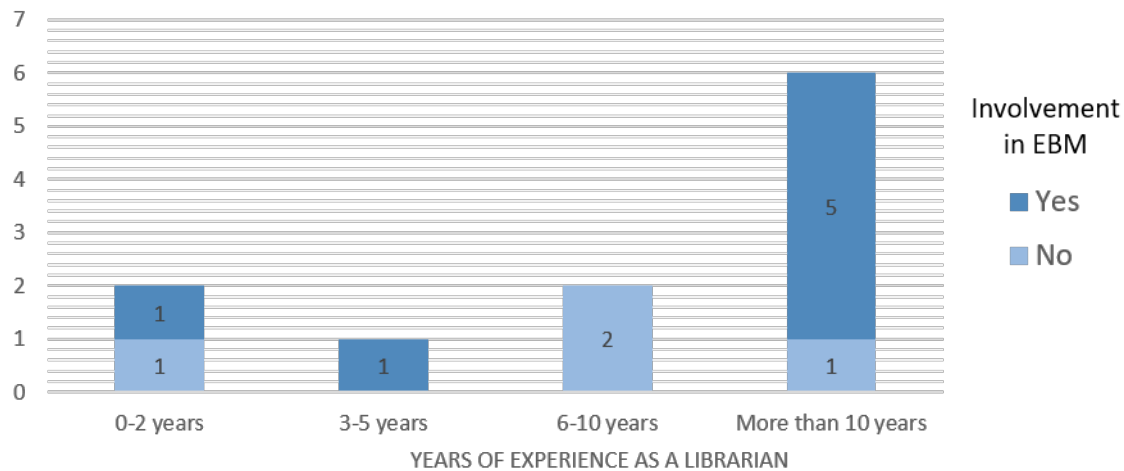


Fig. 2: Years of experience as a librarian and involvement in EBM

Librarian Role in EBM Instruction

Librarians involved with teaching EBM may take on a variety of roles in addition to that of a guest lecturer. These roles include course instructor (n=2/7, 29%), course designer or course committee member (n=4/7, 57%) embedded librarian within their programs (n=3/7, 43%) and participant in course assessment (n=4/7, 57%) (Table 1).

Table 1: Roles of medical librarians in teaching EBM

Role	Percentage	
	Count	(%)
Guest lecturer	4	57.14%
Embedded librarian	3	42.86%
Assessment/grading of course assignments	4	57.14%
Course or curriculum designer/course committee member	4	57.14%
Course Instructor (listed on course outline)	2	28.57%

For librarians involved with assessment, multiple choice questions were the most common assessment method used (n=3/7, 43%), while 2 respondents indicated that they use course assignments (29%).

A majority of the librarians stated that they co-create the EBM content (n=5/7, 71%) with either another health sciences librarian (n=1/7, 14%), a clinical or academic faculty member (n=3/7, 43%), or both (n=1/7, 14%). When it comes to delivering the instruction, 3 respondents (43%) stated that they co-deliver the session with either a hospital librarian (n=1/7, 14%) or with clinical or academic faculty (n=2/7, 29%). Four respondents (57%) delivered EBM sessions on their own.

Setting, Educational Strategies, and Content

EBM instruction involving librarians takes place in a variety of settings including university classrooms (n=6/7, 86%), the library (n=4/7, 57%), hospital lecture halls (n=1/7, 14%), and

hospital library computer labs (n=1/7, 14%). Total face-to-face contact hours between librarian and students, from all formal EBM instruction in one academic year, ranged from 2 hours (n=2/7, 29%), 3 hours (n=4/7, 57%) to 4 hours (n=1/7, 14%).

While in-class lecture is still the most common educational strategy used, with all 7 respondents (100%) saying they use this method, nearly half (n=3/7, 42%) of respondents indicated that online modules are also part of their overall instruction (Table 2). When asked about the specific teaching strategies used, didactic lecture was the most commonly reported method (n=5/7, 71%), however it was often used with other strategies such as active learning in a classroom (n=4/7, 57%) or active-learning clinically integrated (n=1/7, 14%).

Table 2: Educational and teaching strategies used in EBM instruction

Teaching strategies	Count	Percentage (%)
Didactic lecture	5	72%
Active-learning/interactive but classroom-based	4	57%
Active-learning/interactive but clinically-integrated	1	14%
Flipped classroom (hybrid model which requires some pre-class preparation/reading)	2	29%
Educational strategies	Count	Percentage (%)
In-class lecture	7	100%
Small group tutorials (20 students or less)	4	57%
Online modules	3	43%

71% (n=5/7) of survey respondents indicated that their EBM learning objectives were based on a competency framework; furthermore, all of those respondents (n=5/7) mentioned the CanMEDS framework.

In terms of the resources covered during EBM instruction, PubMed and the Cochrane databases were mentioned the most (n=5/7, 71%). All respondents at this point of the survey (n=7/7, 100%) incorporated either MEDLINE or PubMed in their EBM instruction. Clinical tools were also heavily featured and were reported by 5 respondents; DynaMed alone (n=2/7, 29%), UpToDate alone (n=1/7, 14%) or both DynaMed and UpToDate (n=2/7, 29%) (Table 3).

When describing the information literacy skills being taught in the sessions, all of the respondents (n=7/7, 100%) covered skills relating to the first two steps of EBM (ask and acquire) with 2

respondents (29%) also stating that they incorporate critical appraisal (step three of EBM: appraise). In addition to the formal instruction, most librarians (n=6/7, 86%) mentioned that online research guides using a platform called LibGuides were also used to support students learning EBM.

The open responses to the question asking whether significant changes had occurred in the last three years provided some insight on how often changes occur. Overall, 2 respondents (29%) stated that no significant changes had occurred, whereas the remaining 5 respondents (71%) said that significant changes had occurred in the past three years. These changes included: new course content, changes in the role of the librarian in terms of their involvement in course assessment, annual evaluation and changes made to the course and content, or a shift towards more online modules.

Table 3: Information resources being incorporated in EBM instruction

Information resource	Count	Percentage (%)
Cochrane Databases	5	71
Pubmed	5	71
Pubmed Clinical Queries	4	57
Dynamed/Dynamed Plus	4	57
Clinical Guidelines	3	43
RxTx	3	43
UpToDate	3	43
TRIP Database	3	43
Access Medicine	2	29
ACP Journal Club	2	29
BMJ Best Practice	2	29
Ovid Medline	2	29
Clinical Key	1	14
EMBASE database	1	14
Lexicomp	1	14
Martindale	1	14
Medical Letter	1	14
Micromedex	1	14
PubMed Health	1	14

Discussion

Librarian involvement in formal EBM teaching and instruction

EBM best fits into the CanMEDS competencies within the Scholar Role because of the key concept of “Evidence-informed decision making”, as well as into the MCC Scholar objective 2: “[a]pply principles of research and information management to learning and practice” [5,6]. Both the CanMEDS concepts and MCC objectives have specific sections related to information literacy skills. Medical librarians’ competencies in information literacy are therefore well aligned to teaching some of the skills needed to practice EBM. Furthermore, as we have already established, many medical librarians are involved with EBM curricula [11,12,15]. All respondents of this survey confirm that EBM is being taught at their institutions; however only 7 out of the 11 respondents (representing 7 of 10 unique institutions) indicated that they participate in formal EBM instruction.

We defined formal instruction based on GREET [13] and also defined what we meant by a formal environment. This distinction between formal education support and other EBM education support is important because this survey did not capture the other ways medical librarians support their EBM education curriculum through consultations, optional workshops, or online research guides.

Our data did not appear to associate familiarity with the curriculum or years of experience as a medical librarian (which may not correlate with years of experience as the UME librarian) with being involved in EBM instruction; this suggests that there may be program specific or external factors impacting librarian involvement in EBM instruction. This survey did not explore these other factors, and this is an opportunity for further exploration. The comments to the open-ended questions regarding changes that have occurred within UME programs over the last three years

showed that in majority of cases, changes had recently occurred or were occurring on an ongoing basis. Therefore, involvement or lack of involvement of UME librarians in EBM instruction in one year may not be indicative of a trend. The changes mentioned do suggest the fluid and iterative nature of librarian involvement in EBM within the UME program. This survey did not investigate how these changes impact librarian workload, as curriculum pieces shift and teaching modalities change, and this is another area of future exploration.

Integrated approach

Gagliardi et al. discussed an EBM course that was initially offered as a noncredit elective, but eventually became a credit-bearing elective available to 3rd and 4th year medical students [8]. Liabsuetrakul et al. [16] discussed a longitudinal EBM curriculum embedded into the program. All 11 respondents to our survey stated that EBM training is formally offered at their institutions; however, only 3 respondents indicated that EBM is currently being taught as a stand-alone course. This suggests that EBM instruction is being integrated into other components of UME programs.

Survey respondents selected pre-clerkship only (n=4), clerkship only (n=1), both pre-clerkship and clerkship (n=2), or woven throughout the program (n=4) for describing the timing of formal EBM instruction at their institution. If we merge the values of those respondents who selected the option of weaving the formal instruction throughout the program, with those who selected distinct times of the program, then it appears that 10 (91%) respondents from 9 unique institutions have formal EBM instruction in pre-clerkship years, and 7 (64%) respondents from 7 unique institutions incorporate formal EBM instruction during clerkship years. Although this study does not explore the reasons for this discrepancy, the differences between pre-clerkship and clerkship curriculums structures, and the distributed nature of some clerkship programs could be contributing factors. Furthermore, the type of information

taught during these sessions could be seen as foundational information that is best suited for the pre-clerkship curriculum. Our results do however, match those of Nevius et al. [1] who showed that curriculum-integrated library instruction occurs more frequently in year 1 and least frequently in year 4. Their geographic analysis (10 Canadian respondents, out of 73 total respondents) showed that Canadian libraries were more likely to report integration in year 1 ($p=0.037$). However, despite these results appearing to be significant, Nevius et al. [1] did caution that it is possible that the results may have been “essentially random.”

Librarian collaboration and educational approaches

Dorsch & Perry [11] discussed the common interests and collaboration that occurs between health sciences librarians and medical educators. Our data illustrates that this collaboration occurs at Canadian institutions as well. Canadian UME librarians are embedded into UME programs in order to support EBM instruction in Canada; a majority of librarians teach EBM as guest lecturers; many also sit on EBM-focused course committees and contribute to the design of the course. Almost one-half of respondents co-create and/or co-teach EBM content along with medical school faculty. This indicates that there is a significant amount of collaboration between librarians and UME programs. Our results match the trend reported in a review by Maggio & Kung (9); of the 12 studies reported in their review, 33% ($n=4$) of the interventions were co-taught by librarians and clinicians, 42% ($n=5$) were taught by a librarian alone, 17% ($n=2$) were taught by only medical school faculty, and they were unable to determine who taught the sessions in one study (8%). Librarian involvement in the development and design of EBM course content is not new, and does not consist of only the individual sessions taught by librarians but can also be part of the whole EBM course. Gagliardi, Stinnett & Schardt [8] reported on an EBM course that was co-developed by a librarian and a clinician; initially it was a non-credit 6 session course, but eventually

became a credit-bearing elective course for 3rd and 4th year medical students.

Active engagement in the learning process was shown to be a significant variable leading to improvement in knowledge [17]. Maggio & Kung [9] reported in their review that most studies did not provide enough detail to report on the teaching modalities or learning activities. Our survey shows that Canadian UME librarians involved in EBM instruction are utilizing active learning approaches and incorporating interactivity either in conjunction with didactic modes of teaching or using flipped classroom approaches.

Our survey highlighted the variety of resources that are being incorporated into EBM instruction including clinical tools, clinical guidelines, ACP Journal Club, and so on. However, all respondents to our survey also reported incorporating either PubMed or MEDLINE, which matches the findings reported in a 2014 review [9], where 11 (of the 12 interventions) incorporated either PubMed or MEDLINE. This result indicates that teaching how to search the biomedical database MEDLINE still represents a critical element of librarian led EBM instruction, and is being taught as part of EBM content across medical schools in Canada. Highly processed information such as the evidence-based topic summaries found in clinical tools, such as UpToDate, DynaMed or BMJ Best Practice were also frequently mentioned by our respondents. As both subject databases, such as MEDLINE, and evidence-based resources such as UpToDate, are unique and important for educational and clinical environments, this result may not be surprising. This may indicate that there is a breadth to librarian led EBM instruction. For example, searching and selecting a study from a database such as MEDLINE requires different skills than those required to search and consume an evidence-based summary such as a topic summary in UpToDate. However, similar to our survey, many studies reported in the review [9] also incorporated other information resources including pre-appraised resources such as

DynaMed, UpToDate, AccessMedicine, ACP Journal Club, Cochrane reviews, and so on.

While clinical tools and Cochrane databases seem to be the ones more commonly taught as part of EBM, there is no consistency across all institutions. This should not be equated to a lack of consistency in terms of the breadth of information resources that each medical student in Canada is exposed to during their medical education. The variation may be due to many factors including: the specific questions asked in our survey, how each respondent interpreted what does or does not count as “EBM-related,” the amount of time allocated to the librarian for teaching EBM (more allocated teaching time may lead to a greater number of information resources being incorporated), or the way in which the medical program has been designed (it may be that other resources are incorporated in other parts of the program).

In addition to participating in EBM instruction, our survey also showed that Canadian librarians create online research guides (n=6/7, 86%) and online modules (n=3/7, 43%) for EBM instruction. These types of asynchronous electronic resources can be used by students at any time of day and throughout their time as a medical student. Our results are similar to those of Nevius et al. [1] who reported that 85% of the responding medical libraries created subject guides.

While only a minority of librarians created EBM online modules for their students, the open-ended comments received as part of the responses in our survey expressed the need for an increased use of online modules, particularly in programs with regional medical campuses. Nevius et al. [1] reported that 78% of responding medical libraries created recorded tutorials. Their number is higher than that found by our survey, although this is not surprising as our survey focused specifically on EBM, whereas they were reporting on all librarian-led instruction, which incorporates EBM as well as other topics such as databases, citation managers, or apps, to name a few. Online modules have benefits; they do not have to occur in a class

and students can complete the online modules at their own pace and re-watch as needed. However, online modules are time consuming to create, need technological or financial support, and also require the development of proficient e-learning best practices. Schilling [18] examined the impact of traditional versus e-learning on the information retrieval skills of first-year medical students. They gathered data using pre and post skills and attitudes surveys and included an evaluation of the students’ MEDLINE search strategies. Their study showed no significant differences in the MEDLINE searching scores between the two groups (traditional classroom and e-learning).

Limitations

There were several limitations to our study. In the spirit of transparency, we have attempted to share all known limitations, and recognize that many improvements can be made in future research.

Our survey had a lower than desired response rate of 59%. With seventeen accredited medical schools in Canada, we received responses from librarians representing only ten different medical schools. Nevius et al. [1] surveyed both US and Canadian medical libraries, and received a total response rate of 47%, which included responses from ten Canadian libraries (matching the number of responses we received to our survey). We did not translate our survey into French, and this may have affected the response rate.

A further limitation of the cross-sectional study design is that it only shows a snapshot of that particular point in time; in this case capturing data from 2017-2018, the academic year preceding the distribution of the survey.

The population targeted for this survey was only Canadian academic medical librarians participating in EBM instruction within the UME curriculum. Other librarians, such as hospital librarians, may be involved with EBM instruction in UME programs, especially during clerkship, through activities such as orientations, clinical rounds, or as community stakeholders on EBM projects. This survey does not capture their work, and only represents data from when an academic

medical librarian was responsible for organizing or leading the instruction.

Respondents were asked how long they had been a medical librarian, but were not specifically asked how long they had been involved with the UME program. It is unknown whether this will impact the likelihood of being involved in teaching EBM within the UME curriculum. Furthermore, some questions asked about the respondents' practices regarding teaching, creation and delivery of content, selection of resources included, and so on, whereas other questions specifically asked about the respondent's institution. Therefore, it should be noted that some responses reflect the practices of the respondents and are not reflective of institutional practices.

The split path in our survey prevented those respondents who were not involved in EBM instruction from continuing on to respond to the open-ended questions. This prevented us from receiving some potential responses about significant changes that had occurred in the three previous years. This information could have provided some insight into whether changes in involvement had occurred in recent years, whether that year was an anomaly due to extenuating circumstances, or whether the lack of involvement was consistent over the previous few years. As the survey was anonymous, it was not possible to follow up with respondents who exited the survey at the split path to obtain responses to the open-ended questions. Future research using a similar design should take this into consideration when designing surveys.

The three investigators involved in this study met the eligibility criteria to participate in the survey. Since the intention of this survey was to highlight the participation of academic medical librarians in EBM instruction within the UME curricula in as many of the seventeen Canadian medical schools as possible, the investigators also responded to the survey as they were the only representatives for their individual institution or site. Since this survey's intent was to report on the specific aspects of librarian activities which were

considered to be objective rather than subjective, the investigators determined that the benefits of including data from their own practices and their own institutions would outweigh the risk of bias.

Future directions

Clerkship was identified from the responses to our survey questions as an area of opportunity and further collaboration. This sentiment was expressed through comments and responses to the open-ended questions, where librarians stated that they would like to pursue more co-teaching opportunities, as well as collaboration with clinical faculty during clerkship. Identifying potential barriers or successes in achieving further collaboration during clerkship is an area of future research that may be of interest to medical librarians.

This study did not investigate the similarities or differences involved in librarians teaching EBM in person compared to virtual environments. However, EBM instruction using online modules was expressed as an emerging need by several survey respondents. Further research on the incorporation of virtual learning as part of EBM instruction is needed. As well, future research should consider a mixed-methods approach using phone interviews in addition to a survey in order to capture more in-depth information on librarian involvement with EBM instruction within the UME curriculum.

Assessment is an important component of teaching and learning, and plays an important role in UME curricula. This study did not focus on the nature of the assessment, and only asked one split question about librarian involvement in assessment. Investigation into librarians' involvement with assessment in EBM curricula in UME is needed.

As familiarity with the curriculum or years of experience did not appear to correlate with involvement in EBM instruction, further research is required to explore what other factors created opportunities and barriers for librarian involvement in formal EBM instruction within UME programs.

Conclusions

The results of this survey provide evidence of the activities and practices of some UME librarians in Canadian medical schools, and could be useful for other UME librarians in similar contexts who are considering changes to their teaching practices or are trying to advocate for different roles than those they are currently involved in. The survey specifically focused on librarian involvement in formal EBM instruction within the UME curricula. The results of the survey demonstrated that these librarians are embedded within the EBM curricula, with instruction ranging beyond the first two steps of the EBM curriculum, and teaching using a variety of educational strategies, including active learning as well as the use of online modules. Many of the librarians involved within the UME curriculum collaborate with other librarians as well as with medical faculty. The results of this survey highlight the dynamic and fluid nature of librarian involvement in EBM within UME programs in Canada.

Statement of Competing Interests

No competing interests declared.

Acknowledgements

We would like to thank the following individuals: Dr Diane Lorenzetti, Elena Springall, and Vanessa Kitchin for piloting the survey and providing feedback. We would also like to thank Terry Daniels who helped with the preparation of the manuscript. Finally, we would like to thank the reviewers and editors for their thoughtful feedback during the review process.

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Appendix 1: Research instrument

Benchmarking the participation of academic librarians in Evidence-based medicine (EBM) instruction, in Undergraduate medical education (UME) programs in Canada

Survey Instrument

Consent form

Thank you for taking the time to complete this survey. The data collected in this survey is part of a research project on identifying the roles that Canadian medical librarians play in teaching Evidence-based Medicine (EBM).

The University of Calgary, University of Toronto, and University of Victoria Research Ethics boards have approved this research study.

Who is eligible to participate?

You are eligible to participate in this study if you are an academic librarian working with an Undergraduate Medical Education program in Canada.

What type of personal information will be collected?

No personal identifying information will be collected in this study. The name of your institution is required and this information will be kept confidential and will be used to ensure that only one response per library is included in the data. Given the small pool of candidates that qualify for this study, there is a possibility of indirect identification of a participant, by research team members. Once the data has been downloaded, the name of the institution will be removed, prior to analysis of the data. The survey results will not identify which institutions participated and which institutions did not participate.

What are the risks and benefits of participation?

Participation in this study is voluntary. As participation is anonymous, there is no way to withdraw from the study once you have submitted your data. You can however discontinue the survey at any time before submitting the survey and no data will be retained. There are no known risks of participating in this survey. There are also no direct benefits to any individual from participation in this research. The greatest potential benefit of participation is a better understanding of EBM instruction for all librarians working with UME programs in Canada.

Compensation

You will not be compensated for your participation in this study.

What happens to the information in the survey?

The results of this survey will be published in a conference presentation and/or a journal article.

Note:

The research study you are participating in may be reviewed for quality assurance to make sure that the required laws and guidelines are followed. If chosen, (a) representative(s) of the University of Toronto Human Research Ethics Program (HREP) may access study-related data and/or consent materials as part of the review. All information accessed by the HREP will be upheld to the same level of confidentiality that has been stated by the research team.

If you would like to retain a copy of this consent form, please print or save this page as a PDF.

Questions/Concerns

This study is being conducted by Zahra Premji (University of Calgary), Kaitlin Fuller (University of Toronto) and Rebecca Raworth (University of Victoria).

If you have any questions about this research, please contact the principal investigator, Zahra Premji, MLIS, Research and Learning librarian, University of Calgary at zahra.premji@ucalgary.ca or 403-220-8339.

If you have any concerns about the way you have been treated as a participant, please contact the Research Ethics Analyst, Research Services, University of Calgary at (403) 220-4283/220-6289; e-mail cfreb@ucalgary.ca

Or,

University of Toronto Research Oversight and Compliance Office - Human Research Ethics Program at ethics.review@utoronto.ca or 416-946-327

If you consent to participate in this study please check the below box

By checking this box, you indicate that you have read the information provided to you, and consent to participating in this survey.

[required in order to proceed to the next page of the survey]

No, I do not consent to participating in this survey.

[will automatically route to the end of the survey and thank you page]

Part 1 of 3: Demographic/general information

1. What is the name of your institution (*required question #1*)

1b. If you work at a distributed/regional site, please identify your particular site

(Note: the information collected in this question will only be used to identify which institutions participated in the survey, with the objective of gathering a complete data set from across Canada. It will also be used to identify when more than one librarian from the same institution has completed the survey. This data will not be included during analysis of the data or published with the survey results.)

2. What is the annual class size for the UME/UGME program at your institution (if distributed, class size for overall program, not for individual distributed site.)

2b. If you work at a distributed/regional site, please provide the annual class size for the UME/UGME program at your site?

3. How long have you been a medical librarian?

- a. 0-2 years
- b. 3-5 years
- c. 6-10 years
- d. More than 10 years

4. How familiar are you with the medical school curriculum at your institution?

- a. Unfamiliar
- b. Somewhat familiar
- c. Familiar
- d. Very familiar

Part 2 of 3: Evidence-Based Medicine instruction

This section of the survey is about Evidence-based Medicine (EBM) within the UME/UGME curriculum at your institution.

Evidence-based medicine has been described as “the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances” (Straus, Richardson, Glasziou & Haynes, 2005, p.1). This is often expanded to include the 5 steps consisting of articulating the gap as a clinical question (PICO), acquiring and appraising relevant evidence, applying the evidence to a particular patient’s care, & evaluating their practice in light of evidence.

5. Does your institution offer formal training in EBM (i.e. courses, didactic sessions, hands-on activities, practice in clinical settings)?

- a. Yes
- b. No
- c. I don’t know

6. When does EBM instruction take place in the curriculum? (select all that apply)

- a. Pre-clerkship
- b. Clerkship
- c. Weaved throughout the 4 year curriculum
- d. Other (provide a brief description)

7. Is EBM taught in a stand-alone course at your institution?

- a. Yes
- b. No

Part 3 of 3: EBM-related instruction: Librarian involvement

In this section of the survey, we would like to know about the types of formal educational interventions that librarians are involved in for Evidence-based medicine (EBM).

Important definitions

1. An *education intervention* can be described as “any learning activity where the intent is to facilitate the learning of skills or knowledge” (Phillips et al., 2016, Introduction).
2. A formal educational intervention or an educational intervention in a formal setting is defined as one that **is part of the curriculum that each student in the program is exposed to**. For example, a tutorial session within a course would be considered a formal educational intervention. In contrast, a meeting with a librarian for a research consultation or an optional workshop would not be considered a formal educational intervention based on the definition provided above, as it is not part of the UME curriculum that every student is exposed to.

Therefore, for the purposes of this survey a *formal educational intervention for EBM* can be thought of as any formal educational intervention that is aligned with the purpose of EBM. This may include information literacy that is taught within the context of an EBM course, or intertwined with the theme of EBM.

Note: General library-related or information literacy instruction that is not related to EBM is **not** to be considered when answering this section of the survey.

8. Are you involved in the design or teaching of educational content in the context of Evidence-Based Medicine? (*required question #2*)
- a. Yes
 - b. No

[if yes, continue

if no, go to the end of the survey]

9. What is your role in teaching EBM? (select all that apply)
- a. Course Instructor (listed on course outline)
 - b. Guest lecturer
 - c. Assessment/grading of course assignments
 - d. Embedded librarian (please briefly describe how you are embedded)
 - e. Course or curriculum designer/course committee member
 - f. Other (provide a brief description)

10. How many librarian led EBM-related in-person instructional sessions did each MD student receive in the 2016-2017 academic year to MD students?
- a. One
 - b. Two

- c. Three
- d. Other (provide a number)

10b. Based on your answer to the previous question, what is the total face-to-face contact time **in hours**, between students and the librarian, from all of the formal instruction sessions in the 2016-2017 academic year?

Drop down option (number format)

11. In what physical learning spaces are the EBM instruction sessions held? (select all that apply)

- a. University classrooms
- b. Library
- c. Clinical setting
- d. Simulation lab
- e. Other (please provide a brief description)

12. What educational strategies do you use in your EBM instruction? (select all that apply)

- a. In-class lecture
- b. Small group tutorials (*20 students or less*)
- c. Journal club
- d. Online (live webinars)
- e. Other (provide a brief description)

12b. Do you use self-directed online module(s) for your EBM-related formal instruction?

- a. Yes
- b. No

(if yes go to 12 c)

12c. Please provide a description of the module(s) (recorded lecture, interactive module, type of content, etc) [*conditional question based on 12b*]

13. What teaching method(s) do you use? (select all that apply)

- a. Didactic lecture
- b. Active-learning/interactive but clinically-integrated
- c. Active-learning/interactive but classroom-based
- d. Flipped classroom (hybrid model which requires some pre-class preparation/reading)
- e. Other (please provide a brief description)

14. Do you co-create the content for your EBM-related instruction session(s), online or in-person, with anyone other than academic librarians?

- a. Yes (If yes, who is the co-instructor (eg. clinician, faculty member, hospital librarian, etc))
- b. No

15. Do you deliver the instruction session(s), online or in-person, with anyone other than other academic librarians?

- c. Yes (If yes, who is the co-instructor (eg. clinician, faculty member, hospital librarian, etc))
- d. No

16. In the context of your EBM instruction, what information resources do you teach? (select all that apply)

- a. Ovid Medline
- b. Pubmed
- c. Pubmed clinical Queries
- d. TRIP Database
- e. ACP Journal Club
- f. Cochrane Databases
- g. UpToDate
- h. Dynamed/Dynamed Plus
- i. Access Medicine
- j. RxTx
- k. Google/Google Scholar
- l. Clinical Guidelines (guidelines.gov, etc)
- m. Other (please provide names of the specific tools)

17. In the context of the 5 steps (ask, acquire, appraise, apply, evaluate or assess) of EBM (Sackett, Richardson, Rosenberg & Haynes, 1997, p.3), please provide a description of the information literacy skills that are taught in your instruction sessions (example, Boolean logic, formulating a clinical question, PICO, MeSH terms, filters and limits, critical appraisal, levels of evidence, EBM filters etc).

18. Are your learning objectives based on a competency framework (For example, ACRL Framework for Information Literacy for Higher Education, CanMeds competencies, etc)

- a. No
- b. Yes (please provide the name of the framework)

19. Do your sessions include an assessment component?

- a. No
- b. Yes

(if yes, go to #19b)

19b. Which of these assessment methods do you use? [*conditional question based on #19*]

- a. Multiple choice questions
- b. Reflection assignment
- c. OSCE station
- d. Portfolio
- e. Course assignment
- f. Short answer questions
- g. Other

20. Please provide a description of any stand-alone EBM content that is not delivered in a formal instruction setting, but that is highly utilized (for example, libguide, podcasts, online modules, etc.)? Note: please indicate if any other individuals (clinical instructor, instructional designer, teaching and learning specialist, other academic librarian, etc.) were involved in co-creation of this content.

21. Have there been any significant changes in librarian-led EBM instruction at your institution within the last 3 years? (Please provide a description of the changes that have occurred)

22. Do you have any suggestions on how librarian-led instruction in EBM could be improved? (Please provide as much detail as possible)

23. Are there any other details about your EBM-related instruction sessions (that were not covered in the questions above) that you would like to tell us about?

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