



EBM apps that help you search for answers to your clinical questions

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10.1136/eb-2013-101623

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Abstract

In the age of smartphones and tablets, it has become commonplace to find apps that help you do or find almost anything. The quality and breadth of medical apps has improved greatly in recent years. You can now find medical apps that recreate textbooks, search for current articles, calculate likelihood ratios and find point-of-care answers to clinical questions. This article describes and reviews apps aimed at helping clinicians search for evidence to support the practice of *EBM*.

Introduction

Having the ability to search for clinically relevant evidence at your fingertips is now a reality. The frequent use of smartphones and tablets opens up the possibility that clinicians can find the answers to clinical questions in real time at the bedside, provided the right tools are available. This article reviews smartphone and tablet applications (apps) that can help a clinician search for evidence to support the practice of *EBM*. While many of the apps discussed are free, some apps have free access as part of a professional society membership benefit, and some apps have an initial cost or in-app costs. Table 1 provides a summary view of these apps including the platform that supports the app. Of note, there are many apps available and this review provides examples of the breadth of available apps; it is not meant to be comprehensive and does not provide app ratings.

Apps to help search for the best evidence

DiCenso *et al*¹ published a hierarchy of preappraised evidence called the 6S model. This model denotes the six levels of clinical evidence available to help in medical decision-making. It starts with the largest resource available, original published studies. It then moves upwards through synopses of studies, syntheses of studies, synopses of syntheses, summaries and ends with the most specific form of evidence at the apex, with the 'systems' layer. This section will review apps using the first five levels of evidence. For more information about clinical websites and the 6S model see Windish.²

Apps to identify original published studies

These apps allow you to review the primary literature using PubMed or Medscape searches. Some allow you to search using the Patient, Intervention, Comparison, Outcome (PICO) format. Many allow you to save and/or email your search results. Sample apps in this category include PubMed for Handhelds, Medscape and EBSCOhost.

Apps to identify synopses of studies

These apps allow you to review resources that summarise the results of single published studies. Many have customised alerts that deliver the latest evidence from

recently published articles and provide expert classified summaries of the evidence. Sample apps include ACP JournalWise, Journal Watch and InfoPOEMS. Most of these apps have a cost associated with them; others however, are included (free access) as part of professional society membership benefits (eg, members of the American College of Physicians have free access to the ACP JournalWise app).

Apps to identify syntheses of studies

Syntheses provide resources that integrate clinical information of multiple single studies through systematic reviews and/or meta-analyses. The apps that provide these syntheses often are the same apps that provide access to single studies. As with other apps aforementioned, the content of medical journals and databases are often monitored for the latest evidence. Some apps provide summary recommendations and/or practice guidelines from organisations such as the US Preventive Services Task Force (USPSTF).

Apps to identify synopses of syntheses

These apps provide an overview of the results of systematic reviews and meta-analyses with expert summaries of them. The apps in this category are the same apps that provide syntheses and synopses of studies.

Apps to identify summaries

These apps provide clinical practice guidelines. Many provide guidelines by organisation, profession, specialty and categories from worldwide medical associations.

Apps to identify *EBM* tools and clinical calculators

There are many *EBM* tools and clinical calculator apps. Some apps focus only on *EBM* tools, like calculating likelihood ratios and post-test probabilities or prediction rules. Two dedicated *EBM* apps are called *EBM* tools and MedCalc 3000 *EBM*. Other apps have clinical calculators that can provide medical formulas and other calculations such as determining clinical risks.

Cautions about medical apps

Recent studies have demonstrated that 65–86% of medical apps had no medical expert involvement during their development.^{3–4} In addition, questions have arisen regarding the reliability and accuracy of the medical content in apps and the potential consequences for patient safety.^{3–5–6} Given the high stakes nature of medical apps, the US Food and Drug Administration intends to regulate apps including those that: (1) control a medical device or display, store, analyse or transmit patient-specific medical device data (eg, ECG), (2) provide patient-specific results with help from formulae or algorithms and (3) transform the mobile platform into a regulated medical device by using attachments or sensors.

Table 1 Summary of medical apps based on the area or level of *EBM* it addresses*

App name (format)	Description of app capabilities	Cost†
Studies		
PubMed for Handhelds‡ (iPhone, iPad, Android)	Multiple ways to search PubMed/MEDLINE: PICO (Patient, Intervention, Comparison, Outcome); ask MEDLINE, a free-text, natural language search; and Consensus Abstracts. Apple iOS app includes these options as well as BabelMeSH which has search options in 13 languages	Free
Medscape‡ (iPhone, iPad, Android)	Searches MEDLINE and Medscape News. Offers an evidence-based reference with images and video, a drug reference and interaction checker. Can save articles, email articles and share articles. Medical news and critical alerts available	Free
EBSCOhost‡ (iPhone, iPad, Android)	Searches various databases with limits to full text or peer reviewed. Can retrieve full-text and/or PDF formats and save or email results	Free
PubMed On Tap‡ (iPhone, iPad)	Searches PubMed and PubMed Central to find, display, and import reference information and pdfs of the full article. Features are optimised for reference retrieval and management (advanced boolean searches, search for Full Text or Free Full text, recall recent searches, etc)	\$
Mobile Abstracts‡ (iPhone, iPad, Android)	Searches PubMed to view the abstracts and pdfs. Also it has basic bookmarking and abstracts can be sent over email	\$
PubMed Clip‡ (iPhone, iPad)	Searches PubMed. Has a graphical interface for advanced searches with bookmarking. A search history is logged, with search results accessible offline. Can access full-text articles	\$
Synopses of Studies		
ACP Journalwise§ (iPhone, iPad, Android, Blackberry)	Allows customised alerts of recently published articles that specifically match chosen filters. Stores articles and reviews the tables of contents of over 150 medical journals. Experts classify articles according to medical disciplines and rate them using standard criteria	Free for American College of Physician members
Journal Watch General Medicine§ (iPhone, iPad, Android)	Delivers summaries of and commentary on key medical research, recent medical news, research and guidelines	\$
InfoPOEMS§ (iPhone, iPad, Android, Blackberry)	Filtered, graded and summarised synopses of medical research via DailyPOEM ("Patient-Oriented Evidence that Matters"). Synopses of new, valid evidence relevant to patient care originating from critical appraisal of studies published in more than 100 journals	\$
Syntheses		
DynaMED (iPhone, iPad)	Provides clinically organised summaries. Monitors content of medical journals and systematic evidence review databases. Articles evaluated for clinical relevance and scientific validity, and the new evidence is then integrated with existing content	\$
AHRQ ePSS (iPhone, iPad, Android, Blackberry)	Provides information based on the current recommendation of the US Preventive Services Task Force (USPSTF). Can be searched by specific patient characteristics and behavioural risk factors	Free
Summaries		
UpToDate (iPhone, iPad)	Conduct searches of synthesised clinical information—including evidence-based recommendations	App is free, but subscription to UpToDate website is required
ACP Smart Medicine (iPhone, iPad, Android)	Search for evidence-based recommendations on diagnosis, therapy, prevention and screening	Free to American College of Physician members
Clinical Evidence (iPhone, iPad, Android)	Provides journal article reviews and integrates them with <i>EBM</i> resources for point-of-care. Details include benefits, harms, commentary and citations to the original literature	\$
Evidence Central (iPhone, iPad)	Contains four resources within one app: <i>EBM</i> Summaries, Cochrane Abstracts, EE+ POEMs and MEDLINE Journals	Application requires a paid subscription to the online Evidence Central service
Guideline Central (iPhone, iPad, and Android)	Provides summaries indexed by organisation, profession and specialty and categories from worldwide medical associations. Provides offline access of content and ability to share, store and annotate	Free
CURRENT Practice Guidelines in Primary Care (iPhone, iPad, Android, Blackberry)	Provides recent guidelines for preventive services, screening methods and treatment approaches commonly encountered in the outpatient setting	\$
ACP Clinical Guidelines (iPhone, iPad, and Android)	Includes recommendations from ACP's Clinical Practice Guidelines, Guidance Statements and Best Practice Advice papers. Users can access clinical recommendations and rationale, summary tables, algorithms and care advice for all current guidelines in an interactive mobile format	Free
Essential Evidence Plus (iPhone, iPod Touch, Android™, Blackberry, and other Smartphones)	Provides summaries, guidelines, literature reviews and calculators, covering many diseases, conditions and procedures	Paid subscription
First Consult (iPhone, iPad)	Provides answers to questions using MD Consult which provides online access to books, journals and review articles. Data can be stored on the device	Free if you have a paid MD Consult account

Continued

Table 1 Continued

App name (format)	Description of app capabilities	Cost†
BMJ Best Practice¶ (iPhone, iPad)	Provides clinical guidelines and research evidence, even when offline, supported by expert opinion. Topics structured around the patient consultation, including prevention, diagnosis and treatment. Also provides diagnoses and diagnostic tests	Free
EBM tools and clinical calculators		
DynaMED (iPhone, iPod, Android, Blackberry)	Provides many clinical calculators	
MedCalc 3000 EBM Stats (iPhone, iPod, Android)	Calculator of <i>EBM</i> -related statistics	\$
MedCalc (iPhone, iPad, Android)	Provides access to complicated medical formulas, scores, scales and classifications, including <i>EBM</i> stats	\$
MedCalc 3000 (iPhone, iPad, Android)	Contains hundreds of medical formulae, clinical criteria sets, decision tree tools and dose/unit converters	\$
Qx Calculate (iPhone, iPad, Android)	Provides a wide range of calculators to help determine prognosis, treatment, management, staging, classifications	Free
Medicine Toolkit—Teaching Tools for Academic Physicians (iPhone, iPad, Android)	Provides a framework for understanding and teaching statistics, evidence based medicine and clinical decision-making. Contains summaries of review articles, consensus guidelines, landmark papers and new articles	\$
EBM Tools (iPhone, iPad)	Provides simple ways to calculate post-test probability and related statistics	Free
Medscape (iPhone, iPad, Android)	Provides formulas, scales with notes and references. Supports US and SI units	Free

Based on the 6S model hierarchy of *EBM*.¹

*Some apps can do multiple things and are listed in multiple areas.

†\$ Means there is a fee to use or download the app.

‡This app also includes information for syntheses.

§This app also includes information for synopses of syntheses.

¶This app also includes information for synopses of syntheses and summaries. This app is published by BMJ.

Another issue to consider with using medical applications is their use of consensus abstracts that were developed by the National Library of Medicine. Consensus abstracts allow a search of MEDLINE/PubMed using PICO or free text formatting. These searches provide links to individual citations and a statement indicating the final summary. These summaries, or bottom lines, can be the conclusion of the article abstract, if one is provided, or derived from an algorithm and the last two sentences of the abstract.⁷ A potential problem with this approach is that no evaluation has been conducted to determine if consensus abstracts reach the same conclusions as systematic reviews or meta-analyses or how clinicians interpret consensus abstract results.⁷ Thus, those who use apps with consensus abstracts should be aware of this potential limitation.

Choosing medical apps

Trying to choose apps for your medical practice may be difficult given the lack of regulation. While individual apps themselves may have ratings based on current/past users, there is no standard by which to choose an app and no way to guarantee their validity or utility. Given this, one approach to finding apps can include using apps from medical organisations which are more likely

to have medical professionals involved with their creation. Table 1 includes several such applications. Another approach can include trying apps with little or no cost to see if they meet your needs.

Competing interests None.

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