

Perceptions and use of evidence-based revision methods among undergraduate medical students

Qurat-Ul-Ain Ashfaq¹, Taymmia Ejaz², Maria Hasan Baloch³, Kamil Asghar Imam⁴

Abstract

Objective: To assess awareness, perceptions and use related to evidence-based revision methods by undergraduate medical students.

Method: The descriptive cross-sectional study was conducted in three medical colleges of Rawalpindi-Islamabad, Pakistan, from December 01, 2019, to January 31, 2020, after approval from the ethics review committee of Army Medical College, Rawalpindi. The sample comprised undergraduate medical students of either gender. Data was collected online using a 10-item standardised questionnaire. Students were asked about the revision methods they used routinely and their perceptions of conventional and evidence-based revision methods. Data was analysed using SPSS 23.

Results: Of the total 136 respondents, 92(67%) were females and 44(32.3%) were male students. The response from pre-clinical and clinical years was 67 (50.7%) and 69(49.2%), respectively. Highlighting was the most widely used revision method among students (70 (51%) students), followed by re-reading important points (65 (47.7%) students). 126 (92%) students had the opinion that conventional revision methods were effective learning tools. Only 52 (38.2%) students were aware of the term 'evidence-based revision methods'. Digital tools based on principles of evidence-based revision were used by a minority of students which included use of online question banks by 21 (15.4%) students, osmosis by 40 (29.4%) students, sketchy pharma by 35 (25%) students, flashcards by 19 (14%) and picmonic by only 3 (2.2%). More than 114 (80%) students responded that they wanted evidence-based revision methods to be incorporated into curriculum, and 116 (85%) students said they would like to have a workshop on these techniques.

Conclusion: Most medical students were not aware of and were not using evidence-based revision methods, and relied on conventional revision tools. They were, however, eager to learn about newer revision strategies.

Keywords: Medical education, Undergraduate, Learning strategies, Evidence-based revision methods, Active recall.

(JPMA 74: 499; 2024 DOI: <https://doi.org/10.47391/JPMA.9307>)

Introduction

Medical school life is tough due to the exacting nature of its learning process. In addition to managing the regular drill of activities, such as attending lectures, completing assignments, and preparing for assessments, medical students have to deal with a huge amount of knowledge. Students are overwhelmed with learning and retention of factual knowledge, especially when such knowledge is continuously expanding and evolving at a rapid pace.¹⁻³ The information learnt must also be effectively consolidated and memorised because it serves as a cornerstone for the development of a sound clinical judgement in the future.⁴ Unfortunately, the inescapable phenomenon of "forgetting" makes relearning the same

things over and over a tedious and unpleasant task. This is especially true when the incumbents are unprepared to effectively manage their learning process. It is quite surprising that "neurobiology" of learning and effective learning strategies supported by research are neither taught nor have been made a part of standard medical curriculum.⁵ Research into educational psychology and the processes of learning has demonstrated the effectiveness of several new learning strategies.⁶⁻¹³ These new methods which, when incorporated into the design of standard curriculum at medical schools, can improve learning by making it more efficient, less time-consuming, improved retention and leading to a steady learning curve. Some of these new evidence-based revision (EBR) methods are testing-enhanced learning (TEL), active recall, spaced repetition, and memory associations.

TEL involves taking frequent assessments as part of an active learning process. These frequent assessments, when properly spaced, encourage the students' attention, concentration, recall and purposeful improvement in study stratagems for procuring good grades.¹⁴⁻¹⁶ This method has also proven itself to be more useful than repeatedly studying the same material passively.¹⁶ Active recall further

¹Department of Physiology, Shifa College of Medicine, Islamabad, Pakistan;

²Department of Medicine, Aga Khan University Hospital, Karachi, Pakistan;

³Department of Biochemistry, Shifa College of Medicine, Islamabad, Pakistan;

⁴Department of Physiology, Quetta Institute of Medical Sciences, Quetta, Pakistan.

Correspondence: Qurat-Ul-Ain Ashfaq. e-mail: quratulainashfaq64@gmail.com
ORCID ID. 0000-0001-5402-3919

Submission complete: 20-02-2023

Review began: 01-04-2023

Acceptance: 09-12-2023

Review end: 11-10-2023

builds on the psychological phenomenon of the testing effect. It stimulates the brain for memory retrieval and possibly aids in establishing new neuronal connections, thereby acting as an excellent tool for long-term memory retention.¹⁷ Such an act, when practised repeatedly with varying intervals of time between each revision, serves to consolidate memory more efficiently than active recall or testing alone.¹⁸⁻²⁰ Likewise, students can also benefit by mixing and linking information via memory associations, concept maps, mind maps and interleaved practice.

In Pakistan, EBR strategies are usually not integrated in the curriculum of medical schools. Furthermore, the use of newer learning methods and conventional learning strategies that students use to buttress their memory is not known. The current study was planned to find out the different learning methods used by medical students and their knowledge, attitude and perception regarding contemporary EBR methods.

Annexure: Mastering the art of memory in medicine: perceptions and use of evidence-based revision methods among undergraduate medical students

The purpose of this study is to evaluate perceptions and use of evidence-based revision methods among undergraduate medical students. Based on the results of the study, appropriate learning/ revision method workshops will be conducted. Data collected will be used for research purposes only and will be kept anonymous. If you consent to be a part of this study, please select yes and proceed.

Do you wish to be a part of this study? Yes No

Name (optional): _____ Age: _____

Gender: Male Female

Institution: Army medical college Rawalpindi medical college
 Shifa college of medicine

Year of education 1st year MBBS 2nd year MBBS 3rd year MBBS
 4th year MBBS Final year MBBS

1. How often do you utilize the following conventional revision methods?

	Always	Often	Sometimes	Rarely	Never
Re-reading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Highlighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Making notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Summarizing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online videos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. If you have utilized these conventional methods, do you think they have been effective in your revision?

Strongly agree Agree Neutral Disagree Strongly disagree

3. In your opinion, should these conventional revision methods be formally taught to students, as a single workshop midway through first year MBBS?

Strongly agree Agree Neutral Disagree Strongly disagree

4. Are you aware of the term evidence-based revision methods?

Yes No

5. If you are aware of evidence-based revision methods, how did you learn about them?

Social media Teachers Seminar Workshop Friends/peers Family
 Others (please specify): _____ I'm not aware of these methods

6. Which of the following evidence-based revision methods are you familiar with?

Spaced repetition Active recall Test-enhanced learning Interleaved practice
 Concept maps Mind maps Memory associations Elaborative interrogation
 Self explanation Dual coding

7. Do you believe you have used any of the following tools based upon evidence-based revision methods in your medical learning?

Small group discussions Online question banks Offline question banks
 Sketchy pharma Imagery for texts Flash cards Osmosis Picmonic
 Quizlet Anki

8. If you have utilized these evidence-based revision methods, how effective have they been in your revision?

Very helpful Somewhat helpful Neither helpful nor unhelpful
 Unhelpful and time-consuming/cumbersome/difficult to use
 Very unhelpful I have not used any of these techniques

9. In your opinion, should these evidence-based revision methods be formally taught to students, as a single workshop midway through first year MBBS?

Strongly agree Agree Neutral Disagree Strongly disagree

10. In your opinion, should these and other evidence-based revision methods be integrated in the design of your medical curriculum?

Strongly agree Agree Neutral Disagree Strongly disagree

Subjects and Methods

The descriptive cross-sectional study was conducted in three medical colleges of Rawalpindi-Islamabad, Pakistan, from December 01, 2019, to January 31, 2020, after approval from the ethics review committee of Army Medical College (AMC), Rawalpindi. The sample comprised undergraduate medical students of either gender from AMC, Rawalpindi Medical College (RMC) and Shifa College of Medicine (SCM).

The sample size was calculated using OpenEpi 3.01 with confidence level 95%, margin of error 5% and expected outcome frequency 10%.²¹ The sample size was adjusted for expected response rate of 15%. The sample was raised using non-probability convenience sampling technique. Dental students and those not willing to participate were excluded.

After taking written informed consent from the participants, data was collected using a 10-item structured questionnaire that was developed via Google Forms. The questionnaire explored the students' use of conventional revision methods and their perception regarding the effectiveness of these methods, as well as awareness and utilisation of EBR techniques, including spaced repetition, active recall, TEL, interleaved practice, memory association, concept maps and mind maps, and the usage of online resources based upon EBR methods, such as Sketchy pharma, Picmonic, Anki and Osmosis. The students' opinion regarding the integration of EBR practices into teaching via workshops or standard medical curriculum was also sought. Questions were standardised through a pilot run, with all participants receiving identical questions and graded options. The questionnaire was shared with the students via an online link. Data was analysed using SPSS 23.

Results

Of the 1,000 questionnaire distributed online, 136(13.6%) were returned duly filled. Of them, 65(48%) were from RMC, 47(34%) from AMC and 24(17%) from SCM. Overall, 92(67%) participants were female and 44(32.4%) were male students. The response from pre-clinical and clinical years was 67(50.7%) and 69(49.2%), respectively.

Altogether 126 (92%) students agreed that the conventional revision methods were effective learning tools (Figure 1). There were 52(38.2%) students who were aware of the term 'evidence-based revision methods'. When asked specifically about individual EBR techniques, 59(43.4%) responded that they were aware of concept maps, 58(42.6%) were aware of active recall, and 57(41.9%) were familiar with memory associations (Figure 2).

Use of EBR tools was evaluated by asking the students about their use of popular digital revision tools that incorporated EBR methods in their design. Of these digital apps, Osmosis was used by 40 (29.4%) students, followed by Sketchy pharma by 35(25%), and online question banks by 21(15.4%). Furthermore, 101(75%) had been part of

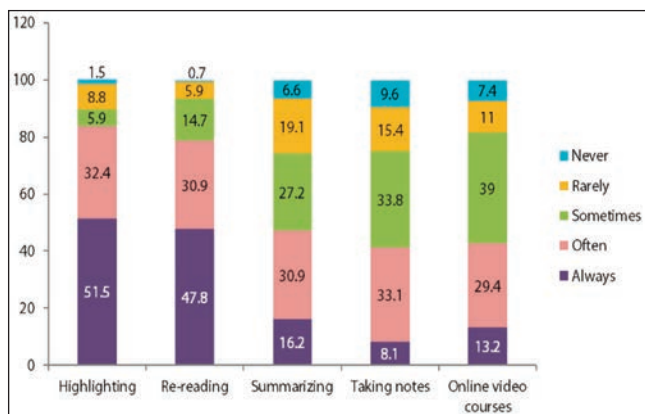


Figure-1: Use of conventional revision methods by students> The X-axis represents conventional revision methods and the Y-axis represents percentage of students' responses.

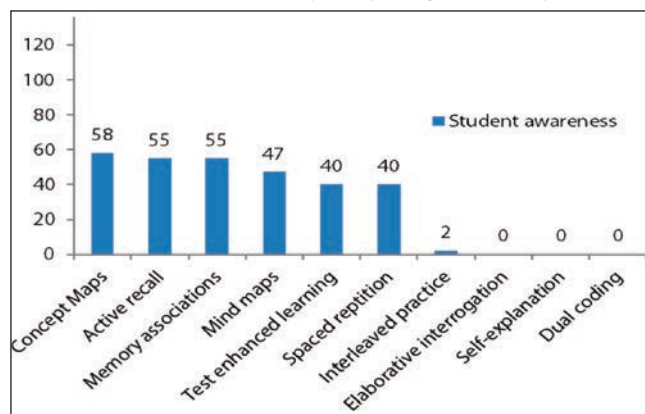


Figure-2: Awareness of students about evidence-based revision methods. The X-axis shows evidence-based revision methods, and the Y-axis represents the number of students who were aware of these methods.

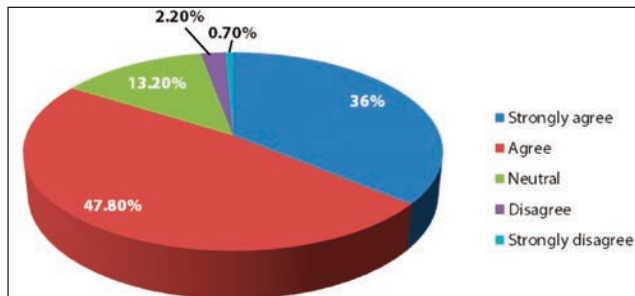


Figure-3: Opinion of the students about incorporation of evidence-based revision methods into the curriculum.

small group discussions, 114(85.3%) asserted that these methods were helpful with the revision, 32(23.5%) said they had first heard about EBR methods on social media, and 15(11%) had heard it from their teachers, while 1(0.75%) student had attended a workshop on the use of these methods.

When asked about their opinion regarding incorporation of EBR methods into the curricular design, 114 (83%) students responded that these methods should be integrated into the curriculum (Figure 3), There were 116 (85%) students who wanted to have a workshop on the use of EBR methods, and 98(72%) said they should have a workshop on the use of conventional revision methods as well.

Discussion

The current study is one of first in Pakistan to establish the perception and practices of medical students related to EBR methods.

There was a higher participation by female students (67.6%) which is in line with the fact that there are more female students in medical colleges across the country.

Among conventional revision methods, highlighting was reported to be the most common revision tool used by the students. It is probably the simplicity and ease of this method that fosters its usage and gives students the illusion of familiarity with the studied material.²² Re-reading, summarising and revising lecture notes were also found to be among the common strategies. The findings were similar to earlier studies.^{3,23-25} Among these commonly practised techniques, high-quality summarisation is a method that has been observed to improve student performance and understanding.²⁶ However, that, too, requires training the students on how to summarise effectively. Highlighting, re-reading and summarisation have been demonstrated to be low-utility revision tools with little value in the long run.³

Another finding of the current study is that undergraduate medical students were not aware of the low utility of these techniques, with 92% participants finding conventional

revision techniques to be effective which perpetuates the misguided practice of these methods. A 2016 study at the University of Florida demonstrated similar findings where medical students perceived lectures and notes as effective tools, and preferred them over active learning.²⁷

The current results showed that majority of students (61%) were not familiar with EBR methods and did not utilise them in their learning strategies. However, when mentioned individually, certain EBR methods, such as active recall, concept maps and spaced repetition, were familiar to >40% of the participants. When inquired about their introduction to EBR methods, only 11% students cited teachers as their source of information about these techniques.

The availability of smartphones has led to the development and popularity of mobile technology and online learning tools, referred to as e-learning.²⁵⁻²⁸ Because of the rise in e-learning tools, the students in the current study were asked about their use of some online learning resources that incorporate EBR principles. Approximately 30% of the participants were found to be utilising Osmosis. The participants also reported using other online studying tools, including Question Banks, Anki, Flashcards, Sketchy Pharma and Quizlet. However, results indicated that the use of these tools was relatively sporadic. A 2012 survey of Welsh medical students found that the use of online medical learning resources was popular among medical students, with 70% of the participants using online tools.²⁹ More recently, a 2022 study into the use of online learning tools by medical students reported that 70% participants used Anki as an e-learning tool,³⁰ whereas only 7% of the participants in the current study.

Most of the online learning resources make use of associations, case-based scenarios, mind maps, picture mnemonics and testing effect to facilitate learning, and enhancing memory retention.^{31,32} When combined with EBR methods, mobile learning can serve as valuable means to help students develop strong intellectual foundation and clinical competence.³³

Students in the current study also reported that the methods being employed in online resources proved useful when incorporated into their study routines. A lot of studies have provided proof in favour of EBR methods in medical education. These are based on the idea that skill of forming memory can be improved if the process of long-term potentiation is reinforced by practising recall, spacing, testing and interleaving.^{34,35} Combined, these strategies can help set the foundation for a sound clinical knowledge.

When the students in the current study were asked about the incorporation of EBR methods in medical curricula, there was an overwhelming positive response. Since a

sizeable section of students rely on reading lecture notes and slides, teachers can work on incorporating EBR methods into their teaching practices. Students who are in the habit of reading and jotting down notes can be taught to write high-quality summaries.²⁶ Revision methods, be it conventional or contemporary, can be tailored to cater to the need of every student. Nonetheless, newer EBR strategies stand superior in their utility and efficiency.³⁶

The current study has the limitations of a cross-sectional design and of having a small sample size which was due to low response rate. Besides, the study did not include responses from faculty, post-graduate trainees and fellows.

Further studies are needed to assess the awareness and attitude of teachers about EBR methods. Teachers can be exposed to the importance and utility of these techniques via seminars and workshops. There is also room for follow-up studies to assess the impact of incorporating EBR methods into medical training.

Conclusion

Medical students lacked an effective revision toolkit for handling the vast and expanding set of knowledge, and a huge majority relied on conventional learning methods. EBR methods, though proven efficient, were not being widely used. Most students were not familiar with such techniques. They were, however, eager to learn about such tools, and responded positively to the idea of incorporating EBR strategies into curricular designs.

Acknowledgement: We are grateful to Dr Iftexhar Yousaf and Dr Shoaib Bin Aleem for their valuable advice and input.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

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Author Contribution:

QAA: Conception of the idea, literature search, study and questionnaire design, data collection and drafting.

TE: Conception of idea, literature search, study and questionnaire design, data analysis and interpretation.

MHB: Literature search, data interpretation and drafting.

KAI: Study design and questionnaire design, ethical approval