Evaluating effectiveness of small group literacy instruction for Undergraduate Medical Education students using a pre-post survey study design.

McClurg C., Powelson S., Lang E., Aghajafari F., Edworthy S.

Key Words

Key Messages

- Librarians and medical faculty should seek opportunities for collaboration and formal inclusion of the library into the undergraduate medical education curriculum, especially Evidence Based Medicine (EBM)

- Health Sciences librarians need to continuously re-assess the duration and delivery of information literacy instruction to maximize learner engagement and uptake of skills development

- To develop lasting professional relationships between health sciences librarians and medical students, efforts must be made to establish collegiality in small group settings

- Information literacy skills development should be encouraged as a lifelong learning endeavor by both librarians and faculty preceptors in a EBM course

- EBM information literacy skills development should strive to build upon concepts of efficiency and bedside application without being repetitive to what students have already received from library instruction in the medical curriculum

Acknowledgements

Abstract

The purpose of our study was to determine if librarian-led small group information literacy instruction, closely integrated with course content and faculty participation, but without a hands on component, was an effective means to convey evidence based information literacy skills including clinical question formation, resource selection and online searching confidence.

Five 15 minute evidence based information literacy sessions were delivered by three librarians to 12 practicing physician-led small groups of 15 students. Students were asked to complete an online survey before and after the lecture and seminar series. Data analysis was through simple descriptive statistics, reporting proportions for question responses.

Instruction in a small group environment without a mandatory hands on component had a positive impact on student's evidence based information literacy skills. Students were more likely to consult a librarian, and had increased confidence in their abilities to search and find relevant information.

Background

The Undergraduate Medical Education (UME) program at the University of Calgary is a three year program with a strong emphasis on small group learning. Approximately 160 students enter the program every year. Students begin their medical schooling in late July, with one week of orientation to the school and the profession, and then classes commence in August. Students then enter clerkships after eighteen months of classroom based learning.

Librarians do primary information skills instruction as part of the Applied Evidence Based Medicine (AEBM) course which students take eight months after starting in UME, in what is considered the beginning of their second year. Students take AEBM concurrently with other courses April-December. AEBM lectures and small group seminars occur in April and May. June through September the students complete either two blocks of clinical electives or an 80-hour research stream. The library component was a one hour hands-on lab, which occurred in August and was taught by the librarians only.

While most medical schools teach evidence based medicine (EBM), its location in the curriculum varies widely(1). In Maggio's review, 30% of the programs delivered this content in the preclinical years(1). The skills taught are standardized, generally covering Strauss's EBM steps, ask, acquire, appraise and apply(1, 2). In twelve (60%) of the studies reviewed, the content was delivered over a single year. Other models were one time interventions or spread across more than one year(1). Senior clinicians demonstrating commitment to EBM is a critical factor, in the retention and application of these skills, no matter when they are taught(3).

Library instruction has been found to be most successful when integrated into the existing medical curriculum (4). Allegri defines curriculum integration as meeting three of the four following criteria:

> "(1) Faculty outside the library are involved in the design, execution and evaluation of the program.
>
> (2) The instruction is curriculum-based, directly related to the students course work.
>
> (3) Students are required to participate.
>
> (4) Student's work is graded or credit received for participation(5)."

If the information literacy sessions are integrated, but stand alone, the literature is mixed on the effectiveness (3, 6-9) but students have been found to be more enthusiastic about information literacy instruction when the process is integrated and supported by the faculty(10). Learners need a high level of perception of the utility of the EBM training with physician roles models an important factor. (2, 3, 11). Mi emphasized the importance of librarians partnering with faculty "to incorporate the resources into EBM instructional content"(11).

In January 2011, the Health Sciences Library Head was invited to sit on the AEBM course curriculum committee to participate in the course redevelopment. One of the goals in redeveloping the curriculum for AEBM was to more closely integrate the information literacy component with the lectures and small group content, and involve faculty and preceptors in the sessions. Preceptors are practicing physicians who contribute to the University of Calgary Undergraduate Medical Education program by offering instruction, usually to small groups, around practical patient care skills.

Objectives

The purpose of our study was to determine if librarian-led small group information literacy instruction, closely integrated with course content and supported by physician preceptors, but without a hands on component, was an effective means to convey evidence based information literacy skills.

Method

Intervention

To more directly connect the information literacy component to the seminar and small group content, and incorporate physician role models, the August hands on lab, solo-taught by librarians, was eliminated. Evidence based information searching skills were added to the April-May preceptor-led small group seminars. Every week, for five weeks, three librarians each, visited four preceptor-led small groups, and delivered fifteen-minute evidence based information literacy instruction. Each weekly session, outlined in Table 1, had two to three specific learning objectives tied directly to that day's one hour Evidence Based Medicine lecture and two hour preceptor lead small group. There were 15 students in each small group and the librarian worked with the same four small groups over the five week period.

Week	Objectives
1	• how to use Pubmed Clinical Queries • how to link to full text • how and why to use Refworks
2	• what pre-appraised resources are • evidence grading in pre-appraised resources • what to look for to evaluate pre-appraised resources
3	• how to use PICO • how to use Boolean operators to combine concepts
4	• how to use MESH and limits to find systematic reviews • how to search the Cochrane Database of Systematic Reviews
5	• how to search for guidelines, including using Alberta and Canadian Medical Association resources, Guidelines.gov, and TRIP

Table 1 Learning objectives for the 5 information literacy sessions

This approach emphasized student engagement over hands on skills practice, although students were encouraged to follow, demonstrate or try searches using their mobile devices or laptop computers. Lapidus states that "using traditional didactic teaching alone is much less effective when educating students about literature searching techniques and the use of print and electronic reference sources." (12). Because of the focus on engagement and discussion, the session's objectives could sometimes not be met in the 15 minutes allotted. A course website was developed that supported the objectives and students were directed to review the content. Ryce and Dodson describe a similar successful approach where librarians created an EBM website developed to provide a repository for course materials, CAT forms, electronic presentations as well as readings. (13)

Measure of Interest

Using a pre-post study design, 160 second year Undergraduate Medical Students taking the AEBM course were asked to complete an online survey before and after the five week lecture block of AEBM. The surveys were identical, covering resource selection, perception of obstacles to evidence based information retrieval and confidence in resource usage, with the exception of two additional qualitative questions on the post-survey, asking what was learned, and when locating and appraising the literature should be taught. All other questions were multiple choice. The surveys (Appendix 1) emphasized information literacy skills but also contained several elements of specific interest to the faculty, and were beyond the content taught in the information literacy component. We will not be discussing these elements in this article. The survey was distributed using SurveyMonkey and promoted to the students at both the introductory and concluding lecture in the series. In addition, students were emailed reminders and survey links were posted on the course content system.

Data Analysis

Data Analysis used simple descriptive statistics. The survey questions were developed based on the survey used by Aitken to evaluate the impact of a clinical librarian intervention(14).

Results

144 out of 160 students responded to the pre-survey, and 112 students answered the post-survey with response rates of 90% and 75% respectively.

Assessing Changes in Methods of Finding an Evidence Based Answer to Patient Care

As Figure 1 shows, there was a marked increase in the likelihood that students would use Ovid Medline, conduct a literature search and significantly, consult with a librarian.
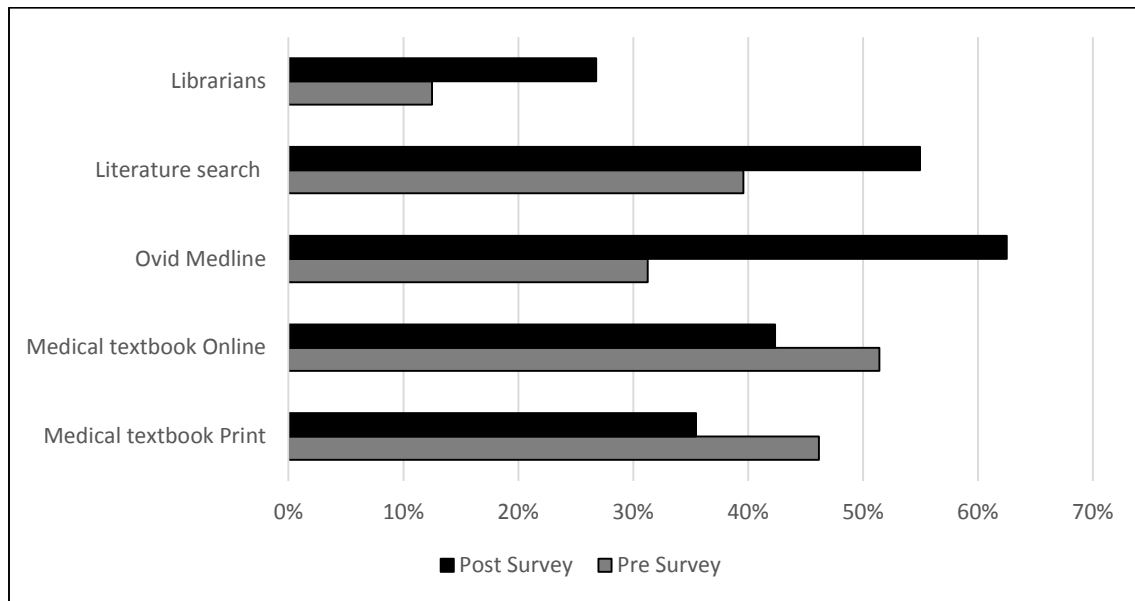

Figure 1 Likelihood of using resources

Assessing Changes in Level of Confidence on Various Aspects Pertaining to Clinical Investigation

Figure 2 shows student's pre and post responses to changes in their level of confidence. There was limited change in student's reported confidence in finding answers quickly. However, there were significant changes to: finding systematic reviews and practice guidelines, using limits, using PICO, and choosing evidence based resources. In particular, the results show a significant increase in student's confidence in using MESH. Students maintained a high level of confidence that they could find answers quickly.
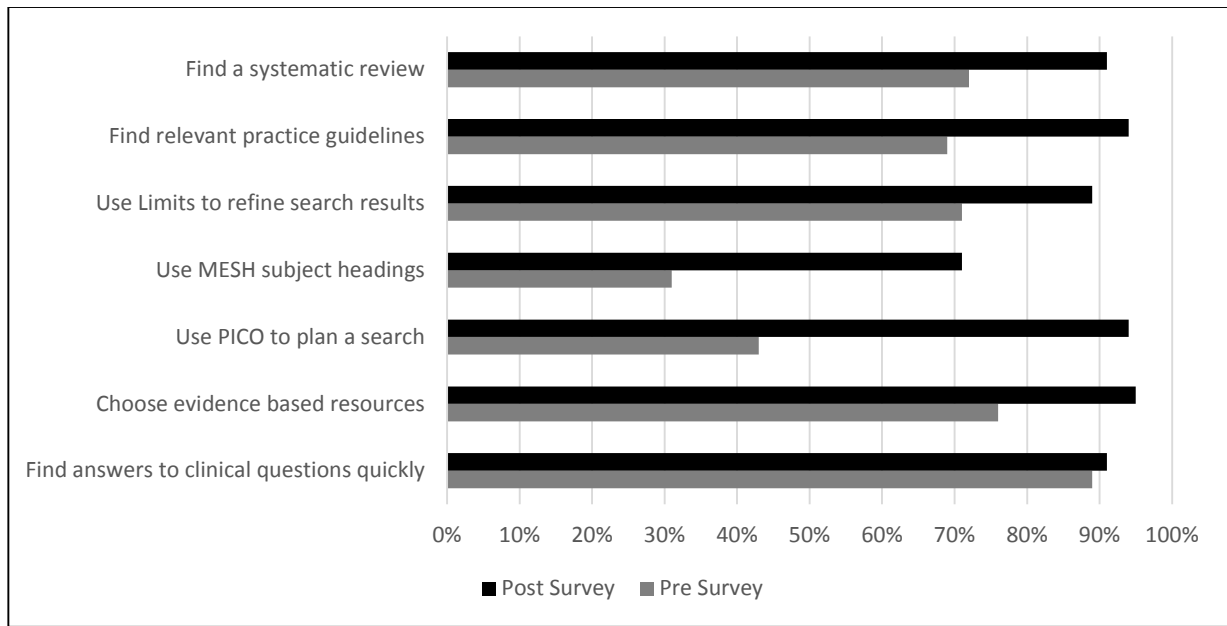
Figure 2 Changes in levels of confidence

Changes in Obstacles

We also assessed changes in obstacles experienced in locating and interpreting evidence to support patient care. We defined obstacles as knowing where to search, difficulty crafting an effective search strategy, retrieving too many results, time it takes to search and knowing how to interpret results. There were changes in the responses to crafting an effective search strategy and retrieving too many results. Figure 3 shows that students were seven times less likely to answer "Yes" to "Is knowing where to search an obstacle?" during the post survey compared to the pre-survey. Interestingly, students continued to perceive finding answers quickly as an obstacle, in direct contrast to their confidence in this skill as in seen Figure 2.
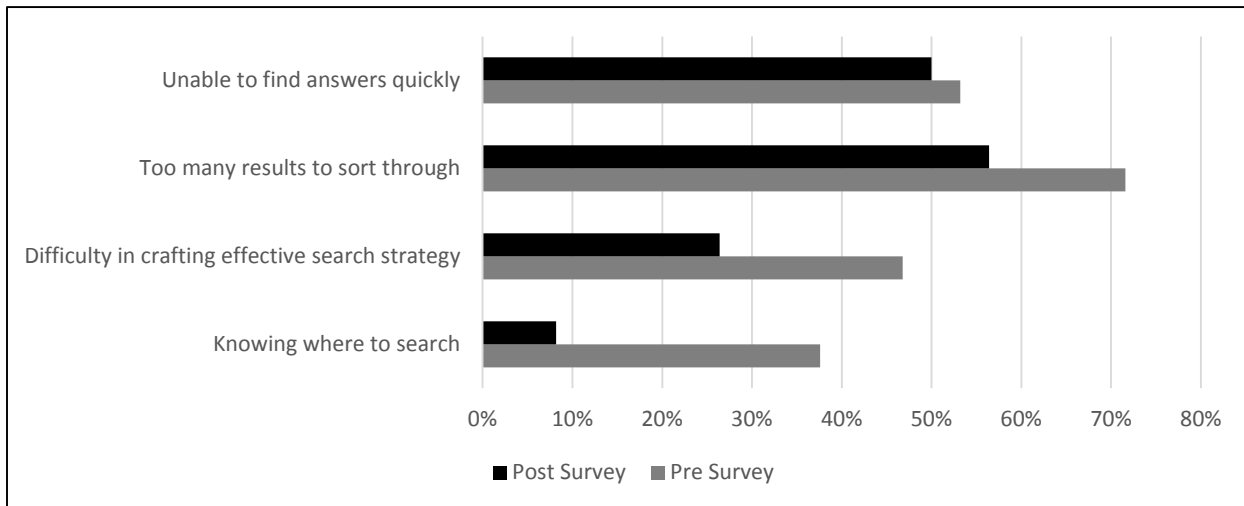
Figure 3 Changes in perceived obstacles

Qualitative Responses

The post-survey allowed students to provide comments in response to their experience in the MDCN 440 seminar series as a whole, including clinical, statistical and information literacy concepts. We received 54 written responses and 34 specifically mention the library component as the most important thing learned in the seminar portion of the course. Fourteen of the 34 comments included more than one important concept learned. We reviewed all the comments and divided them into five broad themes found in Table 2.

	Number of responses
Using Pico	7
How to access library resources	6
How to find evidence for clinical problems	4
How to search medical databases such as Medline	18
How to appraise articles	8
Value of working with a librarian	2

Table 2 Concepts learned

Discussion

Our study describes an innovative and effective approach to teaching students about evidence based medicine information retrieval that does not involve hands on learning, but does closely integrate with course content. We successfully demonstrate that a series of five brief information literacy sessions delivered over a period of five weeks integrated into curricular small group settings is effective. Students were more likely to search Medline, gained confidence in using MESH and significantly were more likely to approach a librarian for information and support.

Lai examined an intervention with some similarities to the one we implemented, focusing on small groups, but during bedside clinical teaching during Pediatric rounds, finding that students "reported increases in their search activities and confidence in EBM"(15). We add to the literature by demonstrating that information literacy training does not have to be tied to the library computer lab and further support the research findings on the importance of

collaboration between faculty and librarians when teaching information literacy. (2, 3, 11). We outline an innovative approach that can be adapted to different settings. Learner's ability to use their own devices, ask questions, and address their own knowledge gaps during the 15 minutes of information literacy programming align with the following premises of adult learning (11, 16)

- Adults are accountable for their own learning.

- Adults learn in the here and now

- Adults learn best when they integrate learning with the rest of their lives.

Philip Candy as cited by Roberts et al. suggests that "[a]n adult training program should center on self-directed learning and facilitate this process so that trainees accept responsibility for their own learning, which evolves into a life-long practice on continuing professional development (17).

The positive responses to the qualitative question in the post survey illuminate our quantitative findings and reflect the enthusiasm that the librarians anecdotally reported after each of the five sessions with their assigned small groups.   The students became more comfortable asking questions, and debating approaches, and this is reflected in the increased number who would consultant a librarian. This increase is evidence of our success in our goal of engaging the students, and is perhaps best summed up by one respondent's statement "I learned a lot from the librarian"

Limitations

Our study is not without limitations. The three year curriculum at the University of Calgary is unique and consequently our intervention and results may not be reproducible or generalizable for medical schools with a four year curriculum.

Our survey tested confidence rather than skills. The results are based on self-reported behavior changes. Baseline skills were not fully assessed prior to the course and we do not know if student's ability to search Medline, for example, did improve. A pre-post survey evaluating actual skills would provide a clearer picture.

There is a curious dichotomy in the student's confidence in their ability to find answers quickly and their perception of finding answers quickly as an obstacle. Our survey results, the qualitative comments and the literature have not helped us to understand why students believe they can find answers quickly yet continue to believe it is an obstacle. This is a question for further research.

Preceptor engagement and support of the information skills was an important but unmeasurable factor in encouraging the students to appreciate the importance of learning to effectively and efficiently search for evidence based answers to clinical questions. The goal of the small group sessions with the preceptors was to link information literacy skills to the clinical settings the students would find themselves in during their electives. Stickrath et. al. describe adult learning theory in their learner centered model for bedside teaching and state: "although it is important for medical students and residents to learn new facts, it is just as important that they learn how to fit facts into larger concepts within a framework of knowledge that they can use in the

future"(18). Thus, individual preceptor's varying ability to connect information literacy skills to clinical practice may have influenced post-survey results.

In addition, although all instructors shared the same script and course materials, we could not control the natural differences in teaching style. Attention was placed on allowing students to ask questions, which varied amongst the small groups and could have impacted students self-assessed changes in skills and confidence.

Conclusion

Our study demonstrates that student engagement and faculty involvement are effective tools for delivering information literacy skills when working with students in a small group setting outside of a computer lab.

Future directions for this initiative would be to evaluate other methods for teaching EBM information literacy skills including team based learning and the flipped classroom approach.   In addition, pre-post testing for specific skills would provide a valuable information on whether student's skills actually improved or just their confidence in their skills.

References

1. Maggio LA, Tannery NH, Chen HC, ten Cate O, O'Brien B. Evidence-based medicine training in undergraduate medical education: A review and critique of the literature published 2006-2011. Acad Med. 2013 Jul;88(7):1022-8.

2. Straus SE, Glasziou P, Richardson WB, Haynes RB. Evidence-based medicine: How to practice and teach it. 4th ed. Edinburgh: Elsevier Churchill Livingstone; 2011.

3. Cullen R, Clark M, Esson R. Evidence-based information-seeking skills of junior doctors entering the workforce: An evaluation of the impact of information literacy training during pre-clinical years. Health Info Libr J. 2011 Jun;28(2):119-29.

4. Burrows S, Ginn DS, Love N, Williams TL. A strategy for curriculum integration of information skills instruction. Bull Med Libr Assoc. 1989 Jul;77(3):245-51.

5. Allegri F. Course integrated instruction: Metamorphosis for the twenty-first century. Med Ref Serv Q. 1986;4(4):47-66.

6. Erickson S, Warner E. The impact of an individual tutorial session on MEDLINE use among obstetrics and gynaecology residents in an academic training programme: A randomized trial. Med Educ. 1998;32(3):269-73.

7. Rosenberg WM, Deeks J, Lusher A, Snowball R, Dooley G, Sackett D. Improving searching skills and evidence retrieval. J R Coll Physicians Lond. 1998 Nov-Dec;32(6):557-63.

8. MacEachern M, Townsend W, Young K, Rana G. Librarian integration in a four-year medical school curriculum: A timeline. Med Ref Serv Q. 2012;31(1):105-14.

9. Gruppen LD, Rana GK, Arndt TS. A controlled comparison study of the efficacy of training medical students in evidence-based medicine literature searching skills. Acad Med. 2005;80(10):940-4.

10. Brown JF, Nelson JL. Integration of information literacy into a revised medical school curriculum. Med Ref Serv Q. 2003;22(3):63-74.

11. Mi M, Moseley JL, Green ML. An instrument to characterize the environment for residents' evidence-based medicine learning and practice. Fam Med. 2012;44(2):98.

12. Lapidus M, McCord SK, McCloskey WW, Kostka-Rokosz M. Combined use of online tutorials and hands-on group exercises in bibliographic instruction for pharmacy students. Med Ref Serv Q. 2012 10/01; 2014/01;31(4):383-99.

13. Ryce A, Dodson S. A partnership in teaching evidence-based medicine to interns at the university of washington medical center. J Med Libr Assoc. 2007;95(3):283.

14. Aitken EM, Powelson SE, Reaume RD, Ghali WA. Involving clinical librarians at the point of care: Results of a controlled intervention. Acad Med. 2011 Dec;86(12):1508-12.

15. Lai NM, Nalliah S. Information-seeking practices of senior medical students: The impact of an evidence-based medicine training programme. Educ Health (Abingdon). 2010 Apr;23(1):151.

16. Reed S, Shell R, Kassis K, Tartaglia K, Wallihan R, Smith K, et al. Applying adult learning practices in medical education. Curr Probl Pediatr Adolesc Health Care. 2014;44(6):170-81.

17. Roberts TV, Gustavs J, Mack HG. Becoming an expert: A review of adult learning theory and implications for vocational training in ophthalmology. Clin Experiment Ophthalmol. 2012;40(5):519-26.

18. Stickrath C, Aagaard E, Anderson M. MiPLAN: A learner-centered model for bedside teaching in today's academic medical centers. Acad Med. 2013 Mar;88(3):322-7.