Follow the evidence wherever it leads…
And question everything.

- Neil deGrasse Tyson

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What is evidence-based medicine?

Evidence-based medicine (EBM) is a practice that integrates the best available research evidence with clinical expertise and patient values and preferences. It is (ideally) a systematic and structured approach to decision-making in healthcare. A practice where clinical decisions are made based on the best available evidence rather than solely on tradition, intuition, or, personal experience.

Evidence-based medicine is a process. It typically involves the following steps:

1. **Formulating a clinical question**
    - This involves identifying a specific clinical question or problem that needs to be addressed in the clinical setting.
    - The formulation of said question often utilizes the PICO framework.
        - **P**atient/Problem,
        - **I**ntervention,
        - **C**omparison,
        - **O**utcome

2. **Searching for and appraising the evidence**
    - A comprehensive search is conducted to identify relevant research evidence from reputable sources such as peer-reviewed journals or evidence-based databases.
    - The quality and relevance of the evidence are critically appraised to determine its validity, reliability and applicability to the clinical question.

3. **Integrating evidence with clinical expertise**
    - The evidence is then integrated with the clinical expertise of the healthcare provider. This includes his/her knowledge, skills, and experience to make informed decisions.
    - This step also involves considering patient values, preferences, and circumstances, as well as the available resources and constraints of the healthcare setting.

4. **Applying evidence in practice**
    - Based on the best available evidence and clinical expertise a treatment plan is formulated and implemented in the clinical practice setting.
    - This may involve prescribing specific medications/supplements, recommending specific interventions, or making other healthcare decisions.

5. **Monitoring and evaluating outcomes**
    - The outcomes of the clinical decision are monitored and evaluated to determine their effectiveness and to continuously refine the clinical practice based on new evidence and patient feedback.

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Evidence-based medicine emphasizes the use of high-quality evidence, such as randomized controlled trials (RCTs) and systematic reviews but also recognizes the importance of integrating individual patient values and preferences into clinical decision-making.

EBM aims to promote the delivery of effective, safe, and patient-centered healthcare by ensuring that clinical decisions are based on the best available evidence, while also considering the unique context of each patient.

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Why should we use evidence-based medicine in practice?

There are several compelling reasons why EBM should be used in practice.

1. **Improved patient outcomes**
    - EBM is based on the best available evidence from rigorous scientific research which helps healthcare providers make informed decisions about patient care. By following evidence-based guidelines and recommendations, clinicians can ensure their patients receive treatments that have been shown to be effective leading to improved patient outcomes and better health outcomes overall.

2. **Enhanced clinical decision making**
    - EBM provides a structured and systematic approach to clinical decision-making. It helps clinicians critically appraise the available evidence, interpret it in the context of their patient's individual need(s) and preference(s) and integrate it with their clinical expertise.
    - This results in more informed and rational decision-making; reducing the reliance on subjective opinions or biases, and leading to more effective patient care.

3. **Improved patient safety**
    - EBM emphasizes the use of interventions and treatments that have been proven to be safe and effective through rigorous research. By following evidence-based guidelines and recommendations, healthcare providers can minimize the risk of adverse events or harm to patients. Thus, ensuring their care is safe and reliable.

4. **Efficient resource utilization**
    - EBM promotes the efficient use of healthcare resources by guiding clinicians to use interventions and treatments that have been proven to be effective and cost-effective.
    - This helps to optimize the allocation of limited healthcare resources, reduce unnecessary or ineffective interventions, and ensure that resources are used to provide the best value for patients and healthcare systems.

5. **Accountability and professionalism**
    - EBM encourages healthcare providers to practice in a transparent and accountable manner. By basing clinical decisions on the best available evidence, clinicians can justify their treatment choices and provide evidence for their clinical decision-making, leading to increased professionalism and accountability in their practice.

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6. **Advancement of healthcare knowledge**
    - EBM promotes the use of research evidence in clinical practice which contributes to the advancement of healthcare knowledge. By using evidence-based approaches, healthcare providers can identify gaps in knowledge and areas that require further research, leading to a continuous cycle of knowledge generation and improvement in clinical practice.

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How should a clinician implement evidence-based medicine in practice?

Implementing EBM in clinical practice involves several key steps:

1. **Formulate Clinical questions**
    - Clinicians should identify specific clinical questions that arise in their practice such as "*What is the best treatment for a particular condition?*" or "*What diagnostic test should be ordered for a specific patient?*"
    - These questions should be clear, focused, and answerable using the available evidence.

2. **Search for and appraise the evidence**
    - Clinicians should conduct a comprehensive and systematic search of the literature to identify relevant research evidence that addresses their clinical questions.
    - This may involve searching for reputable sources of evidence such as RCTs, clinical practice guidelines, or, systematic reviews.
    - Once the evidence is identified clinicians should critically appraise the quality, validity, and relevance of the evidence to their specific clinical question, considering factors such as study design, sample size, and potential biases.

3. **Integrate clinical expertise and patient preferences**
    - Clinicians should integrate their own clinical expertise and experience as well as the preferences and values of their patients when interpreting the evidence.
    - This involves considering the individual patient's clinical characteristics, preferences, and circumstances to determine how the evidence should be applied in the context of their care.

4. **Make informed clinical decisions**
    - Based on the critical appraisal of the evidence and the integration of clinical expertise and patient preferences, clinicians should make informed clinical decisions. This may involve selecting the most appropriate interventions, treatments, or diagnostic tests; all the while considering the best available evidence along with other relevant factors.

5. **Monitor and evaluate outcomes**
    - Clinicians should monitor and evaluate the outcomes of their clinical decisions to assess the effectiveness of the chosen intervention(s) or treatment(s).
    - This may involve tracking patient outcomes, reviewing relevant data, and adjusting the clinical decision-making process as needed based on the feedback obtained.

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6. **Continuously update one's knowledge**
    - EBM is an iterative process that requires clinicians to continuously update their knowledge and skills.
    - Keeping abreast of the latest research evidence, regularly reviewing and updating clinical practice guidelines, and participating in continuing education activities can help clinicians stay up to date with the latest evidence and ensure that their practice remains evidence-based.

7. **Communicate with patients**
    - Clinicians should communicate effectively with their patients about the evidence-based approach they are using in their practice.
    - This involves explaining the rationale behind their clinical decisions, discussing available evidence, and engaging patients in shared decision-making processes that considers their preferences and values.

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What is the risk of not using evidence-based medicine?

Not using evidence-based medicine can pose several risks including (but not limited to):

1. **Suboptimal patient outcomes**
    - Without relying on the best available evidence, healthcare providers may make clinical decisions based on personal opinions, anecdotes, or outdated practices that may not be supported by scientific research.
    - This can lead to suboptimal patient outcomes including ineffective treatments, unnecessary procedures, increased morbidity or mortality, and decreased patient satisfaction.

2. **Patient harm**
    - Without evidence-based practice there is a risk of exposing patients to interventions or treatments that are not proven to be safe or effective, potentially resulting in patient harm.
    - This can include adverse reactions to medications/supplements, complications from unnecessary procedures, or other preventable harms that could have been avoided with evidence-based decision-making.

3. **Wasted resources**
    - Not using EBM can result in wasteful spending on ineffective or unnecessary interventions, tests, or treatments.
    - This can divert resources from more effective and cost-effective interventions, ultimately leading to inefficient resource allocation.

4. **Legal and ethical concerns**
    - In some cases, not using EBM in healthcare may raise legal and ethical concerns.
    - Healthcare providers have a duty to provide care that is consistent with the standard of care, which includes using evidence-based practices.
    - Failure to do so could expose healthcare providers to potential legal liabilities and ethical concerns related to substandard care or deviation from established standards of practice.

5. **Variability in care**
    - Without EBM, there may be variability in the care provided to patients, leading to inconsistent or uneven quality of care across different healthcare providers or settings.
    - This can result in inequities in healthcare, where patients may receive different levels of care based on geographic location, provider preference, or availability of resources, rather than what is supported by evidence.

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6. **Missed opportunities for innovation and improvement**
    - EBM promotes the use of research evidence to guide clinical practice which can drive innovation in healthcare. Not using EBM may result in missed opportunities to identify and adopt new, evidence-based interventions or practices that could improve patient outcomes, enhance patient safety, and optimize resource utilization.

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What is the future of evidence-based medicine?

EBM is likely to adapt and to the changing landscape of healthcare, driven by advancements in technology, research methodologies, and a growing emphasis on personalized and patient-centred care. Potential trends that may shape the future of EBM include:

1. **Precision Medicine**
    - Precision medicine, also known as personalized medicine, tailors medical care to the unique characteristics of individual patients, taking into account their genetic, environmental, and lifestyle factors.
    - Using genetic and molecular data to better inform clinical decision-making and optimize treatment strategies. This personal data can then guide treatment selection, dosage adjustments, and patient monitoring leading to more targeted and effective interventions.

2. **Real-world evidence (RWE)**
    - RWE refers to data collected outside of traditional randomized controlled trials (RCTs), such as electronic health records, claims databases, and patient registries.
    - The future of EBM is likely to increasingly incorporate RWE as it can provide insights into the effectiveness and safety of interventions in real-world clinical practice.
    - RWE can also fill in knowledge gaps for patient populations that may be underrepresented in clinical trials (such as those with rare diseases like CIRS).

3. **Big data and artificial intelligence**
    - The use of big data and AI in healthcare is expected to grow.
    - Analyzing large datasets can generate insights and patterns that may not be apparent in smaller studies and AI can be used to process and analyze the data more efficiently.
    - Machine learning algorithms can be trained on large datasets to generate predictive models, decisions support tools, and recommendations for clinical practice.

4. **Patient engagement and shared decision making**
    - Both patient engagement and shared decision making are gaining prominence in healthcare and the future of EBM is expected to place a greater emphasis on involving patients in the decision-making process.
    - This may include incorporating patient preferences, values, and goals into clinical decision making and engaging patients as active partners in their own care.
    - Patient reported outcomes and patient-generated health data will empower patients to be active participants in their care.

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5. **Multimodal evidence synthesis**
    - Evidence synthesis methods such as meta-analysis and systematic reviews are fundamental to EBM. In the future, there may be an increasing use of multimodal evidence synthesis which combines data from multiple sources including RCTs, observational studies, and other types of evidence to provide a more comprehensive and nuanced understanding of the evidence base.

6. **Continuous learning and update**
    - EBM is an evolving field and the future is likely to see a greater emphasis on continuous learning and update of clinical practice. Clinicians will need to keep up with the latest research evidence, clinical guidelines, and technological advancements to ensure their practice remains evidence-based.
    - Continuing education, professional development, and access to up-to-date evidence through digital platforms and tools may become more prevalent to support lifelong learning and continuous improvement.

The future of EBM looks bright. Though we must endeavour to keep the patient front of mind. If we get lost in big data and AI, personalized medicine may fall through the cracks.

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How to use evidence-based medicine for poorly understood conditions?

The tenets of EBM do not change whether you're dealing with a poorly understood condition like chronic fatigue or a more well-defined illness like strep throat. Unfortunately, most practitioners cherry-pick when to use evidence-based medicine. If the data supports their personal bias, they use it. But should data contradict their bias or, should it require a reasonable amount of learning to understand a complicated condition then one too often relies on his/her past experience.

Below I list the most basic first steps a practitioner needs to take when attempting to tackle poorly understood and complicated illnesses:

Ask a clinical question:
The first step in EBM is to formulate a clear and answerable clinical question. For conditions like chronic fatigue syndrome or fibromyalgia, a typical question might be "*What is the most effective treatment for this condition*?" (Hint: it's not an antidepressant)

Search for the evidence:
Once the question is formulated, the next step is to search for relevant evidence. This can involve searching online databases of medical literature, such as PubMed or Cochrane Library, to identify studies that address effective treatment options for the condition.

This step is almost always glossed over in complicated conditions. It's much more expedient for a practitioner to suggest the patient is experiencing somatization. A prescription for anxiety medication is handed out and the case is closed.

Evaluate the evidence:
After identifying relevant studies, it's important to evaluate the quality of the evidence. This involves considering factors such as study design, sample size, and potential biases that may affect the validity of the findings.

Who is running clinical trials on medications for fatigue?
If it's drug manufacturers, you may want to consider a reporting bias.

Apply the evidence:
Based on the evidence, clinicians can make informed decisions about the most effective treatment options. This may involve considering factors such as the patient's medical history, current symptoms, and other individual factors that may impact treatment outcomes.

Monitor and evaluate outcomes:
After initiating treatment, it's important to monitor the patient's progress and evaluate the outcomes of

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treatment. This may involve assessing changes in symptoms, measuring markers of inflammation, or evaluating other clinical outcomes.

Are primary care providers charting the progress of their CFS and fibromyalgia patients?
If they were, I'm sure they would quickly realize that their recommendations for graded-exercise therapy, eating healthy, and getting at least eight hours of sleep, aren't cutting it.

In summary, using EBM for poorly understood conditions involves a systematic approach to identifying and evaluating relevant evidence, and using this evidence to inform clinical decision-making.

In the context of chronic fatigue syndrome and fibromyalgia, it is apparent that the majority of primary care providers are not practicing evidence-based medicine. If they were, a simple Google query would suggest that the evidence supporting the diagnosis and treatment of CIRS is far more robust and efficacious than a lazy diagnosis like chronic fatigue syndrome and treatment with antidepressant medication.

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