Artificial Intelligence
Changes Evidence Based Medicine

A Scalable Health White Paper
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EXECUTIVE SUMMARY

Evidence-Based Medicine (EBM) is considered the guiding principle of clinical practice. There is a plethora of research that proves evidence-based practices improve the quality of patient care, but the reality is that implementing EBM for point-of-care decision making in the age of Big Data often fails in practice. The sheer (and ever-growing) amount of scientific evidence available makes it nearly impossible for healthcare providers to keep up with the latest trials and studies in their field. The National Institute of Health reports that only 20% of clinical care is based on research evidence.¹

Recent developments in Big Data analytics and Machine Learning can enhance the practice of evidence-based medicine by offering an efficient technological approach to EBM. Through pattern recognition of population health trends and clinical research, artificial intelligence (AI) can help uncover what is known and what is unknown; this will offer providers a greater ability to discover scientific research applicable to their patients. Armed with better research data, doctors will be able to present patients with more options for better care outcomes. Big Data analytics coupled with AI will allow physicians to finally achieve evidence-based practices in today’s ever-growing data environment. This paper explores the process that—through a combination of Big Data analytics, sensors, and artificial intelligence—could upend evidence-based medicine and the way care is delivered.

UNDERSTANDING EVIDENCE BASED MEDICINE (EBM)

EBM is intended to optimize the healthcare decision making process by basing care options on scientific research (i.e., evidence). The strongest evidence comes from meta-analyses, systematic reviews, and randomized controlled trials. EBM can impact medical education, individual treatment decisions, population health guidelines, and administrative policies. The use of scientific evidence is intended to eliminate any knowledge gaps or biases that the provider may have when exploring treatment options.

EBM dictates that healthcare practitioners must rely on the latest scientific research available when diagnosing and exploring a patient’s medical options. EBM provides the knowledge base for the physician who is discussing various treatment protocols with the patient. Healthcare providers are inundated with new scientific research every day, so it is not enough to simply be aware of new therapies; rather, a systematic approach is needed to evaluate the information received to determine the most relevant treatment for a specific patient.

The caregivers’ clinical expertise allows them to decide the best course of care for specific patients given their medical histories, genetic dispositions, and lifestyles. This systematic approach to evaluating clinical research allows healthcare providers to find relevant data applicable to their patients, critically analyze potential outcomes, and incorporate this data into their practices. Data analytics coupled with AI can better search huge amounts of clinical research, identify patient-matching criteria, and ultimately present the doctor with the most relevant treatment protocols to consider for a patient. EBM is about discovering the best clinical evidence in a sea of medical data at the right time to allow for the best possible care outcome.

¹ Evidence Based Medicine – New Approaches and Challenges, National Institute of Health

www.scalablehealth.com
Every day, new discoveries are made - new drugs, treatment protocols, clinical trials, new devices, and use of wearable technologies. Doctors are tasked with keeping abreast of all these new developments through publications, conferences, and academia. Research of the best treatment protocols competes with the ever-growing demand for doctor’s time and attention. Providers are faced with the demands of their patients, compliance and reporting requirements, and other administrative tasks, leaving little time for the extensive, ongoing research required to effectively practice EBM.

EBM provides a means to specifically identify the most applicable clinical evidence available to the practitioner to facilitate care options. Further, it identifies protocols that may be scientifically outdated or deemed to be ineffective or harmful. EBM is about finding the best existing therapies that meet the specific care needs of the presenting patient. This is done through research of clinical data coupled with the healthcare provider's expertise in accessing the various options discovered.

EBM involves more than reviewing the available scientific research. It is an approach whereby the doctor develops clinical questions based on the needs of patients. With these questions in mind, the practitioner can conduct a more refined search to answer clinical questions. This process is intended to narrow the parameters of the search to make it more effective and manageable within the healthcare provider’s already overloaded caseload, while at the same time expanding the practitioner's knowledge base.

EBM is never intended to replace the clinical expertise of the doctor, but instead to close knowledge gaps and present the practitioner with the latest scientific research to consider when exploring treatment options.

**6 Steps of Evidence-based Medicine**

1. **Ask a Clinical Guiding Question**
2. **Search for the Best Evidence**
3. **Critically Appraise the Evidence**
4. **Integrate the Evidence**
5. **Evaluate the Outcomes of the EBP**
6. **Disseminate the Outcome**
Evidence-based medicine is simply not provider-friendly. While EBM is considered the "Gold Standard," the barriers to implementation are numerous.

1. **Not Enough Hours in the Day** - To remain current with the latest research, it is estimated that doctors should be reading 19 articles a day, but the average practitioner has a single hour a week available for such research. In addition to research, the healthcare practitioner is responsible to compare and appraise multiple studies to determine which are applicable to the individual patient. Given both the time and economic restraints of running a practice, this is simply not feasible.

2. **Each Patient is Different** - In addition to researching and analyzing studies, doctors must determine if their patient is a viable candidate for this particular treatment protocol. Considerations include previous medical histories, lifestyle influences and genetic dispositions that may impact treatment outcomes.

3. **Just Because it is Published** - Many studies are underwritten by companies with certain agendas and biases. For example, pharmaceutical companies may be biased to publish outcomes that shown their drug in a favorable light.

Clinicians need a more efficient means to implement evidence-based practices into their busy schedules.

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Mašić I. Medicina bazirana na dokazima. U: Porodična/ Obiteljska Medicina principi i praksa, Avicena Sarajevo, 2007: 115-23
EBM is typically broken down into five steps.

1. **Translating the Clinical Problem into a Question** - The questions must be clear, focused on the presenting problem and answerable through medical research. The standard format of these questions addresses four points: problem, intervention, comparison, and outcome (PICO).
   - Who is the patient or what is the problem?
   - Based on the research what are the options?
   - Of the presented options, which is the best for this patient?
   - What was the outcome of the outcome of the selected treatment?

2. **Systematic Retrieval of the Best Research** - This is traditionally a search of medical journals, scientific databases, and consultation with colleagues.

3. **Critical Evaluation of the Information** - Doctors traditionally evaluate the value of the study, its methodology, outcome, and transparency. Critical evaluation becomes a function of the provider’s expertise and knowledge base.

4. **Applying the Information to the Patient** - When considering whether the research is applicable to the specific patient, doctors need to decide if the participants in the study are similar (e.g., medical histories, genetic predispositions, lifestyle considerations) to the patient. Doctors also need to consider whether the patient’s insurance covers the proposed protocol, the potential side effects, and whether it is consistent with the patient’s wishes.

5. **Evaluating the Outcomes** - Once the treatment protocol is decided and undertaken, the healthcare providers will monitor outcomes. Did the treatment work as expected? If it did not, why? What changes in the treatment protocol should be implemented?
HOW ARTIFICIAL INTELLIGENCE CAN HELP EBM

The New England Journal of Medicines was established in 1812 as a means to disseminate medical research and data from clinical trials to support the practice of Evidence Based Medicine. A lot has changed since the launch of The New England Journal of Medicine. Today, practitioners are inundated with medical data and research. And all that data must be analyzed to meet the specific needs of each patient. Caregivers must consider population health trends, worldwide clinical research, the latest drug discoveries to match them to the profile of the patient - what symptoms they present, their medical history, their genetic disposition and any known allergies to present the best treatment options for them. It takes a lot of data to find the right treatment, at the right time for the right patient.

Evidence Based Medicine ensures that care providers integrate the most current clinical research evidence available along with their professional expertise and the patient's values when considering treatment option for care. The concept behind EBM is that it is not enough to rely on a practitioner's experience and expertise, but that treatment options must be based on the latest scientific research available. AI can fill knowledge gaps to ensure the patient and the care provider have considered all the available research when creating a treatment plan. Doctors and patients are on a continuous learning journey for the latest methodologies in diagnosis, prognosis, therapy and other clinical and healthcare issues.

Big Data Analytics can aggregate disparate data from a variety healthcare silo to consider all the available treatment options and medical research to begin patient matching and drive better outcomes. AI can identify patterns within population health data and other medical research to recommend the best scientifically supported treatment options to caregivers. Doctors armed with the latest and most complete analysis and scientific research close the knowledge gap and offer patients treatment options likely to result in the most favorable outcomes.

Natural language processing and speech recognition technology play an important role in changing live dictation into digital text. From digital text, physicians can extract actionable meanings in real time, using which they can capture patients activities without severity of EHR templates. Using speech enabled software allows transparency of EHR data entry as clinicians can easily view workflow at anytime and anywhere. Physicians also develop personal preferences into how they can communicate with their patients. Transcript-based records at the point of care helps physicians to focus on their patients in a single touch. Instead of having to look down at a screen to insert data, they can focus now emphasize on patient and record more observations. Speech-recognition tools also promotes process progression among physicians by making data input more well-organized. Physicians can utilize their voice commands to bounce over monotonous tasks and log data faster than they can type.
CONCLUSION

The adoption of Healthcare Information Technologies along with the use of evidence based medicine can lead to tremendous gains in the healthcare ecosystem. These technologies can lead to lower medical costs and improved patient care quality by delivering access to integrated healthcare information for both patients and providers across healthcare setting. Undoubtedly, the worlds of healthcare and technology are colliding at rocket speed.

What we need now is evidence-based practice. The use of evidence based medicine can enable clinicians to analytically use best research evidence to meet patient’s need. Using population-based research evidence based on techniques from deep learning and cognitive computing can enhance the way care is delivered in healthcare industry.

Evidence-based medicine is more than just using evidence to design treatment plans. It motivates healthy dialogue between providers and patients to make better decisions and create value. Plus, providers and patients can find a suitable plan while determining an appropriate treatment plan. Successful deployment of IT platforms in healthcare settings can offer greater potential to promote “Meaningful Use of Artificial Intelligence.”
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