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Evidence-based medicine databases: An overview

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ABSTRACT

Evidence-based medicine (EBM) helps to bridge the gap between current healthcare practice and recent research findings in health care. Today's era of scientific information explosion makes hard for healthcare providers to remain up to date on the best clinical practices. In reality, a physician has to read 17 scientific literature works per day to remain up to date. This is a difficult challenge, but EBM databases provide quick access to research findings. This review aims to provide an overview of EBM databases. These databases provide information about guidelines, disease, treatment, diagnosis, clinical relevance, systematic reviews, clinical trials, observational studies, preappraised information, summary, abstract, full text, similar studies, short reports, clinical queries, images, e-textbooks, patient counseling information, and continuous medical education in a minimum period of time. The identification and utilization of recent research findings is a critical step to enhance patient care and clinical practice. This review provides an insight into various EBM databases, type of evidence, access details, and link to each database. Establishing educational requirements and awareness in the practice of EBM among healthcare professionals is a great step for promoting the practice of EBM.

INTRODUCTION

Evidence-based medicine (EBM) has originated as a paradigm shift in clinical practice to reduce the gap between current practice and recent research findings in a particular area among healthcare professionals to enhance the quality of patient care (Sackett *et al*., 1996). It integrates recent research findings with the expertise of practitioners along with considering patient preferences and values (Kamath and Guyatt, 2016; Seshia *et al*., 2013). EBM search strengths and weaknesses behind individual research findings, medical interventions, and clinical trials in terms of risks and benefits and act as a significant tool in clinical decision-making (Mohsen *et al*., 2015). A practice of EBM among patients involves formulating clinical problem or query into an answerable research question, searching for the best evidence from the evidence resources, critical appraisal of research evidence, and application and evaluation of the suitable best evidence to a patient (Bhimani, 2013; Novak *et al*., 2010).

We are living in an era where everyday 2.5 quintillion bytes of new information are being produced. Overload of healthcare information presents a challenging task among healthcare professionals to recognize information from valid resources/studies and translate those information at the point of patient care. Technology has advanced in such a way that accesses to a huge volume of data from multiple resources worldwide (Bastian *et al*., 2010; Ruano *et al*., 2018; Subramanyam, 2013).

EBM databases are evidence resources, which provide various research evidence in the accessible form which will help healthcare professionals to integrate these findings in their daily clinical practice. EBM databases enhanced the effective incorporation of evidence, expert knowledge, and patients' preferences in the patient care. The reliance of EBM databases was useful for acute (mostly single disease) conditions treated with simple interventions, but these databases were not helping much in

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the current epidemiological context characterized by chronicity and multimorbidity in complex health systems. The EBM databases are designed and developed to systematize the search. Databases collect information from a wide variety of sources, with a strong focus on academic journal articles. Typically, databases do not collect the documents themselves but, instead, extract important bibliographic information, including titles, authors, and article abstracts, and compile this information into records within a searchable online catalog. In a field such as the health sciences, databases are vital to research success. Instead of manually flipping through the pages of academic journals or filtering through a pile of nonacademic results in Google, databases allow us to simultaneously search thousands of publications with a click of a button (Fernandez *et al*., 2015).

The majority of medical practice entities such as hospitals and clinics have access to one or more medical databases to aid healthcare professionals in studying future trends in the pattern of disease, identification, and its management. Healthcare professional students and practicing healthcare professionals are not completely aware of the available EBM resources worldwide other than they accessed and practiced during their academics and practice. Lack of time, lack of knowledge in EBM, lack of training in EBM, lack of awareness regarding EBM sources, inadequate access to resources, lack of evidence, inadequate skills, lack of infrastructure and financial support from working organization, negative attitude, patient barriers, language barriers, and logistical barriers were the major barriers found, which limit the practice of EBM (Al-Jazairi and Alharbi, 2017; Sadeghi-Bazargani *et al*., 2014; Zwolsman *et al*., 2012).

The process of creating database records requires indexers to identify the key concepts covered in a given article and include these terms in a searchable field for easy retrieval. A common problem that arises from assigning these concept terms is that human language allows for numerous ways to describe the same concepts. This may lead to missing of a relevant article on a specific search in the EBM database. A majority of database content is typically limited to a specific discipline (Mollá and Santiago-Martinez, 2011).

The challenge in the daily routine within a clinic or a research setting lies in understanding one's own information needs and subsequently being able to choose the most efficient way for localizing and accessing the appropriate and best information available. Skills (searching the medical literature), knowledge (regarding different EBM resources, databases, and type of information providing by the databases), and institutional/ administrative support for providing access to EBM databases are, therefore, vital for every healthcare practitioner who wants to take well-informed decisions (McCaughey and Bruning, 2010; Metzendorf *et al*., 2014; Tyagi *et al*., 2015).

In the literature, information are not available regarding different EBM databases, type of information, access policies, and area of research information. EBM sources play a crucial role by providing essential updated information to healthcare providers quickly. The purpose of this review is to provide information about various EBM databases available today and their clinical relevance.

EBM databases

EBM databases can be categorized based on the type of information that they are providing (Fig. 1).

American College of Physicians (ACP) Journal Club

The ACP Journal Club enables us to remain up to date with the recent clinical evidence appropriate to internal medicine

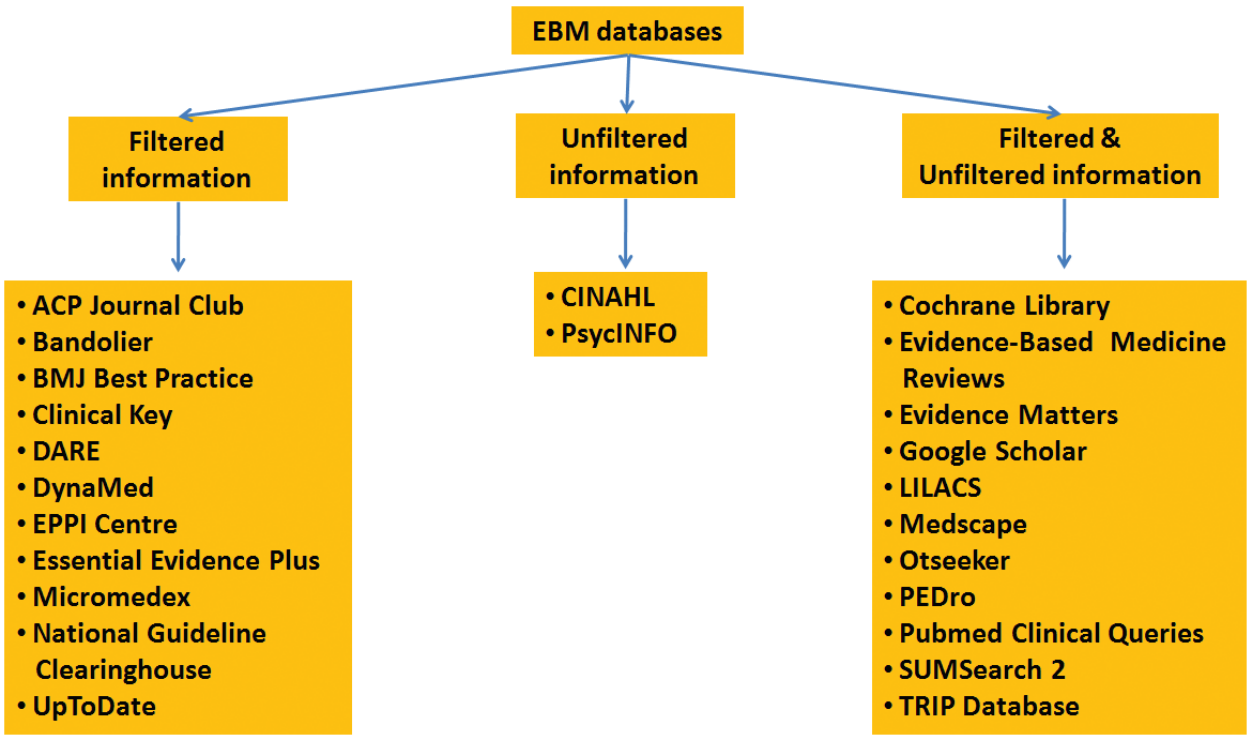

Figure 1. Classification of EBM databases.

and its subspecialties. This is a monthly feature in Annals of Internal Medicine. Annals is the most widely cited general medicine journal (57,057 total cites in 2018) published by the ACP. The ACP Journal Club summarizes recently published relevant and methodologically sound scientific evidence in the field of internal medicine from over 120 journals in a similar discipline. It will be published as easy to read the editorial, abstract, and commentary of selected original articles, systematic reviews, and other notable articles. Free access to the ACP Journal Club is only to the members of the ACP and the nonmember subscribers of Annals of Internal Medicine. It is useful to find the preappraised individual studies. It will help healthcare professionals to up to date with current research evidence in internal medicine (ACP Journal Club | Annals of Internal Medicine | American College of Physicians, 2019).

Bandolier

Bandolier is an autonomous healthcare journal written by Oxford researchers. It is a source of high-quality data for patients, caregivers, and healthcare professionals also. Bandolier's impetus was to find out information that comes from the clinical trials, systematic reviews, meta-analysis, and high-quality observational studies about the scientific evidence of efficacy or lack of efficacy and to present the results as simple. The research team in Bandolier is few but diverse. This group has developed the work on systematic reviews in anesthesia and pain initially. Later, they extended their contributions in migraine, atrial fibrillation, statins, erectile dysfunction, prostatic hyperplasia, and genital warts. This group conducted and published several systematic reviews also. It provides free access to users (Bandolier, 2019).

BMJ Best Practice

BMJ Best Practice is a clinical decision support tool, which supports all the three domains of EBM. It reframes the recent research findings to actionable guidance. It incorporates systematic reviews, patient leaflets, guidelines, and visual alerts to enhance the knowledge and awareness of recent findings of what, why, and how. A daily monitoring of drug alerts, systematic reviews, clinical trial reports, guidelines, feedback, and internal and external peer review will help in the continuous updating of information. The changes will be highlighted for awareness to users. Drug withdrawals or modifications which will influence the safety of patient are updated within 24–48 hours. Evidence which give views in the change of current practices are updating within a month and which confirm the current practice are updating in 3 months. Their clinical expertise team includes 1,600 working clinical authors and editors from around 29 countries. Access to BMJ is based on subscription (BMJ Best Practice, 2019).

Cumulative Index to Nursing and Allied Health Literature (CINAHL)

CINAHL database is the most commonly used research database for nurses, allied healthcare professionals, nurse educators, researchers, and students worldwide. It provides literature works from allied healthcare journals, nursing journals, and publication from the American Nurses Association and National League for Nursing. It covers a broad range of topics, which includes biomedicine, nursing, alternative/complementary medicine, allied health disciplines, physiotherapy, respiratory therapy, sports medicine, public health, general health, nutrition, and dietetics. Contents include full texts, healthcare books, standards of practice, clinical innovations, research instruments, selected conference proceedings, continuous education modules, evidence-based care sheets, overview of disease, and conditions. Access is based on subscription (CINAHL Complete | Full Text Nursing Journals | EBSCO, 2019).

ClinicalKey

ClinicalKey is Elsevier's latest evidence-based clinical reference tool, which is the replacement for MD Consult/First Consult. ClinicalKey is a solution of clinical expertise intended to assist healthcare practitioners and learners to find out the correct responses at the right moment through a wise range and depth of research materials. It offers access to multiple contents such as journals, e-books, images, videos, practice guidelines, point of care monographs, drug information, customized patient education handouts, and more. Each topic includes summary, background, diagnosis, therapeutic outcomes, prevention information, and recommendations. It offers clinicians, pharmacists, nurses, faculty, and students with a distinctive learning experience to assist them in finding the correct responses at the point of decision-making. Access is based on subscription and registration (ClinicalKey, 2019).

Cochrane Library

The Cochrane Library is a collection of high-quality reliable evidence to inform decision-making in the healthcare sector. It provides information as Cochrane reviews, trials, and clinical answers through different databases such as the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials (CENTRAL), and Cochrane Clinical Answers (CCA), respectively. A Cochrane review is a systematic review and/or meta-analysis of various relevant topics in health care, health services, and health policy publishing in the Cochrane Database of Systematic Reviews. Cochrane review includes intervention reviews, diagnostic test accuracy reviews, methodology reviews, qualitative reviews, and prognostic reviews. Systematic reviews published in Cochrane are prepared by the team of authors working with Cochrane by agreeing on a review protocol through registration. Besides, it also contains editorials and special collection of relevant topics. CENTRAL is a source of randomized and quasi-randomized controlled trials. It includes bibliographic details and abstract of the article but not the complete text. CCA includes a clinical question, brief response, and supporting data from most relevant research findings for practicing healthcare professionals. They are intended to use in clinical decision-making at the point of care. The evidence will be presented in a user-friendly format including data, narrations, and link to graphics. Access to Cochrane Library is based on fee. The abstract and plain language summary of the published systematic reviews, title, and bibliographic details of controlled trials will be available freely, whereas the remaining will be available based on payment (Cochrane Reviews | Cochrane Library, 2019).

Database of Abstracts of Reviews of Effects (DARE)

DARE is a database of critically evaluated systematic reviews from various medical journals and represents as

abstracts. It includes a wide variety of topics in healthcare and can be used to answer clinical questions about the impacts of interventions in healthcare, as well as to develop guidelines and policymaking. DARE is available free of charge. DARE produced and maintained by the researchers of the Centre of Reviews and Dissemination (CRD), University of York's (England). The Department of Health, the National Institute for Health Research (NIHR), was providing fund for the production and maintenance of DARE between 1994 and March 2015. As the funding ceased in March 2015, CRD researchers were not adding new records to it. Later, the Canadian search interface database [health technology assessment (HTA)] has been launched in collaboration with CRD and publishing abstracts. Now, DARE and HTA abstracts are available in the CRD website (NIHR Center for Reviews and Dissemination – CRD Database, 2019).

DynaMed

DynaMed is a clinical decision-making tool. The content is written by a world-class team of doctors and specialists who synthesize the clinical evidence from published research works which can be utilized for clinical decision-making. It contains clinical topic summaries, which is based on strict, seven-step evidence-based methodology, systematic literature search, and clinical expertise. It provides quickly accessible and actionable recommendations in a minimum period of time. DynaMed provides clinicians with a chance to join various organizations, enabling access to any site. It also provides continuous medical education programs to enhance the learning experiences. Access is based on subscription (DynaMed | Evidence-Based Content | EBSCO, 2019).

EPPI-Centre

The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI - Centre) performs the systematic reviews of scientific research evidence across a variety of research topics include initial teacher education, public health, health promotion, social welfare, education, and international development. Apart from conducting the systematic reviews, it also involves in developing strategies for the systematic reviews and research studies, assisting others in carrying out reviews, and providing training and guidance in systematic reviews. The EPPI-Centre supports a range of databases including the research studies and reviews. Active databases included in this are Database of Promoting Health Effectiveness Reviews (DoPHER), Trials Register of Promoting Health Interventions (TRoPHI), and Bibliomap. DoPHER is a specialized health promotion review register. Reviews include both systematic and nonsystematic reviews of public health and health promotion efficiency worldwide. TRoPHI is a database of trials (both randomized and nonrandomized controlled trials) including interventions in health promotion and public health. As a consequence of searching and coding studies for including in systematic reviews, the EPPI complied the studies with a database called Bibliomap. It is updated every time when a systematic review is finished by EPPI-Centre. Access is free (EPPI Centre Home, 2019).

Essential Evidence Plus (EEP)

EEP is a powerful, comprehensive system for supporting clinical decision-making that integrates research evidence into the clinical workflows of healthcare professionals. This decision-making tool was developed for nurses, doctors, pharmacist, and other healthcare professionals by a global team of renowned medical specialists. EEP comprises several databases which can be searched individually or simultaneously by entering search terms. It consists of essential evidence topics, decision support tools, history and physical examination calculators, diagnostic test calculators, Cochrane systematic reviews, patient-oriented evidence that matters (POEMs), derm expert image viewer, and E/M coding (to facilitate reimbursement from Medicare). The special features of this database include daily POEM alerts, labeled level of evidence, drug safety alerts, and continuous medical education programs. Access is based on subscription (Essential Evidence Plus, 2019).

Evidence-Based Medicine Reviews (EBMR)

EBMR is a product from Ovid Technologies. EBMR promotes the practice of EBM by providing a single database of the most trusted EBM evidence resources. These resources include the Cochrane Library, ACP Journal Club, and DARE. EBMR was published and maintained by the ACP. All topics published in the above EBM resources can access with Ovid interface database. Access is based on subscription (EBM Reviews, 2019)

Evidence Matters (EE)

EE creates industry-specific, evidence-based knowledge solutions in the areas of general medicine and mental health. The content is focused on physicians, nurses, allied healthcare professionals, decision-makers, researchers, and other healthcare consumers and maintained by a team of physicians, medical librarians, and scientific advisory panel for each domain. The system consists of an internet database containing search engine, data analysis tool, contents, and references that are fast and simple to use. The search results are expressed as tables, charts, and lists, which can filter by more than 50 evidence-based characteristics. A link to full text article or summaries or abstracts also will be available in the result page. It helps users to select the best treatment choices. EE is available in English, French, and Spanish. Access is based on subscription (Evidence Matters – Partnering for Success with Evidence Matters, 2019).

Google Scholar

Google Scholar is a web search engine that is available freely and indexes the metadata or full text of literature works across a wide range of publication formats and disciplines. It offers an easy way to search for literature works widely. It allows searching across books, journal articles, theses, abstracts, and opinions from academic publishers, online repositories, universities, professional societies, and other websites. It also helps to identify related works, authors, and citations other than publications. Google Scholar tries to rank the papers as the way scientists do, full text of articles, publication location, authors of paper as well as how recently published and how often cited in

other literature works. Registration in Google Scholar is optional (Google Scholar, 2019).

LILACS

Latin American & Caribbean Health Sciences Literature (LILACS) is the most significant and detailed index of the scientific literature of Latin America and the Caribbean. The contents include regional relevant books, official documents, full texts, journals, articles, thesis, monographs, and other records. The information is categorized into systematic reviews, integrative reviews, controlled clinical trial, health economic evaluation, HTA, evidence synthesis, and overview. In the selected articles, Spanish, Portuguese, and English language translations are available. Access to this database is free (LILACS EN, 2019).

Medscape (E-Medicine)

Medscape is an online medical knowledge base previously known as E-Medicine. The latest medical news, expert opinions, drug updates, journal articles, clinical trial details, and continuous medical education are available on Medscape. Contents include summaries from the following areas: immunology, allergy, clinical procedures, cardiology, dermatology, critical care, emergency medicine, gastroenterology, endocrinology, hematology, genomic medicine, infectious diseases, neurology, nephrology, oncology, obstetrics/gynecology, perioperative care, pathology, physical medicine and rehabilitation, radiology, pulmonology, psychiatry, rheumatology, and sport medicine. This website is designed for all set of healthcare professionals. Medscape is available in five different languages such as English, Deutsch, Spanish, French, and Portuguese. The website is free to use, which requires registration only (Latest Medical News, Clinical Trials, Guidelines – Today on Medscape, 2019).

Micromedex

Micromedex is evidence-based clinical decision-making support, which contains preappraised information from various global biomedical literature works covering data on drugs, diseases, conditions, toxicology, and alternative medicine. Micromedex evidence-based drug information contains drug dosing, medication management, drug interaction, IV incompatibility, mechanism of action, and patient education. It is designed for nurses, pharmacists, physicians, emergency department clinicians, medical libraries, students, and residents. Links to the full text of evidence are also available in that. Access is based on subscription (Micromedexsolutions, 2019).

National Guideline Clearinghouse (NGC)

The NGC is a database of evidence-based practice guidelines. It was created by the Agency for Healthcare Research and Quality in partnership with the American Medical Association and the American Association of Health Plans. The NGC website includes clinical practice guidelines for abstract and full texts, guidelines for comparisons, bibliography database for searching literature works, and a forum for discussion for exchanging concepts about guidelines. It aims to provide an affordable system of evidence-based clinical practice guidelines for physicians, nurses, pharmacists, and other healthcare providers to practice evidence-based health care. The funding for the NGC has ended. Therefore, the contents will no longer be updated with new content as of July 2, 2018, and as of July 18, 2018, it will no longer be accessible online. However, other stakeholders are presently investigating hosting alternatives to return that. Access to NGC was free (Guidelines and Measures | Agency for Healthcare Research and Quality, 2019).

OTseeker

OTseeker is a database containing an abstract of randomized controlled trials, systematic reviews, and other occupational therapy (OT)-related resources containing interventions related to OT. The interpretability and validity of most of the trials are critically evaluated in this. Featured resources in OTseeker include evidence-based practice resources, injury management resources, qualitative evidence syntheses, and implementing evidence in practice. The information on OTseeker from 2016 onward is not extensive as before due to the absence of financial support. Access to this database is free (OTseeker, 2019).

PEDro

PEDro is a free, evidence database for physiotherapy consisting of systematic reviews, randomized trials, and clinical practice guidelines in physiotherapy. It provides abstract, link to full text, and citation details of all the possible included guidelines, trial, and review. All trials on PEDro are evaluated separately for quality and rated with a checklist called PEDro scale. The PEDro scale checks the believability (internal validity) of the trial and whether it contains adequate statistical information to support the study outcomes. It does not check the treatment effect or generalizability of trial (Physiotherapy Evidence Database, 2019).

PubMed Clinical Queries

PubMed is a free, internet-based public MEDLINE search engine designed in cooperation with various literature publishers to enable access to complete text, citations, and links to similar articles of participating publishers. "Clinical queries" is a new function on PubMed to access information at the point of clinical decision-making. It filters one search by clinical study categories, medical genetics, and systematic reviews. The clinical study category includes therapy, etiology, diagnosis, prognosis, and clinical prediction guides. It retrieves the clinical studies that discuss the above mentioned categories and provide the results as relevant articles. It lacks a critical appraisal component of selected citations (PubMed Clinical Queries, 2019).

PsycINFO

PsycINFO is a database of abstracts/summaries of scientific literature works in psychology and psychological aspects of other associated disciplines. Associated disciplines include psychiatry, business, education, nursing, medicine, computers, social work, linguistics, law, and pharmacology. The source of information includes books, journals, dissertations, articles, and technical reports in the field of psychology and associated disciplines. It enables students, researchers, practitioners, and other healthcare providers to stay up to date with recent advances in the clinical practice of psychology. Access is based on subscription (PsycINFO, 2019).

SUMSearch 2

SUMSearch 2 is a free search engine intended to assist the users for searching a wide range of clinical queries in the best way. It searches original studies, practice guidelines, and systematic reviews from multiple sources such as PubMed, DARE, and NGC for evidence-based healthcare information. The contents include abstracts, blogs, citations, link to the full text of articles, practice guidelines, and continuous education details. Besides**,** entries from the ClinDx website will be presented with the image challenge of the New England Journal of Medicine, continuous medical education cases, medical news, and recent articles from the ACP Journal Club (TMC Library | SUMSearch 2, 2019).

Turning Research into Practice (TRIP) database

TRIP is a free search engine aiming to provide a comprehensive and updated list of internet resources that are helpful for evidence-based practice to healthcare professionals. It offers free access to a wide range of high-quality content. One of the TRIP database characteristics is that the search results are shown in various categories. The TRIP categories are systematic reviews, evidence-based synopses, guidelines, regulatory guidelines, key primary research, clinical questions and answers, controlled trials, primary research, ongoing systematic reviews, ongoing trials, patient decision aids, patient information leaflets, blogs, e-textbooks, and education. It also shows the level of evidence of each result in evidence pyramid. Unfortunately, the search engine does not improve the search, in which search term entered in a synonym or medical subject headings. An upgraded version of TRIP premium is available with payment to users (TRIP Medical Database, 2019).

UpToDate

UpToDate is a subscription-based evidence-based clinical resource intended to provide access to concise, current clinical evidence summaries to physicians. It contains a compilation of medical and patient information, drug monographs, drug-to-drug, herb-to-herb, and herb-to-drug interactions, and medical calculators. The contents are written by physicians, peer reviewer, editors, and other medical experts. The results combine selected literature works with experts' knowledge and provide recommendations for clinical practice. The articles of UpToDate are now anonymously peer-reviewed and discloses the conflicts of interest of papers by authors (UpToDate, 2019).

Various EBM databases and link to the websites are shown in Table 1.

Table 1. EBM databases.

Sl No	EBM databases	URL
1	ACP Journal Club	https://annals.org/aim/journal-club?_ga=2.215464279.1110571881.1561956609-947064019.1561956609
2	Bandolier	http://www.bandolier.org.uk/
3	BMJ Best Practice	https://bestpractice.bmj.com/info/benefits-features/evidence-based/
4	CINAHL	https://www.ebscohost.com/nursing/products/cinahl-databases/cinahl-complete
5	ClinicalKey	https://www.elsevier.com/en-in/solutions/clinicalkey
6	Cochrane Library • Cochrane Database of Systematic Reviews • CENTRAL • CCA	https://www.cochranelibrary.com/
7	DARE	https://www.crd.york.ac.uk/crdweb/homepage.asp
8	DynaMed	https://www.ebsco.com/products/research-databases/dynamed
9	EPPI-Centre	https://eppi.ioe.ac.uk/cms/
10	Essential Evidence Plus	https://www.essentialevidenceplus.com/
11	Evidence-Based Medicine Reviews (OVID EBMR)	https://www.ovid.com/product-details.904.html or https://www.ovid.com/
12	EE	http://evidencematters.com/
13	Google Scholar	https://scholar.google.com/intl/en/scholar/about.html
14	LILACS	http://lilacs.bvsalud.org/en/
15	Medscape (E-Medicine)	https://www.medscape.com/
16	Micromedex	https://www.micromedexsolutions.com/home/dispatch/ssl/true
17	National Guideline Clearinghouse	https://www.ahrq.gov/gam/index.html or https://archive.org/details/guidelinesgov
18	OTseeker	http://www.otseeker.com/
19	PEDro	https://www.pedro.org.au/
20	PubMed Clinical Queries	https://www.ncbi.nlm.nih.gov/pubmed/clinical
21	PsycINFO	https://www.apa.org/pubs/databases/psycinfo/
22	SUMSearch 2	https://library.tmc.edu/database/sumsearch-2/
23	TRIP database	https://www.tripdatabase.com/
24	UpToDate	https://www.uptodate.com/contents/search

CONCLUSION

The practice of EBM depends on healthcare providers' access on reliable research findings. EBM databases provide a platform to make this search easy and accessible at the point of clinical decision-making by providing information about research, education, and patient care. The reliability and depth of gathered information in different databases differ considerably from database to database, institution to institution, and between nations. This review provides an insight into various EBM databases, type of evidence, access details, and link to each database. Knowledge regarding available EBM databases provides a roadmap to healthcare professionals for solving clinical queries.

CONFLICT OF INTEREST

Authors declare that they do not have any conflicts of interest.

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