Case-based EBM instruction for Osteopathic Medical Students: A Case Report

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Abstract

Background: Evidence-based medicine (EBM) is an important part of graduate medical education and a learning outcome necessary for preparing students to become effective residents. However, many medical educators and librarians struggle to offer EBM instruction that is contextualized, relevant, and engaging. Case-based learning (CBL) can establish the relevance of EBM instruction sessions by using clinical scenarios that link theory to practice.

Experience: This case report describes how a college of osteopathic medicine (COM) liaison librarian redesigned a large cohort, lecture-based learning approach to EBM instruction into interactive, relevant, and contextualized CBL labs. CBL labs with smaller student groups were designed to provide an active learning environment and encourage peer-to-peer learning. The CBL format has been previously applied to EBM instruction but not quantifiably evaluated. A modified rubric was created to provide a quantifiable measurement of student performance in future evaluations.

Discussion: First-year osteopathic medical students participated in CBL sessions, integrating EBM into their curriculum. The small groups facilitated personalized guidance, peer-to-peer learning, and critical thinking. Clinical scenarios that were mapped to the students' curriculum provided relevance to the learning experience.

The CBL format allowed the librarian to support students individually and increased engagement compared to lecture-based learning. Challenges included assessing the students' prior EBM knowledge and the time commitment for a solo librarian. However, group assignments and a grading rubric helped to minimize the challenge.

Conclusion: The initial pilot testing of this instructional design format and rubric has shown promise in reaching the objectives of providing a relevant and active learning platform with quantifiable results. A future randomized controlled trial is planned to provide quantifiable evidence supporting CBL labs for EBM instruction when compared to lecture-based learning.

Background

The Association of Colleges of Osteopathic Medicine (AACOM) and the Accreditation Council for Graduate Medical Education (ACGME) in 2015 outlined the competencies osteopathic medical students are expected to demonstrate such as, "locating, appraising, and assimilating evidence from scientific studies. . . using information technology"[1-2]. The ability to search for evidence is foundational to the clinical practice of evidence-based medicine and research. Many students lack the skills needed to meet these competencies because most osteopathic medical schools have not fully integrated Evidence-based medicine (EBM) instruction into their curricula due to the lack of faculty development, time and resources[3-7]. Numerous studies have highlighted the struggles medical students face when implementing EBM skills. Such struggles include the inability to develop well-formed clinically relevant questions, not being able to navigate medical databases, struggling to interpret search results, and an average poor grade in new residents' core EBM skills[5-8]. There is also a significant lack of evidence supporting the EBM instruction methods within Colleges of Medicine (COMs) in the United States. A current PubMed search demonstrated this lack of evidence in the results of only two studies. A 2010 study by Laird et al. and a 2019 study by Vaughan, et al. based on Australian osteopathic students[9-10].

The Association of Academic Health Sciences Libraries (AAHSL) mapped the 2015 AACOM competencies to the Association of College and Research Libraries (ACRL) information literacy framework to establish a baseline of library engagement and to create a cross-referencing map of existing EBM and information literacy documents[11]. This mapping supports the implementation of librarian-led EBM instruction. Recent studies also demonstrate that librarian-led instruction improves question formulation and translation of search terms to productive searches because librarians use various pedagogical methods to promote independence in skill development[6,12,13]. As such, Eldredge et al. suggest that librarians are "natural collaborators in teaching [EBM]"[12].

Case-based learning (CBL) is an instructional method that provides students with clinically relevant patient scenarios and active learning opportunities within peer groups. Students are provided with a clinical patient scenario relevant to their area of study and asked to apply their theoretical knowledge in a realistic application of EBM skills. By applying CBL to the EBM process of learning to develop an answerable question and acquire evidence to support this question, students can link theory to practice. Students' learning engagement also improved with CBL when compared to lecture-based learning[14-17]. CBL can also facilitate peer-to-peer interactions within the small group activities not found in lecture-based learning. This combination of peer interaction and active, relevant learning can enhance students' engagement and comprehension of EBM methodology[14,16].

Swanberg et al. presented a pilot integration of a librarian-led CBL approach to clinical question development and search strategy instruction. In their study, the effectiveness of the sessions was measured by student feedback in course evaluations and a faculty-generated rubric. The measures did not assess the students' proficiencies with a validated instrument[18]. Menard et al. measured the effectiveness of scaffolded EBM instruction using a modified version of the Fresno Test to assess student performance[19]. The proposed CBL instruction sessions to be discussed in this article combine Swanberg et al.'s design and apply Menard et al.'s modified version of the Fresno Test as a grading rubric. The combination of these

instructional methods will provide a quantifiable measurement tool to demonstrate that relevant teaching materials combined with peer learning opportunities are more effective than lecture-based learning.

Experience

The medical library at this private midwestern college of Osteopathic medicine has one librarian dedicated to the COM. The university, across three separate campuses, has six liaison librarians and five staff. The university libraries serve the associated medical, health science, and dental programs through collection development, research assistance, information literacy, and EBM instruction.

This COM program did not have a liaison librarian for two years prior to the author's appointment, and EBM was not addressed in any part of the COM curriculum. The librarian initially approached the associate dean with the proposal of library instruction by referencing the dean's prior scholarship which supported the inclusion of EBM instruction within COMs to meet AACOM competencies[1,4,20]. The associate dean agreed to allow the librarian one 60-minute session in the late fall to introduce EBM. The first session was conducted in a lecture-based format, with one librarian instructing an auditorium of approximately 160 first-year medical students. At this session, the librarian did not have the opportunity to interact with the students individually and was not able to incorporate active learning. These factors limited an interactive learning environment and the ability to measure student outcomes. The librarian decided to redesign the course from lecture-based to CBL which would incorporate the interactive and relevant learning that was missing in the lecture-based session. The librarian consulted the university's Teaching and Learning Center for assistance with the development of the course goals and objectives as well as the design of a CBL lab. The redesigned course was presented to the associate dean, who granted permission for the librarian to run a pilot of the course.

The CBL session goals and course objectives included the AACOM competencies expected by residency[1]. The overall learning goal(s) are to introduce first-year osteopathic medical students to the EBM process and demonstrate the applicability of this process to clinical practice using relevant clinical scenarios in an interactive, engaging environment. The learning objectives were as follows:

1. First-year osteopathic medical students will be able to construct a well-formed clinical question according to the criteria in the associated rubric, with a minimum of two points.

2. First-year osteopathic medical students will be able to acquire medical evidence according to the criteria in the associated rubric, with a minimum of two points.

Students at this COM varied in their educational and professional experiences, from a basic undergraduate science degree to extensive medical and/or research experience. The librarian was unable to determine the degree to which any of the students had had prior information literacy or EBM instruction due to their varied backgrounds. To accommodate for these variations and unknowns, the librarian provided an introduction to EBM to the students before the implementation of the CBL sessions. This introduction was provided through a LibWizard tutorial[21]. This tutorial guided students through the Ask and Acquire steps of the EBM

process and utilized a combination of videos and interactive activities to encourage participation. All students were assigned the tutorial through their learning management system (LMS). They were provided instructions to complete the tutorial before the lab sessions and informed that the information within the tutorial was required for the lab sessions. Students were instructed to upload the completion certificate provided by LibWizard to receive credit for completing the tutorial. All students received the full amount of credit regardless of their performance. This detail was not provided to the students before the tutorial to encourage quality performance. The librarian worked with the medical education fellows from the COM to design clinical scenarios aligned with the students' current topics of study in the curriculum for the CBL sessions. This was done to ensure that the students would be knowledgeable about the disease and treatment presented and to further embed relevancy within the CBL assignment. (Examples of the clinical scenarios can be found in (**Appendix A**).

The librarian divided the class of approximately 160 first-year osteopathic medicine students into smaller groups of 25-30 students for each 60-minute lab session. Each lab group was then divided in to smaller working groups of 3-5 students each. Each session began with a brief review of the pre-session tutorial and instructions on how to complete the in-lab assignment (**Appendix B**). The students were instructed to complete the lab worksheet (**Appendix C**) as a group and for each student to upload the completed worksheet into the LMS. Students were encouraged to ask questions throughout the session and they were provided feedback and prompts to encourage critical thinking. Examples of prompts included suggestions to minimize the number of search terms, to focus on the most important search terms and to refer to background information resources (e.g., textbooks) when they required additional information about the clinical scenario.

The grading rubrics (**Appendix D**) were based upon the original Fresno rubric developed by Ramos et al. and modified based on the Menard et al. study[19,22]. The Fresno measurement was the rubric of choice because it has been validated and the modifications made in the Menard et al. study fit the CBL instructional design for this COM[19,22]. The original Fresno rubric was employed to critique the students' ability to design an answerable clinical research question based on the provided clinical scenario. In addition to the modifications made by Menard et al.[19], the Fresno rubric was further modified to fit within the time constraints of the labs, such as limiting the search requirements to one database instead of three. The Fresno rubric was also modified to grade the search strategy. The requirement to include field tags was necessary as the students had not received prior instruction regarding the inclusion of field tags. The pre-session tutorial focused only on question development and searching the PubMed database to provide focus on the basic search needs of this assignment. All student working groups were provided with a copy of the rubric and instructed as to how this rubric would be used to grade their submitted assignments.

The liaison librarian taught all six CBL sessions and graded all assignments submitted to the LMS. Each student's submission was also provided with detailed feedback as needed. Students who performed poorly or required extensive feedback were encouraged to meet with the COM librarian. Students were allowed to revise their assignments if requested.

Discussion

CBL was implemented with a class of first-year osteopathic medical students to establish EBM instruction within the curriculum and provide a relevant, active learning experience linking theory to practice. The CBL lab design with small working groups of 3-5 students provided an opportunity for the librarian to work one-on-one with students as needed, fostered peer-to-peer learning, and presented a learning environment that encouraged critical thinking. By using curriculum-mapped clinical scenarios as examples for the practice of the ask and acquire portions of EBM, the students were provided with an opportunity to translate their academic knowledge to the clinical application of EBM skills. The instructor provided the students with clear assignment expectations per the modified Fresno rubric. The modifications made to the original Fresno rubric fit well within the 60-minute lab sessions and the baseline experience level of the students completing the lab assignment.

One significant strength of the CBL design was that it allowed the librarian to observe student interactions and determine which students may require more assistance. The librarian also observed that the students appeared more engaged with the task when compared to lecture-based learning. Examples of engagement included parsing of lab tasks, collaboration, and active debates regarding processes and interpretations of the data. The answers to the questions asked by the students during the lab sessions were shared and demonstrated by the librarian for the lab to learn as a whole group, which provided a larger aspect of peer-to-peer learning.

There were also challenges associated with the adoption of CBL to teach EBM. One significant challenge was in designing the CBL labs. The amount of previous experience with EBM among the large group of students was unknown and therefore the course could not be designed to accommodate a higher level of knowledge if appropriate. While there is no simple solution to determine the degree of previous EBM instruction of a class, the peer-to-peer learning aspect of CBL encourages those with more experience to assist those with less. The smaller lab sessions also allow for one-to-one interactions between the librarian and the students that may require more in-depth assistance.

A second challenge was that this type of course design requires significant time and dedicated commitment, which is often difficult for a solo librarian to manage. This librarian was able to prioritize the design and implementation of this course due to the support of the library director. Because this program had not had a liaison librarian for a significant amount of time, both the librarian and the director recognized the vitality of instituting EBM instructional services into this curriculum. The administrator(s) granted the librarian approval to develop instruction services on an as needed basis and to prioritize these services over others.

The librarian worked with the COM faculty to schedule the lab sessions over a one-week period at the beginning of the Spring semester. This schedule formatting allowed the librarian to focus solely on the lab sessions over other tasks and provided the librarian time to grade the assignments before the end of the semester. The librarian also had fewer assignments to grade due to the group work design of CBL. Each small working group submitted one assignment and each group member received the same grade. Each lab used the same clinical scenario, which allowed the librarian to address issues in the whole lab instead of individual scenarios. The use of the grading rubric also provided the ability to grade each group's assignment

efficiently and guided the librarian to determine their actions with variations in the answers.

With positive reflections from the initial run of this pilot program, the librarian designed a randomized controlled trial (RCT) comparing the effectiveness of the lecture-based instruction sessions to the CBL sessions using the same assignment. This RCT will be applied to future COM cohorts upon receiving IRB approval. Changes envisioned for future sessions would be based on the results of the randomized controlled trial planned to compare the effectiveness of CBL to traditional lecture-based learning.

Takeaways

Many medical librarians are faced with the daunting task of providing EBM to large cohorts of medical students in one-shot sessions and growing numbers are required to do this on their own. The author's desire to instill relevance to the EBM learning process and implement opportunities to interact more closely with the students inspired them to design case-based learning sessions. These small labs, mapped to the students' curriculum with the assistance of the medical education fellows, provided relevant interactive learning opportunities where both the librarian instructor and the students could have fulfilling experiences. These experiences will be quantifiably measured through future studies comparing lecture-based learning to case-based learning.

Data Availability Statement

There is no data associated with this article.

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