How to Promote Learning of Evidence-Based Medicine Among Japanese Medical Students

Yoshihiro Kataoka (kataoka-tuk@md.tsukuba.ac.jp)
University of Tsukuba Faculty of Medicine: Tsukuba Daigaku Igaku Iryokei https://orcid.org/0000-0002-3180-7996

Takami Maeno
University of Tsukuba Faculty of Medicine: Tsukuba Daigaku Igaku Iryokei

Takashi Inaba
University of Tsukuba Faculty of Medicine: Tsukuba Daigaku Igaku Iryokei

Sayaka Ninn
University of Tsukuba Faculty of Medicine: Tsukuba Daigaku Igaku Iryokei

Masatsune Suzuki
University of Tsukuba Faculty of Medicine: Tsukuba Daigaku Igaku Iryokei

Tetsuhiro Maeno
University of Tsukuba Faculty of Medicine: Tsukuba Daigaku Igaku Iryokei

Research article

Keywords: active learning, Evidence-based medicine, patient communication, thematic analysis, undergraduate education

Posted Date: May 20th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-535857/v1

Abstract

Evidence-based medicine (EBM) has become increasingly widespread over the last 30 years. However, the ideal curriculum for undergraduate EBM education has yet to be developed. To establish an EBM curriculum suitable for the educational environment in Japan, we conducted a qualitative study to identify the elements needed to facilitate undergraduate EBM learning among Japanese medical students.

Participants were supervising physicians working in teaching hospitals or clinics. Six physicians were interviewed individually from October 2019 to January 2020. The interviewees were asked about their own EBM learning and teaching experiences, what they kept in mind when teaching EBM to medical students and what they felt was needed to improve current undergraduate EBM education. Interview transcripts were analyzed using thematic analysis.

Thematic analysis extracted five themes: awareness of foreground questions in clinical practice, motivating learning through observation of role models, awareness of the role of medical students and active learning, understanding patient background as a starting point for practicing EBM, and prioritizing understanding “why” rather than “how” in EBM.

Japanese medical students with limited clinical experience may first need to observe their supervisors practice EBM to develop the motivation to learn and grasp the bigger picture of EBM. It is important for medical students to develop an interest in their patients through conversations. Focusing on learning the rationale rather than the skills for practicing EBM may be the key to facilitating initial interest in undergraduate EBM education for subsequent continuous learning.

Introduction

Evidence-based medicine (EBM) has become prevalent as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” since its introduction by Sackett et al. in the 1990s(Thoma and Eaves, 2015). The principles of EBM include asking appropriate clinical questions about patients, interventions, comparisons, and outcomes (PICO; step 1); searching related and relevant evidence (step 2); critically appraising the evidence (step 3); integrating the evidence with clinical expertise and with patient’s unique biology, values, and circumstances (step 4); and evaluating the effectiveness and efficiency of steps 1 to 4 (step 5)(Straus et al., 2018).

EBM is considered one of the most important aspects of undergraduate medical education(Ahmadi-Abhari et al., 2008; EDUCATION, 2015). A number of studies have reported on undergraduate EBM curricula. The educational environment typically comprises classroom instruction, clinical settings (e.g., bedside rounds), and online learning(Maggio et al., 2013). The timing of education can be preclinical, clinical, or scattered over multiple grades as a longitudinal curriculum(Maggio et al., 2013). In terms of educational content, some curricula include more than one of the five principles of EBM, but few include step 1 (asking questions) and step 5 (reflection on steps 1–4)(Larsen et al., 2019). Although there have been many reports on the practice of EBM education, there are currently no established standards for when and how to educate, or how to evaluate the education (Ahmadi et al., 2015; Larsen et al., 2019).

When developing a medical education curriculum, it is important to identify the specific challenges in learning, learner needs, and learning objectives(HARDEN et al., 1984), and the same is true for EBM education. Given that medical education systems vary from country to country, and differ in learning challenges and learning needs, it is important to establish an EBM curriculum that suits the actual educational situation in each country. Thus, it is necessary to first understand the learning environment for EBM education in individual countries(Prideaux, 2007).

In Japan, a survey on the status of EBM education was conducted in 2001(Matsumura et al., 2001; Ohno et al., 2001); however, there has been no comprehensive report since. Further, while there is a four-week EBM elective training course at a single university(Kojimahara et al., 2000) and a year-long EBM education course for those who wish to attend(Watanabe et al., 2017), these programs have not undergone any standardized evaluation. Thus, the specific challenges in learning, learner needs and learning objectives required to build an EBM curriculum suitable for the realities of undergraduate education in Japan remain to be determined.

Further, despite the fact that acquiring EBM techniques forms one of the learning goals of the model core curriculum for undergraduate medical education(Committee, 2016), few residents reportedly use EBM skills on a daily basis(Risahmawati et al., 2011). It is possible that medical students do not fully understand the needs and objectives of EBM education. Thus, to determine the elements needed to engage medical students in EBM learning, it may be more effective, rather than focusing on the perceived needs of medical students as learners, to identify educator-perceived normative needs and learning goals (Grant, 2002).

We performed a qualitative study to identify factors that would facilitate medical students' learning of EBM through personal interviews with educators.

Methods

This was a qualitative study based on individual interviews (semi-structured interviews).

Participants

Participants were recruited by purposive sampling. They were university faculty and physicians in teaching hospitals or clinics who are involved in EBM education. The researcher (YK) contacted the participants via email and asked them to participate in the study.

Data acquisition

Semi-structured interviews were conducted with each participant individually between October 2019 and January 2020. Interviews were conducted using an interview guide developed by YK and TM. The interview questions mainly inquired about the contents of EBM education and what the interviewee keeps in mind when teaching EBM to medical students. The interviews were conducted in a private room at the participants' place of employment. Each interview was recorded on an IC recorder after obtaining consent from the participants. Notes were also taken during the interview. Each interview lasted 40–60 minutes.

Each participant was asked questions about the following: 1) their age, gender, years post-graduation, area of expertise, and years of experience in EBM education; 2) how and when they learned about EBM; 3) the curriculum and programs for EBM education at their institution; 4) their role in EBM education; 5) points they keep in mind when implementing EBM education; 6) their perception of medical students' competence in EBM; 7) what is needed to improve undergraduate EBM education.

Analysis

A verbatim record of each interview was made by transcribing the recorded audio data. The verbatim transcripts were checked by the participants for errors. Two researchers (YK, TM) analyzed the text data using a thematic analysis method. Coding of the data was mainly performed by YK and the contents were confirmed by TM. The themes were extracted deductively after the data were obtained. Additionally, specific suggestions for EBM education strategy obtained from the interviews were listed separately from the themes.

Ethical issues

This study was conducted after obtaining approval from the Ethics Committee of the Faculty of Medicine, University of Tsukuba (notice number 1430). Participants were informed that they were free to decide whether or not to cooperate in the study, and that there were no disadvantages to not cooperating. In addition, they could choose to stop the interview midway through if they changed their minds about participating. There were no conflicts of interest between the interviewees and the researchers. After the interviews had been transcribed, the interviewers were asked to review the contents and delete any information that they did not want to be used in the analysis.

Results

Six of the seven invited participants (two university faculty members and four teaching hospital/clinic physicians) gave consent to be interviewed. All interviewees were male, with an average age of 43.3 years, 19 ± 10.9 years since graduation and 11.5 ± 9.5 years of EBM education.

Thematic analysis extracted five themes: awareness of foreground questions in clinical practice, motivating learning through observation of role models, students' awareness of their own role and active learning, understanding patient background as a starting point for practicing EBM, and prioritizing understanding "why" rather than "how" to practice EBM. Below, we detail the five identified themes, providing supporting quotes from the interviewees. We have added supplemental text to the quotes in brackets when further context was needed to facilitate understanding. In addition, we have also detailed some of the interviewees' specific suggestions for EBM education strategy.

Awareness of foreground questions in clinical practice

When one interviewee learned about the existence of EBM, vague questions in daily practice emerged as "clinical questions," which inspired him to learn more about EBM.

"[In daily practice,] I wasn't registering my questions in the form of 'I don't understand this.' I had a lot of vague questions, and when I read Sackett's book, I was able to recognize that these were concrete questions." (interviewee 1)

"At least I didn't understand that I didn't understand. I thought, 'Well, this might be interesting.'" (interviewee 1)

These statements suggest that the interviewee's act of questioning clinical decisions that he had considered to be obvious promoted his EBM learning. The interviewee noted that the first step to practicing EBM was to realize the things he had been unaware of.

However, medical students have little clinical experience and little general knowledge of diseases and syndromes, making it difficult for them to generate foreground questions.

"I think most of what students learn in class is background questions, and that knowledge is what they learn. Foreground questions are the ones that come up in clinical practice, or rather, the ones that develop in the field of clinical practice, so students who don't participate in clinical practice probably won't develop them at all." (interviewee 5)

Motivating learning through observation of role models

The interviewees suggested that for medical students, who were less likely to be aware of foreground questions, observing their supervisors practicing EBM could help them learn how EBM methods could be useful in a clinical setting.

"Personally, I think junior doctors would be inspired to see senior doctors enjoy learning and share the excitement of learning." (interviewee 4)

“I think it’s important to have the attitude that there are things we [supervising physicians] don’t understand, and that we’re doing our best to research our questions on a daily basis.” (interviewee 4)

Additionally, the interviewees suggested that it was important for supervising physicians to be role models for medical students and to practice EBM on a regular basis.

“I think that the person teaching it should do it [EBM] right, first of all. If you’re in clinical practice, then you should practice EBM.” (interviewee 1)

“But I think the number of doctors doing that kind of thing [practicing the 5 steps of EBM] has increased tremendously compared to the past.” (interviewee 1)

Students’ awareness of their own role and active learning

Some interviewees thought that medical students needed to learn to become aware of their desire to help patients and their role within the medical team to enable them to actively learn EBM.

“In short, senior residents have to explain the patients’ conditions to them and perform a variety of procedures, and even if they wanted to, they would not have enough time to find and read papers. Junior residents and students can help with that part of the work. That’s the kind of role we wanted them to play, and we wanted them to work as a team.” (interviewee 2)

One interviewee stated that he would sometimes try to stimulate passive students to make them aware of their role.

“I never treat them as students. It’s not like, ‘You’re a student, so you’ll have to watch.’ In the mornings, I would deliberately ask, ‘How is the patient who was admitted to hospital yesterday?’ That means they would have had to have seen the patient before the round. That’s what I try to get students to do. That’s why they need to know their patients.” (interviewee 3)

The interviewees suggested that having a “patient-focused” perspective would make medical students more willing to learn apparently difficult skills, such as information seeking.

“The students actually learn that the process of searching for articles on clinical questions and applying them to their own patients is useful. This is the so-called ‘aha moment,’ and it is why the hurdle of searching for articles naturally becomes lower.” (interviewee 3)

Understanding patient background as a starting point for practicing EBM

The interviewers suggested that it is important to communicate with each patient and to learn and understand their background and values. Several suggested that trying to understand the patient is the first step in practicing EBM.

“It’s not just about focusing on what the outcome is, it’s about knowing the person. When thinking of the patients themselves, the outcome comes naturally.” (interviewee 4)

“For me personally, when I think about PICO as the first step, information about the outcome is extremely important, so I want students to very carefully talk to the patients and explore their values.” (interviewee 4)

Prioritizing understanding “why” rather than “how” to practice EBM

Remarks from the interviewees suggested that medical students place less priority on learning specific skills such as information retrieval and critical appraisal of articles because they think these skills can be acquired in the future when they become physicians.

“At the time, I didn’t understand the necessity of learning EBM, which is something I understand in hindsight; I don’t really feel that I should have learned about EBM techniques first.” (interviewee 5)

“Personally, I don’t think students need to learn about critical appraisal at all. I think it’s a craftsman’s world to a certain extent.” (interviewee 4)

One interviewee suggested that a priority learning theme should be to understand the reason for the formulation of PICO, which is to understand patients’ background.

“Formulation of questions by PICO is only a tool, and the purpose is to be curious and learn about patients’ background. In that sense, I would like to introduce this tool to students at Step 1 of EBM.” (interviewee 4)

Suggestions of specific strategies to help medical students learn EBM

During the interviews, the participants suggested specific strategies to help medical students learn EBM. One was to use the study of statistics and history of medicine during the pre-clinical phase to help medical students realize the impact of medical articles on clinical decisions. Another was to incorporate the EBM principles as additional learning in their areas of interest or an area in which the students feel they have a strong understanding once they have acquired some background knowledge in each clinical discipline. The interviewees also suggested that students could divide their role into two, as a doctor and as a patient, and explain the research-proven effects of a drug to patients as a way to learn how to apply the evidence into practice. Finally, rather than educating students about EBM in a specific discipline, some interviewees suggested creating a curriculum that allows them to learn EBM across disciplines.

Discussion

Analysis of the interview transcripts led to the identification of several elements that could be used to promote undergraduate EBM education. While becoming aware of the foreground questions in clinical practice is a trigger for practicing and learning EBM, medical students with little clinical experience are first motivated by observing their supervisor practice EBM as a role model. As medical students begin to realize their role in the care of patients, they will understand the significance of the EBM methodology, which is essentially to problem solve for patients. In learning EBM, it is important to first understand patients’ background and values to enable the formulation of questions through PICO, and an appropriate learning goal for students is to understand why EBM is practiced rather than how to practice it.

Although there are signs of gradual change in Japan, clinical practice is still often an observation-based learning method(Inada et al., 2010). By giving medical students certain roles in clinical practice, their learning changes from “observational” to “participatory” and they become able to proactively think about patients’ health issues(Inada et al., 2010). Proactively interacting with patients enables students to think about what it means to be healthy and what is of high priority for the patient—the true outcomes for the patient—which leads to the generation of foreground questions based on PICO.

To enable medical students to formulate their own clinical questions, application of legitimate peripheral participation(MATUSOV et al., 1994) may be useful. Legitimate peripheral participation is a process in which the learner forms a “legitimate member” of a workplace and learns from the periphery by gradually deepening their degree of participation by emulating the person at the center of the workplace. By creating a learning environment in which medical students participate in ward teams or outpatient clinics as “legitimate members,” they begin to acquire knowledge and skills in a step by step manner by observing how doctors practice EBM, even if they are unable to

immediately learn EBM practices on the job. This will require a change in faculty awareness and curriculum to welcome medical students as part of the team.

Based on the remarks of educators in the interviews, it may be more important for medical students to learn why EBM is necessary for clinical practice than the specific skills and knowledge content of EBM. Thus, it may be better for first-time medical students to begin learning EBM from Step 4, understanding that Step 1 is the starting point, and then that information retrieval skills (Step 2) and critical appraisal (Step 3) are methods for obtaining answers to the questions raised in Step 1. Learning EBM in this order will increase students' internal motivation for learning and help them to refine their EBM methods once they have graduated as physicians.

One interviewee suggested that pre-clinical students could learn EBM by thinking about how medical articles affect clinical practice through the study of statistics. How early-career medical students can effectively learn EBM without abundant medical knowledge is a major consideration when establishing an EBM curriculum(Maggio et al., 2016). One report(D et al., 2019) lists "understanding of basic principles and simple examples of medical decision making" and "the scientific method applied to the study of medical science" as items that students should learn in the first two years of medical school. Meanwhile, exercises such as scenario-based clinical questioning were listed for later years of medical school. This gradual progression of learning from lower to higher grades(Maggio et al., 2016) would facilitate medical students' understanding of their need to learn EBM while increasing their prerequisite background knowledge for EBM.

This study gained insights from interviews with supervisors about ways to facilitate EBM learning among medical students. The ideas are compelling because they are derived from the supervisors' experiences with developing their own knowledge and skills in EBM and current teaching. One limitation of this study is that the interviewees were educators rather than learners. We interviewed educators to obtain their views on not only the challenges associated with facilitating EBM learning, but also the solutions to those challenges. Future studies asking medical students about their readiness to learn EBM and their past experiences with EBM will strengthen our findings.

In conclusion, based on interviews with educators, we extracted several factors that may facilitate EBM learning among medical students. Initially, it is important for medical students to understand the significance of and reasons for using EBM methods through observing role models practicing EBM. Once students have gradually acquired clinical knowledge, they can start learning EBM by actively communicating with patients and formulating clinical questions via these conversations. Additionally, the focus of learning goals should not be on learning how to search for literature and critically appraising it, but rather to understand that the goal of EBM is to make decisions that are best for the patient.

Declarations

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated during and analysed during the current study are not publicly available to protect the privacy of personal information but are available from the corresponding author on reasonable request.

Competing interest

The authors declare that they have no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors' contributions

YK and TM made contributions to the conception of the work, data analysis and writing manuscript. YK also contributed to data collection. TI, SN, MS, TM involved in revising the manuscript. All authors read and approved the final manuscript.

FC analyzed and interpreted the patient data regarding the hematological disease and the transplant. RH performed the histological examination of the kidney, and was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

Acknowledgments

The authors would like to thank all of the participants for their cooperation in the interview.

References

1. Ahmadi-Abhari S, Soltani A, Hosseinpanah F. Knowledge and attitudes of trainee physicians regarding evidence-based medicine: a questionnaire survey in Tehran, Iran. J Eval Clin Pract. 2008;14(5):775–9. DOI 10.1111/j.1365-2753.2008.01073.x.
2. Ahmadi S-F, Baradaran HR, Ahmadi E. Effectiveness of teaching evidence-based medicine to undergraduate medical students: A BEME systematic review. Med Teach. 2015;37(1):21–30. DOI 10.3109/0142159X.2014.971724.
3. Committee MEMCCC. (2016). Model Core Curriculum for Medical Education. AY 2016 Revision. Retrieved Dec. 28, from https://www.mext.go.jp/component/a_menu/education/detail/__icsFiles/afieldfile/2018/06/18/1325989_30.pdf.
4. D M, Gaddis G, Ra S, Eskin B, Sinert R. A FRAMEWORK FOR TEACHING EVIDENCE BASED MEDICINE (EBM), A KNOWLEDGE TRANSLATION TOOL. ACROSS THE MEDICAL CURRICULUM; 2019.
5. EDUCATION WFFM. (2015) 'BASIC MEDICAL EDUCATION WFME GLOBAL STANDARDS FOR QUALITY IMPROVEMENT The 2015 Revision'. Available at: https://wfme.org/standards/bme/ (Accessed: Mar, 24, 2020).
6. Grant J. Learning needs assessment: assessing the need. BMJ. 2002;324(7330):156–9. DOI 10.1136/bmj.324.7330.156.
7. HARDEN RM, SOWDEN, S. & DUNN WR. Educational strategies in curriculum development: the SPICES model. Med Educ. 1984;18(4):284–97. DOI 10.1111/j.1365-2923.1984.tb01024.x.
8. Inada H, Mitsunami K, Motohara S, Fetters D, M. (2010). Increasing motivation of medical students through a participatory style of learning.
9. A case study demonstrating how to move away from "osmotic learning". Igaku Kyoiku / Medical Education (Japan), 41 (5), 347–351. DOI 10.11307/mededjapan.41.347.
10. Kojimahara N, Okamoto T, Kagawa J. A Trial of Evidence-Based Medicine in Clinical Clerkships in a Department of Hygiene and Public Health. Igaku Kyoiku / Medical Education (Japan). 2000;31(2):113–8. DOI 10.11307/mededjapan1970.31.113.

11. Larsen CM, Terkelsen AS, Carlsen AMF, Kristensen HK. (2019). Methods for teaching evidence-based practice:a scoping review. Bmc Medical Education, 19. DOI 10.1186/s12909-019-1681-0.
12. 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;88(7):1022–8. DOI 10.1097/ACM.0b013e3182951959.
13. Maggio LA, ten Cate O, Chen HC, Irby DM, O'Brien BC. Challenges to Learning Evidence-Based Medicine and Educational Approaches to Meet These Challenges: A Qualitative Study of Selected EBM Curricula in U.S. and Canadian Medical Schools. Acad Med. 2016;91(1):101–6. DOI 10.1097/acm.0000000000000814.
14. Matsumura S, Ono M, Fukuhara S, Kaga K. National Survey of Programs to Teach Evidence-based Medicine to Undergraduates in Japan. Igaku Kyoiku / Medical Education (Japan). 2001;32(3):173–8. DOI 10.11307/mededjapan1970.32.173.
15. MATUSOV E, BELL N, ROGOFF B. Situated Learning: Legitimate Peripheral Participation. JEAN LAVE and ETIENNE WENGER. American Ethnologist. 1994;21(4):918–9. DOI https://doi.org/10.1525/ae.1994.21.4.02a00340.
16. Ohno M, Matsumura S, Takahashi M, Fukuhara S, Kaga K. Introducing Evidence-Based Medicine Into Undergraduate Medical Curricula. Results of a Nationwide Survey in Japan; 2001.
17. subtitle_in_Japanese. Igaku Kyoiku / Medical Education (Japan), 32 (6), 421–426. DOI 10.11307/mededjapan1970.32.421.
18. Prideaux D. Curriculum development in medical education: From acronyms to dynamism. Teaching Teacher Education. 2007;23(3):294–302. DOI https://doi.org/10.1016/j.tate.2006.12.017.
19. Risahmawati RRM, Emura SSE, Nishi TTN, Koizumi SSK. Japanese Resident Physicians' Attitudes, knowledge, and Perceived Barriers on the Practice of Evidence Based Medicine: a Survey. BMC Research Notes. 2011;4(1):374. DOI 10.1186/1756-0500-4-374.
20. Straus SE, Glasziou P, Richardson WS, Haynes RB. (2018). Evidence-Based Medicine E-Book: How to Practice and Teach EBM. (Elsevier Health Sciences).
21. Thoma A, Eaves FF, III. A Brief History of Evidence-Based Medicine (EBM) and the Contributions of Dr David Sackett. Aesthetic Surg J. 2015;35(8):NP261–3. DOI 10.1093/asj/sjv130.
22. Watanabe H, Fujiwara T, Kobayashi N. A year-round evidence-based medicine-learning course organized by medical students at Ehime University. J Gen Fam Med. 2017;18(4):175–9. DOI 10.1002/jgf2.38.