



EVIDENCE BASED MEDICINE

Maryam Okhovati

ML&IS Dept. Kerman University of Medical Sciences

Okhovati.maryam@gmail.com

EBM

- Evidence-based medicine (EBM) is the use of high-quality clinical research in making decisions about the care of patients



mid-nineteenth
century
Paris

EBM

- Dr. David Sackett (McMaster University) formalized the EBM movement in 1967.
- It rooted in the words of Archie Cochrane (1909–1988), a British epidemiologist, who understood the importance of synthesizing high-quality evidence to inform clinical decisions.
- In 1979, Archie Cochrane wrote: “It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials.”
- 1991- American College of Physicians (ACP) Journal Club editorial

Archie Cochrane- 1972- "... decisions about medical treatments were still based on a gut instinct" (Cochrane 1989)



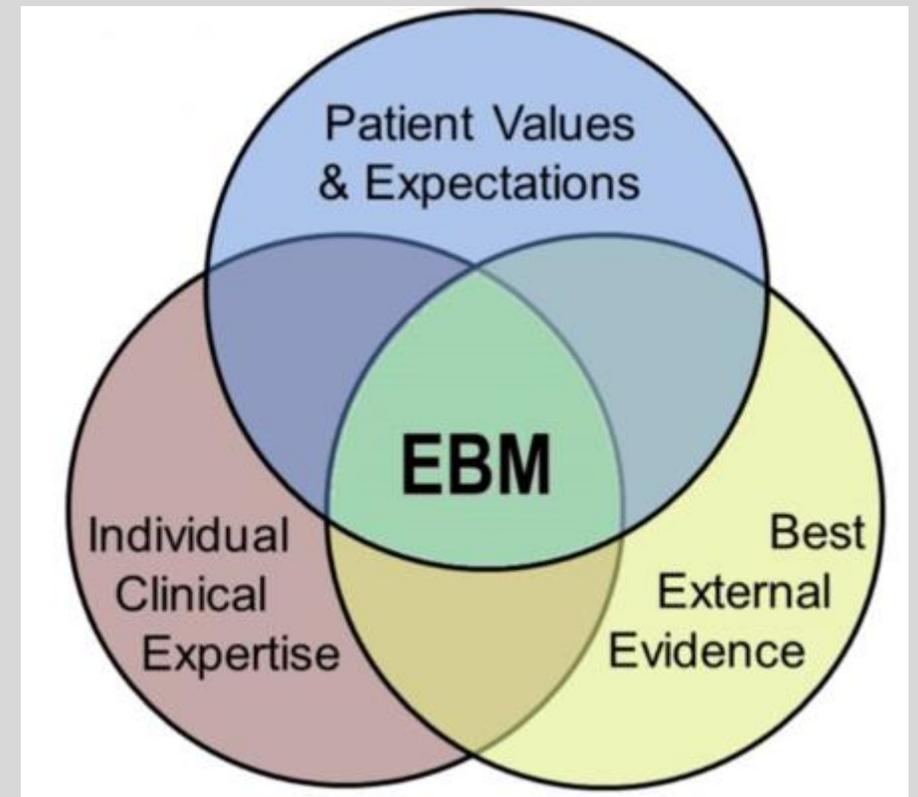
EBM

➤ *JAMA* article, the Evidence Based Medicine Working Group introduced EBM to the wider medical community (1992):

"A new paradigm for medical practice is emerging. Evidence-based medicine deemphasizes intuition, unsystematic clinical experience, and pathophysiologic rationale as sufficient grounds for clinical decision making and stresses the examination of evidence from clinical research. Evidence-based medicine requires new skills of the physician, including efficient literature searching and the application of formal rules of evidence evaluating the clinical literature."

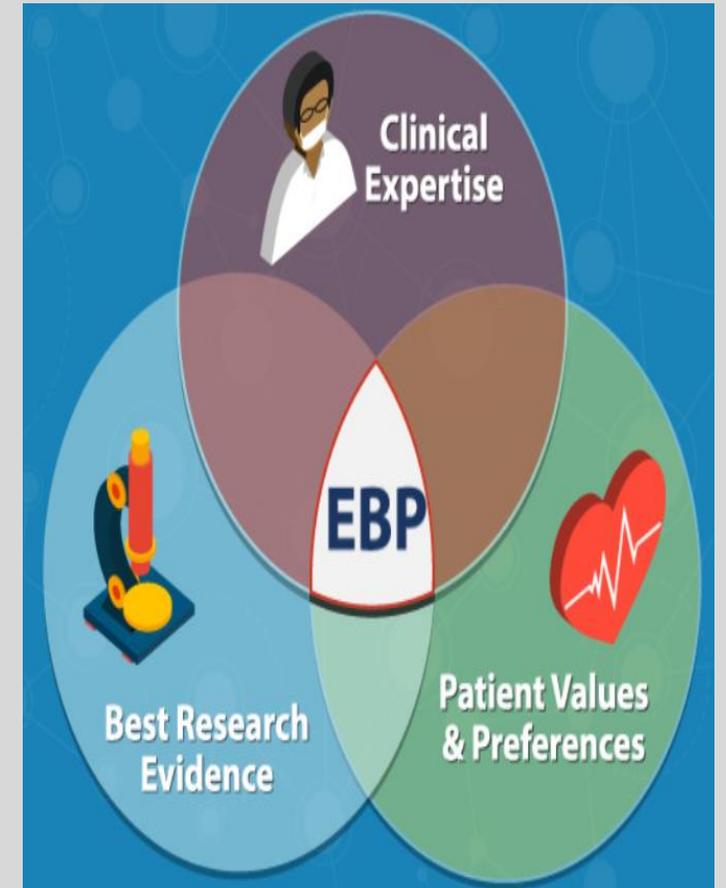
Evidence Based Medicine

- The integration of best evidence from current research, patient preferences and values, and clinical expertise to clinical questions in a timely fashion (Sackett, 2000).



Why EBM

- ❖ Medical knowledge & accepted practice change rapidly
- ❖ Volume of research articles is expanding exponentially
- ❖ Integrating the evidence into your practice regularly makes it easier to find and apply the evidence during busy clinical schedules
- ❖ It allows you to blend patients' preference with the research resulting in patient-centered care

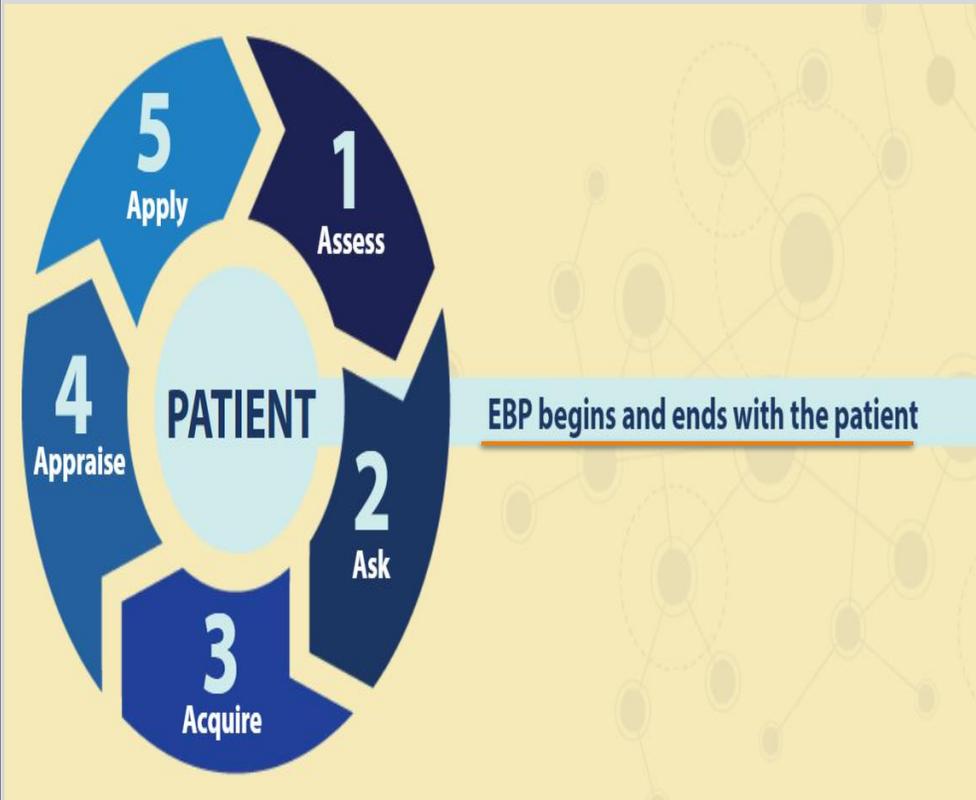


The Five Basic Components of Evidence-Based Medicine

Step 1	Converting the need for information (about prevention, diagnosis, prognosis, therapy, causation, etc.) into an answerable question
Step 2	Tracking down the best evidence with which to answer that question
Step 3	Critically appraising that evidence for its validity (closeness to the truth), impact (size of effect), and applicability (usefulness in our clinical practice)
Step 4	Integrating the critical appraisal with our clinical expertise and with our patient's unique biology, values, and circumstances
Step 5	Evaluating our effectiveness and efficiency in executing steps 1-4 and seeking ways to improve for next time

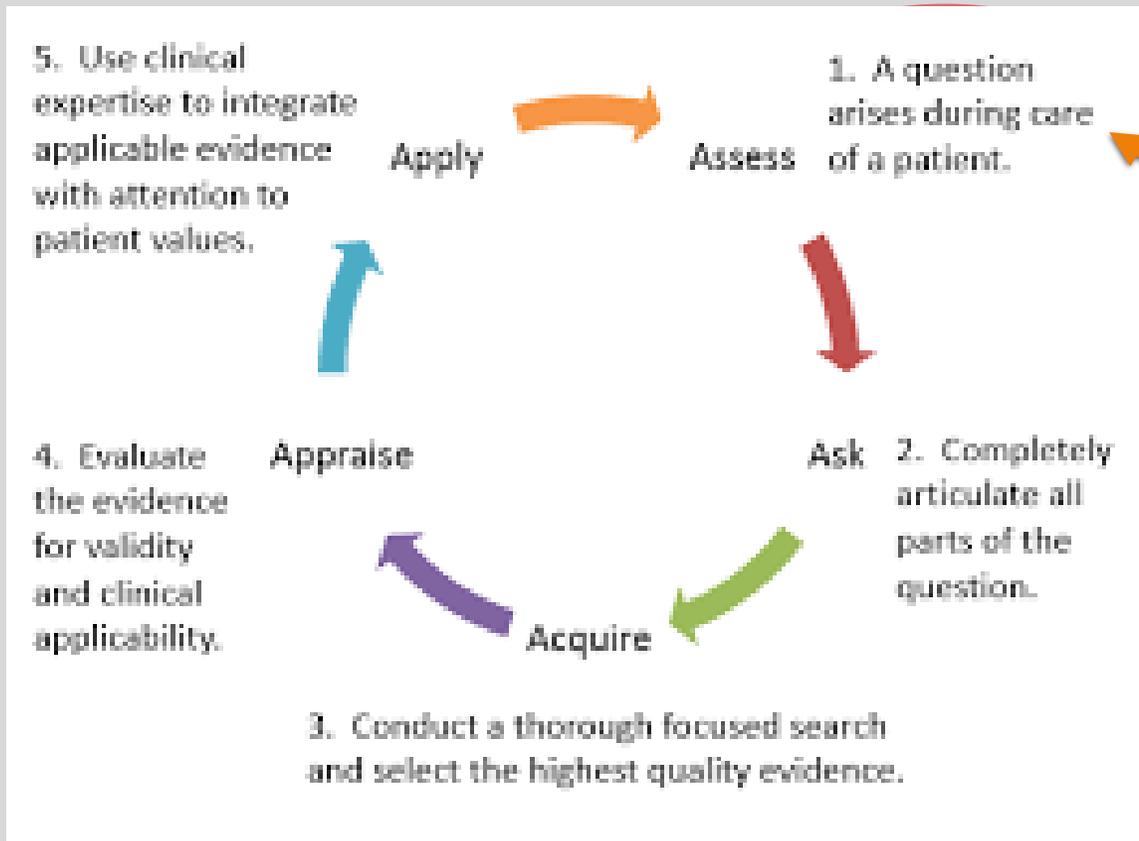


EBM steps



- Assess the patient and your own knowledge gaps
- Ask a well-built clinical question derived from the case
- Acquiring the evidence by selecting appropriate resource and conducting search
- Then appraise the evidence for its validity and applicability
- Finally apply what you have learned, talk with a patient and the evidence with your clinical expertise and patient preferences
- Evaluate the performance with your patient

1. Assess



❖ Assess the patient and your own knowledge gaps

65 year-old male



- Long history of type 2 diabetes and obesity
- Non-smoker
- Knee surgery 10 years ago



Tried numerous diet and exercise programs without much success

Desire to see granddaughter graduate college

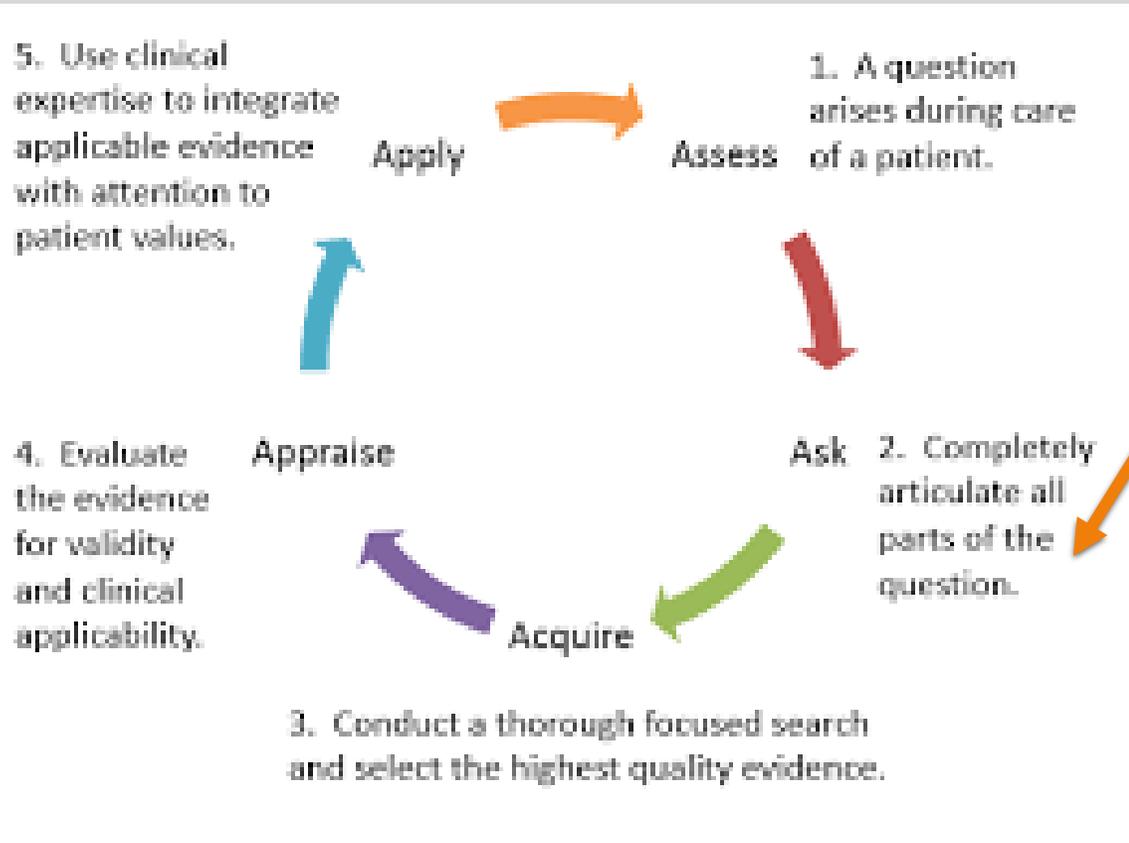
Understands increased risk of heart disease and frustrated at inability to lose weight

Assess

A cartoon illustration of the 65-year-old male in a hospital room. He is standing next to a hospital bed, leaning on a cane. He has a sad expression. The room has blue walls, a white bed frame, and a desk with a computer monitor.

Heard about "stomach stapling"
Lose weight AND "cure" diabetes
Does it really work?

2. Ask



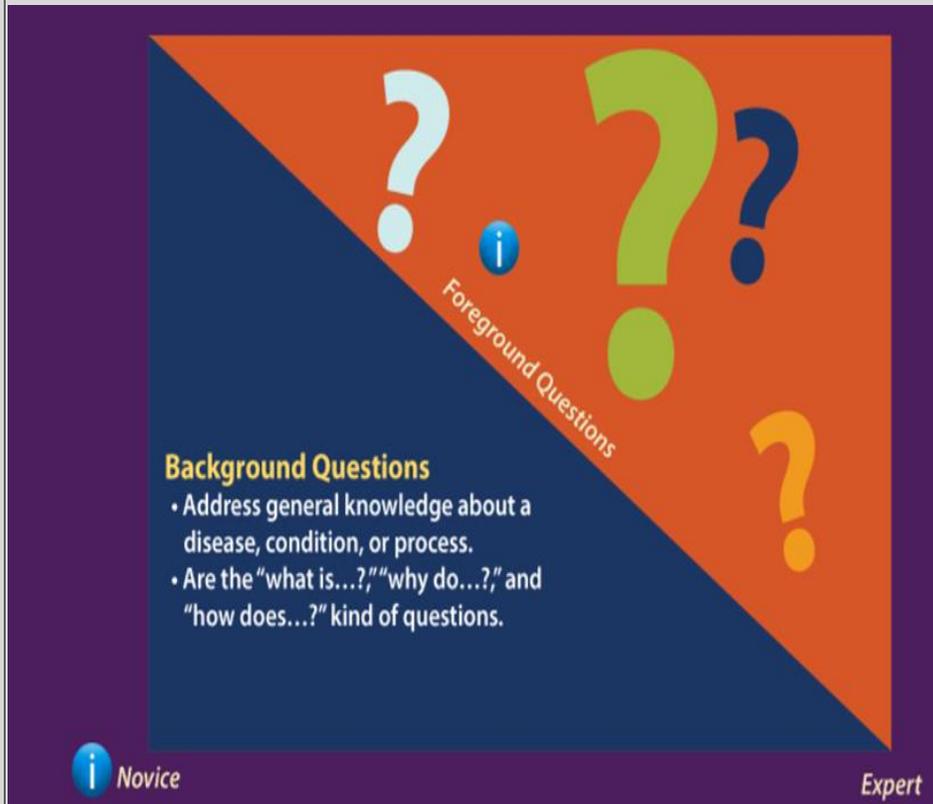
❖ Ask a well-built clinical question derived from the case

ASK/Clinical question types

1. Background
2. Foreground



Background questions:



ask for general knowledge about a condition, test or treatment. These types of questions typically ask who, what, where, when, how & why about things like a disorder, test, or treatment, or other aspect of healthcare.

- What causes migraines?
- When do complications of appendicitis usually occur?
- How is Type II Diabetes managed?

The best resources to answer them are: Books & textbooks, clinical practice guidelines, clinical EBM resources.

Background questions:



Textbooks

Online textbooks are searchable and offer guidance and best practices for various specialties and disciplines.

Some examples of online textbook sources are:



AccessMedicine



Clinical Key



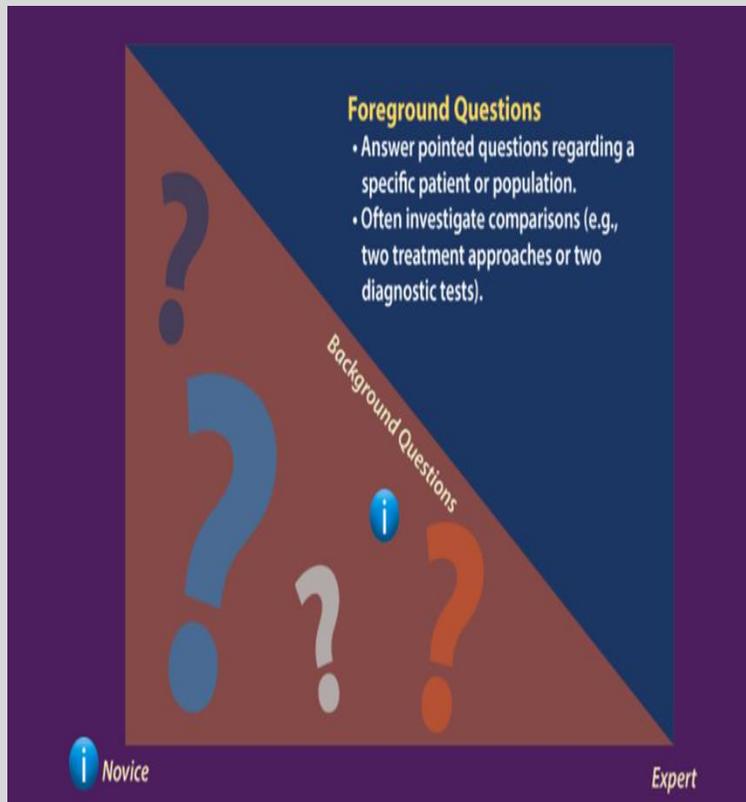
Scientific American Surgery



UpToDate.com

Provides syntheses on clinical topics (e.g., "Bariatric operations for management of obesity indications and preoperative preparation"), which offer background information on disease management, prognosis, and other recommendations.

ASK/ Foreground questions



ask for specific knowledge to inform clinical decisions. These questions typically concern a specific patient or particular population. They tend to be more specific and complex than background questions. Quite often, foreground questions investigate comparisons, such as two drugs, or two treatments. They require primary sources that synthesize a wide range of knowledge, and usually call for evidence-based answers.

Is Crixivan effective in slowing the rate of functional impairment in a 45 year old male patient with Lou Gehrig's Disease?

In patients with osteoarthritis of the hip, is water therapy more effective than land-based exercise in restoring range-of-motion?

*The best resources to answer them are: **Databases***

ASK/ Foreground questions



Research Articles from Journals

PubMed/MEDLINE

Scopus

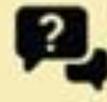
Web of Science

Google Scholar

Pre-appraised Sources and Syntheses



American College of
Physicians® Journal Club



Family Physicians Inquiries
Network Clinical Queries



Essential Evidence Plus



Cochrane Library

ASK

Background questions:

- ✓ What are COX-2 inhibitors?
- ✓ What causes depression?
- ✓ What is temporal arteritis?
- ✓ How is Type II Diabetes managed?

Foreground Questions:

- ✓ What are the effects of prolonged bed rest on patients with severe scoliosis after lumbar surgery?
- ✓ Are mobile devices an effective tool to manage workflow in an emergency department?
- ✓ What are the determinants of transitions to palliative care in acute care patients under the age of 35?

PICO

Key components of a well-formed question



PICO

- ***Patient problem:*** the most important characteristics of a patient, the primary problem, disease, conditions, the demographics of the patient may be relevant to the diagnosis or treatment of disease
- ***Intervention:*** prognostic factor or exposure, what are you going to do for the patient, order a drug, order a test, order a surgery- what factors may influence the prognosis of patient such as age, co-existing problems or previous exposure
- ***Comparison:*** the main alternative to compare with intervention, are you trying to compare two drugs, a drug or a non-medication or two diagnostic tasks
- ***Outcome:*** what can you hope to accomplish, what are you trying to do for the patient, relieve or eliminate the symptoms, reduce the number of adverse events

Patient Problem



Obese

Remission
of
Diabetes

Intervention



Diabetes
Type 2

Male

Comparison



Weight
Loss

Stomach
Stapling

Outcome



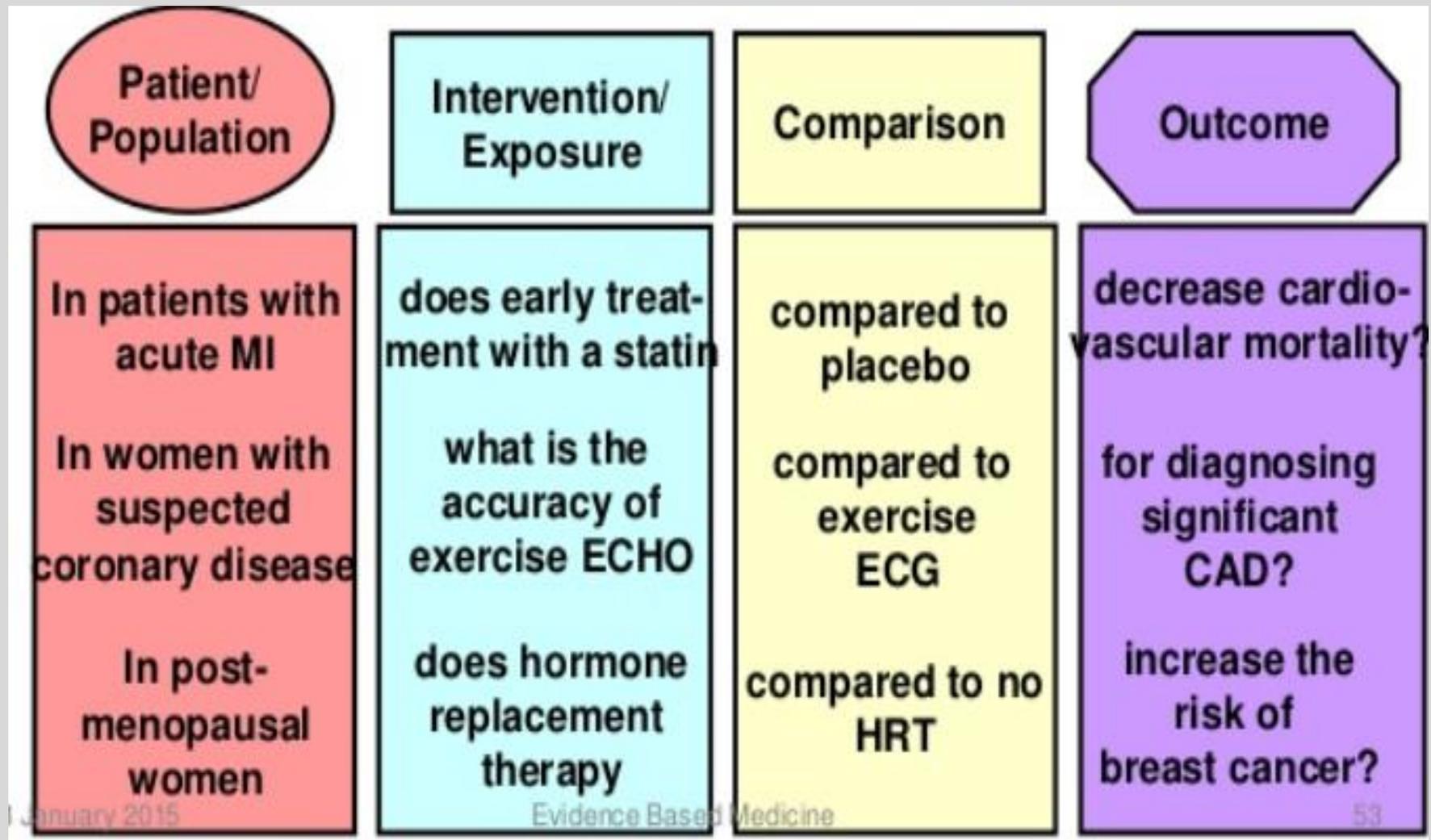
Mortality

Standard
Medical
Care

PICO



PICO



PICO/ Scenario

Tom is 55 years old and has smoked one pack of cigarettes a day for the last 30 years. He is ready to quit, and is wondering about his options. He has heard of a medication called bupropion, but is also familiar with nicotine replacement therapy options such as patches, lozenges, and gum. Tom wants to know which option will work best to help him quit and abstain from smoking again in the future.

- ❖ **Patient/problem/population:** mid-50s male with a 30 pack-year history of smoking
- ❖ **Intervention:** bupropion
- ❖ **Comparison** intervention: nicotine replacement therapy
- ❖ **Outcome:** long-term abstinence from smoking

PICO/ Scenario

Janet is 42 years old and just had her first mammogram. She does not have a history of breast cancer in her family, and she has heard from her friends that she doesn't need to have a mammogram every year, only every three years because of new guidelines. She wants to know if she has to come back every year for a mammogram, or if she can make an appointment every three years.

- ❖ **Patient/problem/population:** woman in her 40s with no family history of breast cancer
- ❖ **Intervention:** mammograms every three years
- ❖ **Comparison:** yearly mammograms
- ❖ **Outcome:** early detection of breast cancer

ASK/Why PICO?

- **Helps you form a focused question that will return relevant results**
- **Helps you retrieve a manageable amount of results**
- **Assists you in brainstorming keywords for your research**
- **Saves time!**

ASK/ Types of questions

- Diagnosis
- Therapy
- Prognosis
- Harm/ Etiology

The type of question is important and can help lead you to the best study design.



ASK/ Types of clinical questions

- ❑ ***Therapy***: questions concerning the effectiveness of a treatment or preventative measure.
- ❑ ***Harm/Etiology***: questions concerning the likelihood of a therapeutic intervention to cause harm.
- ❑ ***Diagnosis***: questions concerning the ability of a test to predict the likelihood of a disease.
- ❑ ***Prognosis***: questions concerning the future course of a patient with a particular condition.

Diagnosis

How to select and evaluate diagnostic tests.

Study Designs:

Cross-sectional study or a prospective, blind comparison to a gold standard

Therapy

Is a treatment effective?

Study Designs:

Systematic review, randomized controlled trial or cohort study

Prognosis

What is the patient's likely clinical course over time?

Study Designs:

Cohort study, case control and case series

Harm/ Etiology

What caused this disease?

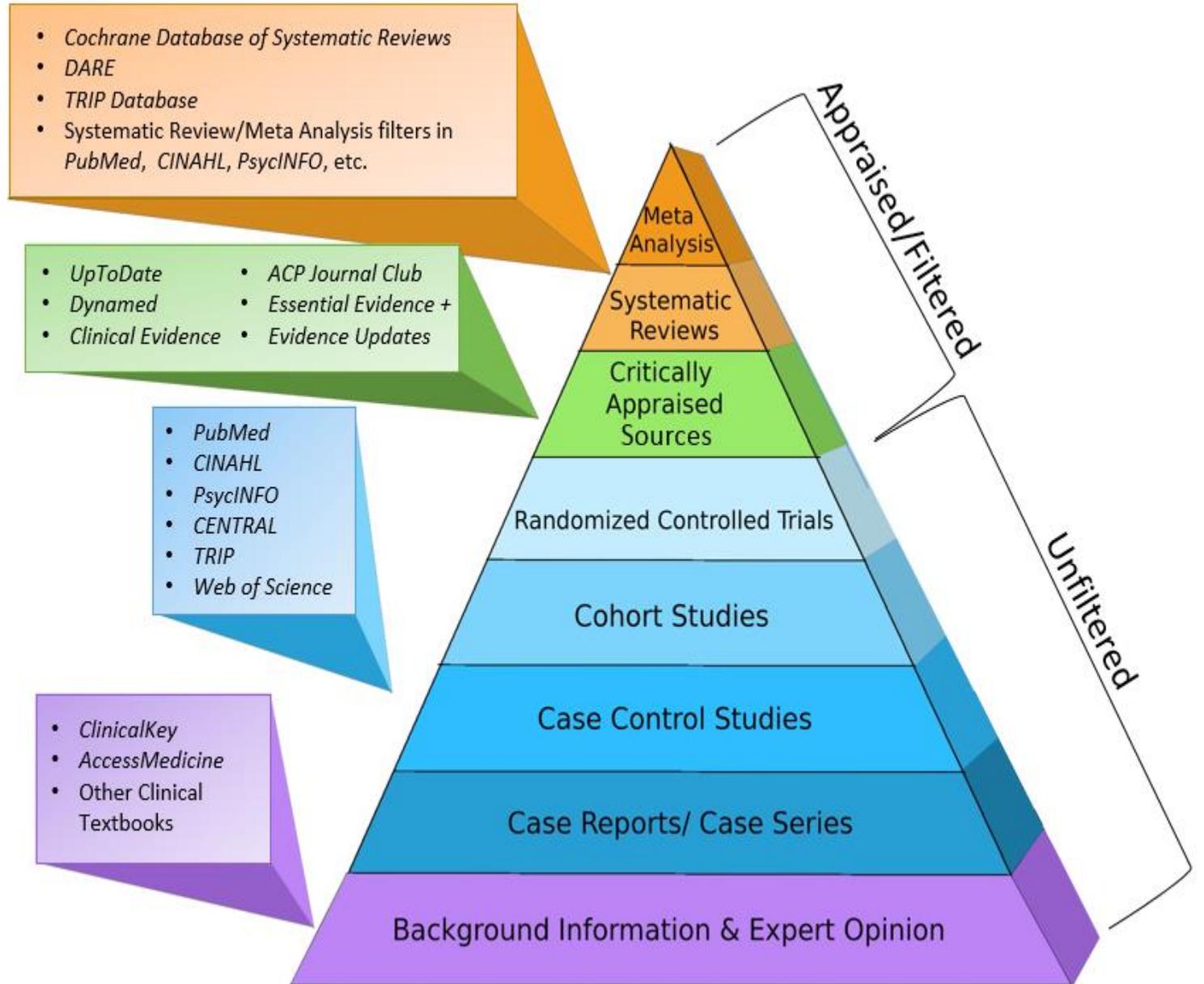
Study Designs:

Cohort, case control or case series can answer questions of harm.

ASK/ Types of Questions

Categories of Clinical Questions	Best Type of Study for this Question Category
Diagnosis Which diagnostic test should you select and how should you interpret the results of that test?	Cross-Sectional Studies, particularly Prospective, Blind Comparison to a Gold Standard Study
Therapy Which treatment will be the most beneficial and worthwhile?	Randomized Control Trials
Prognosis How can you predict the likelihood of a particular outcome for your patient?	Cohort Studies or Case Control Studies
Etiology How can you determine the cause of a disease?	Cohort Studies

Acquire/ Hierarchy of Evidence



Acquire/ Types of questions

What type of question are we asking?

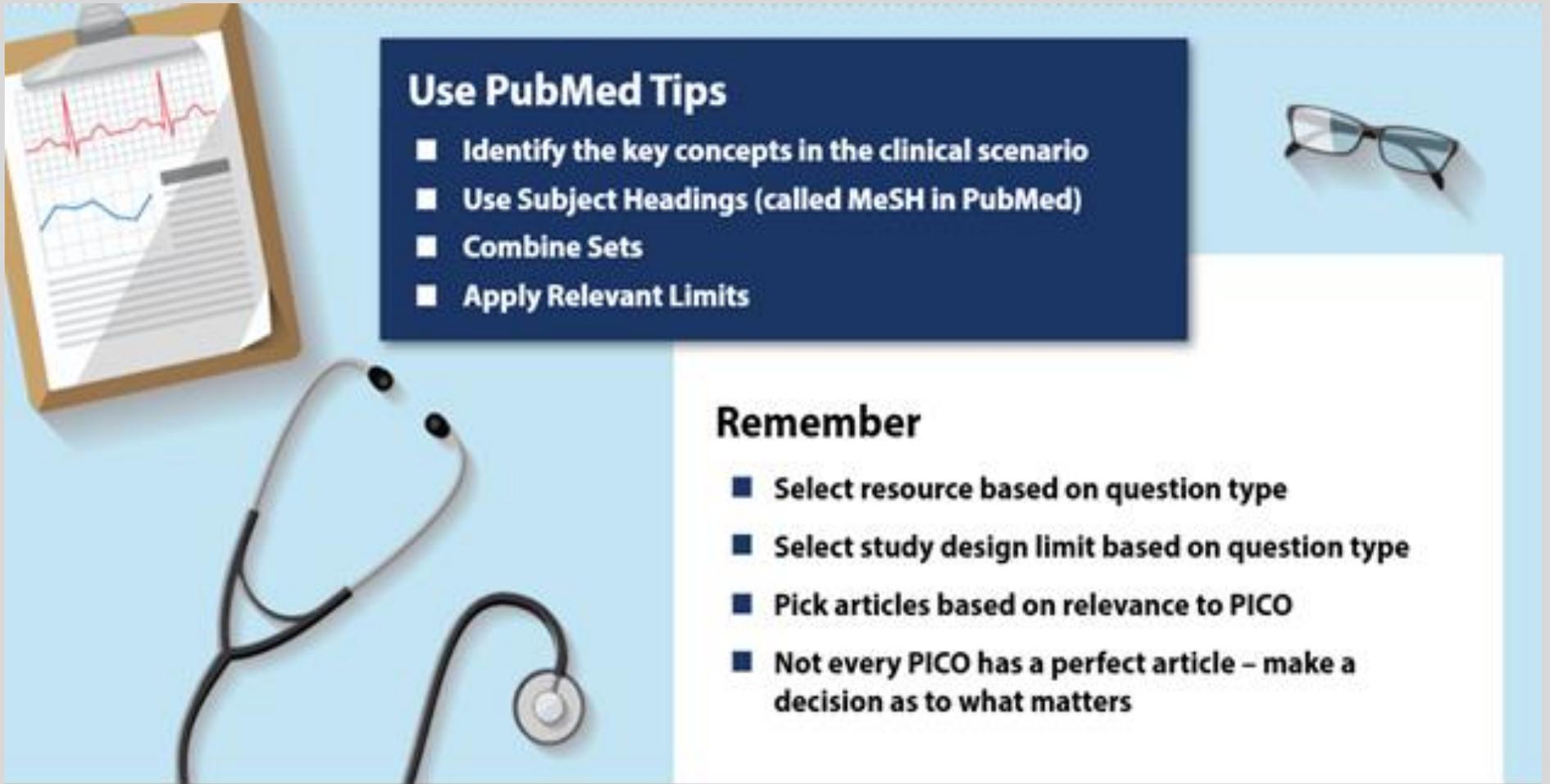
It is a Therapy question.

What type of study are we looking for?

The best evidence would be a randomized controlled trial (RCT). If we found numerous RCTs, then we might want to look for a systematic review.



ACQUIRE/ PUBMED



Use PubMed Tips

- Identify the key concepts in the clinical scenario
- Use Subject Headings (called MeSH in PubMed)
- Combine Sets
- Apply Relevant Limits

Remember

- Select resource based on question type
- Select study design limit based on question type
- Pick articles based on relevance to PICO
- Not every PICO has a perfect article – make a decision as to what matters

ACQUIRE/ PUBMED/ PICO



ACQUIRE/ PUBMED



PubMed is the National Library of Medicine (NLM)'s search interface to the MEDLINE database.

Millions

of references to articles from medicine, nursing, basic sciences, and related biomedical fields.

1940s - Present

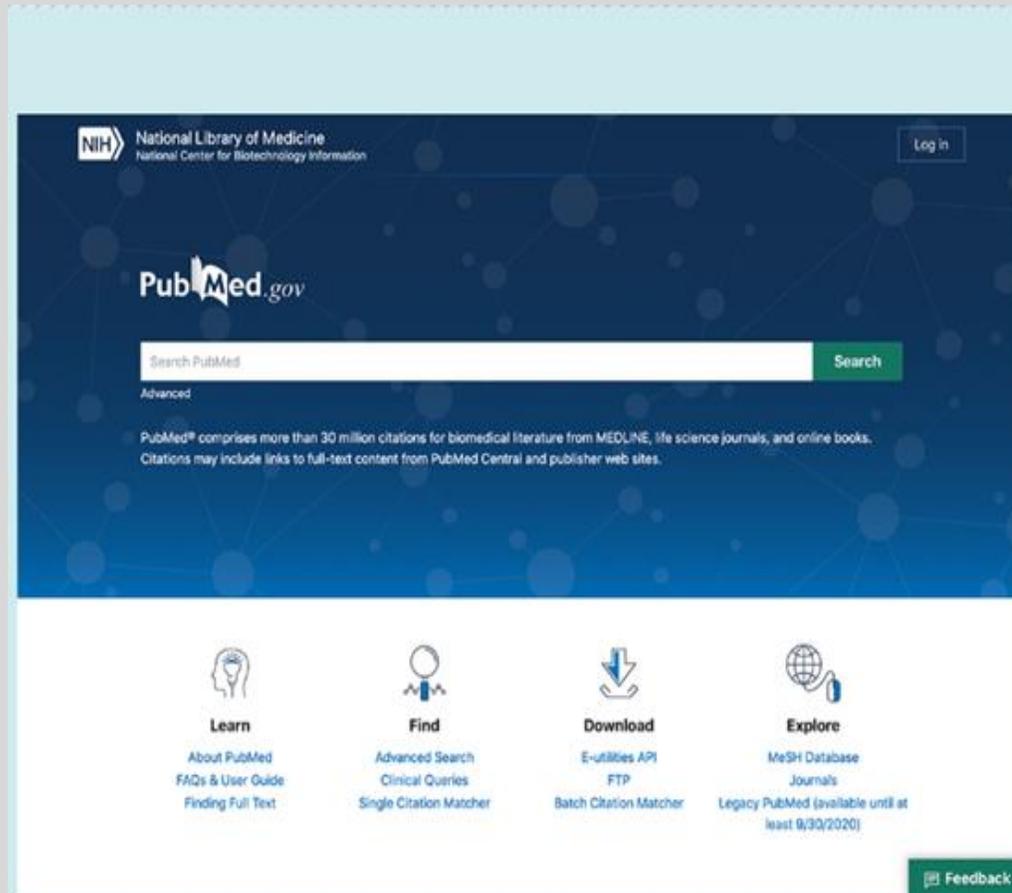
over 5,600 global journals in numerous languages.

MeSH (Medical Subject Headings)

Each indexed reference is tagged with MeSH terms that describe the contents of the article.

PubMed comprises more than 34 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full text content from PubMed Central and publisher web sites.

ACQUIRE/ PUBMED



Select each item below to learn more.

1 Identify the key concepts in the clinical scenario

2 Use Subject Headings (called MeSH in PubMed)

3 Combine Sets

4 Apply Relevant Limits

Use Subject Headings/ MESH

What is it called when a blood clot blocks the flow of blood through a coronary artery – a blood vessel that feeds blood to a part of the heart muscle?

Heart attack?
Myocardial infarction?
MI? Heart infarction?



- Authors can refer to a given disease, condition, or medical concept in multiple ways. To ease article retrieval on a topic it is best to include subject headings in your search. In PubMed, these headings are called MeSH terms. The National Library of Medicine has added them to every citation in the MEDLINE database.
- When you search for terms in PubMed, it will frequently find a MeSH term for you. But, you must check search details to confirm it finds and searches on the correct MeSH terms.

History and Search Details Download Delete

Search	Actions	Details	Query	Results	Time
#1	+++		Search: heart attack [("myocardial infarction"[MeSH Terms] OR ("myocardial"[All Fields] AND "infarction"[All Fields]) OR "myocardial infarction"[All Fields] OR ("heart"[All Fields] AND "attack"[All Fields]) OR "heart attack"[All Fields]) Translations heart attack: "myocardial infarction"[MeSH Terms] OR ("myocardial"[All Fields] AND "infarction"[All Fields]) OR "myocardial infarction"[All Fields] OR ("heart"[All Fields] AND "attack"[All Fields]) OR "heart attack"[All Fields]	258,718	09:51:07

Acquire/ MESH

**National Library of Medicine**
National Center for Biotechnology Information

[Log in](#)

MeSH

[Create alert](#) [Limits](#) [Advanced](#) [Help](#)

Full

Bariatric Surgery

Surgical procedures aimed at affecting metabolism and producing major WEIGHT REDUCTION in patients with MORBID OBESITY.
Year introduced: 2006

PubMed search builder options

[Subheadings:](#)

<input type="checkbox"/> adverse effects	<input type="checkbox"/> instrumentation	<input type="checkbox"/> rehabilitation
<input type="checkbox"/> classification	<input type="checkbox"/> legislation and jurisprudence	<input type="checkbox"/> standards
<input type="checkbox"/> economics	<input type="checkbox"/> methods	<input type="checkbox"/> statistics and numerical data
<input type="checkbox"/> education	<input type="checkbox"/> mortality	<input type="checkbox"/> trends
<input type="checkbox"/> ethics	<input type="checkbox"/> nursing	<input type="checkbox"/> veterinary
<input type="checkbox"/> history	<input type="checkbox"/> psychology	

Restrict to MeSH Major Topic.
 Do not include MeSH terms found below this term in the MeSH hierarchy.

PubMed Search Builder

[YouTube Tutorial](#)

Related information

[PubMed](#)

[PubMed - Major Topic](#)

[Clinical Queries](#)

[NLM MeSH Browser](#)

[dbGap Links](#)

Acquire/ Combine the sets

Ensure the articles you retrieve include all the concepts important to your question by combining search sets

So your PubMed search could look like:

(heart attack OR myocardial infarction) AND aspirin

Search

Notice how parentheses keep synonyms or similar concepts together: this tells PubMed how to interpret your search. Parentheses are required when you mix ANDs and ORs in a single search statement.

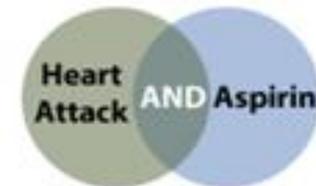
You can often combine PICO concepts in one search string, like this:

obesity AND diabetes type 2 AND bariatric surgery

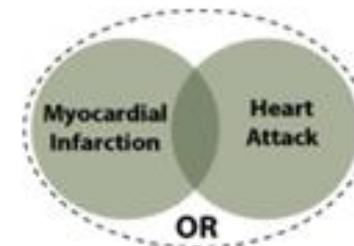
Search

If you choose to search for them separately, combine them with the correct Boolean operators (AND, OR) on the Advanced Search page.

Boolean Terms Explained



AND looks for the intersection of two or more sets and is primarily used for combining the major concepts in your search.



OR finds results that include either of the criteria and is primarily used for combining synonyms

Apply filters

PubMed[®] myocardial infarction Search

Advanced Create alert Create RSS User Guide

Save Email Send to Sort by: Best match Display options

MY CUSTOM FILTERS 299,247 results Page 1 of 29,925

RESULTS BY YEAR

1916 2025

PUBLICATION DATE

- 1 year
- 5 years
- 10 years
- Custom Range

TEXT AVAILABILITY

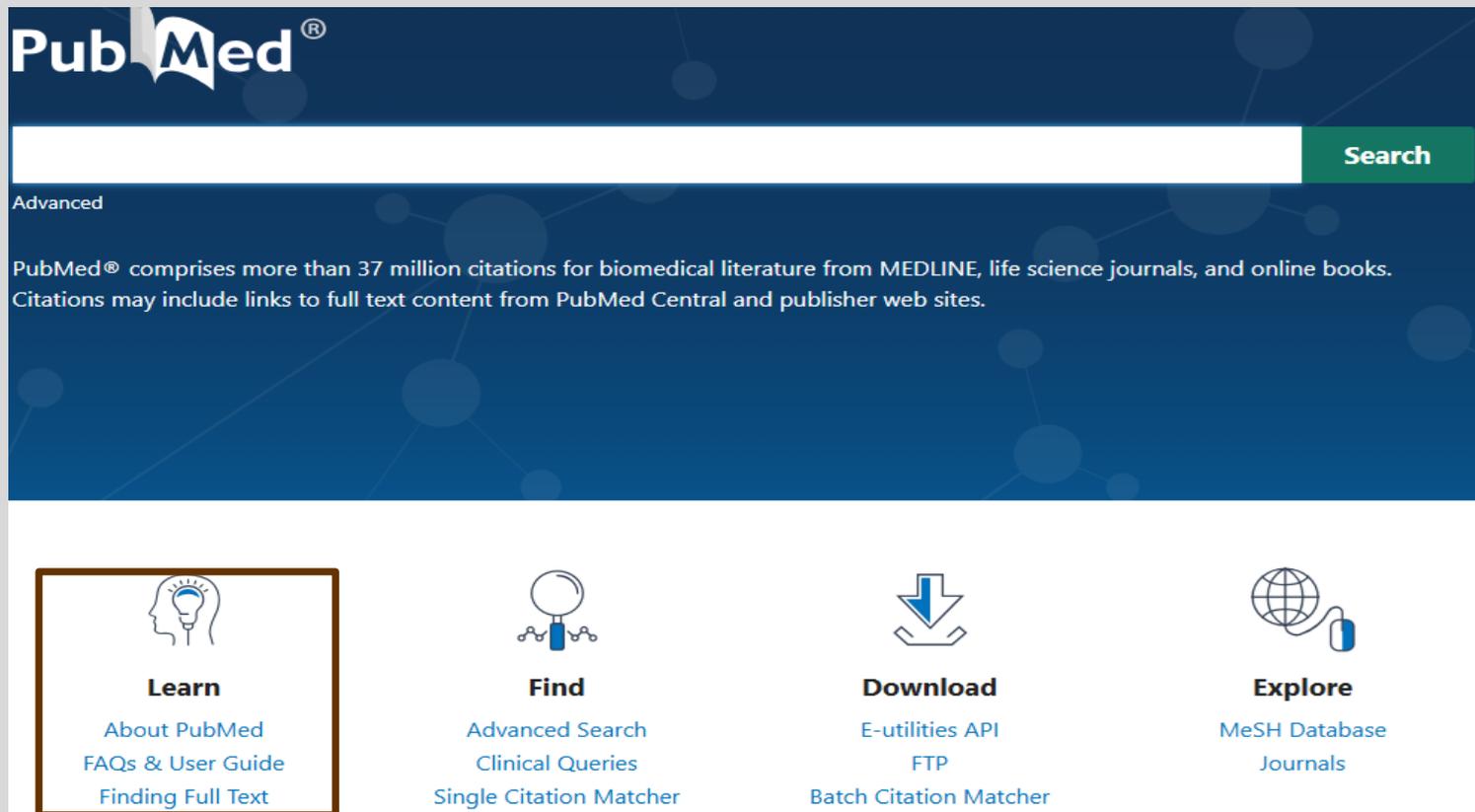
- Abstract
- Free full text
- Full text

Arrhythmias After Acute Myocardial Infarction.
1 Frampton J, Ortengren AR, Zeitler EP.
Cite Yale J Biol Med. 2023 Mar 31;96(1):83-94. doi: 10.59249/LSWK8578. eCollection 2023 Mar.
PMID: 37009192 **Free PMC article.** Review.
Share The incidence of arrhythmia after **myocardial infarction** has declined since the introduction of reperfusion techniques. Nevertheless, ischemic arrhythmias are often associated with increased morbidity and mortality particularly in the first 48 hours after hospital ad ...

Myocardial Infarction: Symptoms and Treatments.
2 Lu L, Liu M, Sun R, Zheng Y, Zhang P.
Cite Cell Biochem Biophys. 2015 Jul;72(3):865-7. doi: 10.1007/s12013-015-0553-4.
PMID: 25638347 Review.
Share **Myocardial infarction** (MI) is a term used for an event of heart attack which is due to formation of plaques in the interior walls of the arteries resulting in reduced blood flow to the heart and injuring heart muscles because of lack of oxygen supply. ...

The acute myocardial infarction.
3 Pollard TJ.
Cite Prim Care. 2000 Sep;27(3):631-49;vi. doi: 10.1016/s0095-4543(05)70167-6.
PMID: 10918673 Review.

PubMed help



The screenshot shows the PubMed homepage with a dark blue header containing the PubMed logo and a search bar. Below the search bar, there is a section titled 'Advanced' with a paragraph of text. At the bottom, there are four columns of navigation links, each with an icon and a title. The 'Learn' column is highlighted with a brown border.

PubMed[®]

Search

Advanced

PubMed[®] comprises more than 37 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full text content from PubMed Central and publisher web sites.

Learn	Find	Download	Explore
About PubMed FAQs & User Guide Finding Full Text	Advanced Search Clinical Queries Single Citation Matcher	E-utilities API FTP Batch Citation Matcher	MeSH Database Journals



The banner features a cartoon doctor character on the left, a speech bubble on the right, and two links on the far right. The background is a light teal color.

Need help searching PubMed?

Go to the National Library of Medicine's PubMed help resources...

[PubMed User Guide](#)

[PubMed Online Training](#)

Acquire/Primary sources/ nonappraised

- CINAHL (Cumulative Index to Nursing & Allied Health Literature)

Nursing and allied health journals and other publications of the American Nurses' Association and the National League for Nursing.

- ProQuest Health Research Premium Collection

Over 4,500 full text health and medical journals. Plus instructional videos, grey literature, and more. ProQuest's unique mix of training content, scholarly literature, and clinical reference materials is accessible to those preparing for a career in healthcare.

- Embase

•An international biomedical literature database that indexes more than 8,500 peer-reviewed journals for users looking for drug, medical device, and disease-related information.

- PsychInfo

Produced by the American Psychological Association, this database provides abstracts and citations to scholarly literature in the psychological, behavioral, and social health sciences.

Web of Science

This database provides access to the Science Citation Index Expanded from 2002-present. SCIE covers over 150 disciplines including medicine, biology, life sciences, and technology.

secondary

- **ACP Journal Club**

Summarizes the best new evidence for internal medicine from over 120 clinical journals.

- **Clinical Key**

ClinicalKey supports healthcare professionals and students with the latest evidence across specialties in a variety of formats. With more than 1000+ textbooks, 500+ journals, and 5,000+ patient handouts in English and Spanish with over 13,000 videos and millions of images. To access certain features, you will need to register for an account and the setup must be from on-campus , using your SHSU email address.

Cochrane Library

The gold-standard in Evidence-Based Practice documentation for Nursing, Health and all healthcare related disciplines. Providing high-quality, independent evidence to inform healthcare decision-making, including: Cochrane Database of Systematic Reviews; Cochrane Central Register of Controlled Trials; Cochrane Methodology Register; Database of Abstracts of Reviews of Effects (DARE); Health Technology Assessment Database; and NHS Economic Evaluation Database.

UpToDate

UpToDate® is a point-of-care resource providing access to evidence-based recommendations covering 25 specialties.

- TRIP Search Engine

Turning Research Into Practice - Find high-quality research evidence to support patient care.

- PEDro (Physiotherapy Evidence)

PEDro is the Physiotherapy Evidence Database, a free database of over 46,000 randomised trials, systematic reviews and clinical practice guidelines in physiotherapy.

- ACCESSSS

ACCESSSS provides "one-stop" access to pre-appraised evidence to address this key question: what is the current best evidence available to support clinical decisions?

- Epistemonikos

Combines the best of Evidence-Based Health Care, information technologies and a network of experts to provide a unique tool for people making decisions concerning clinical or health-policy questions.

- EvidenceAlerts

Quality articles from over 110 clinical journals are selected by research staff and then rated for clinical relevance and interest by an international group of physicians. Includes a searchable database of the best evidence from the medical literature and an email alerting system. Requires free registration

- OTSeeker

OTseeker is a database that contains abstracts of systematic reviews and randomized controlled trials relevant to occupational therapy.

- Evidence-Based Medicine (Journal)
- Evidence-Based Nursing (Journal)
- Evidence-Based Mental Health (Journal)

Acquire

- [ACP Journal Club](#)

ACP Journal Club summarizes the best new evidence for internal medicine from over 130 clinical journals

- [AHRQ's Evidence-based Practice Reports](#)

Agency for Healthcare Research and Quality's Evidence-based Practice Centers

- [Centre for Evidence Based Medicine \(CEBM\)](#)

EBM tools: Asking focused questions, finding the evidence, etc.

- [Cancer Treatment Reviews](#)

Cochrane

- **Cochrane is an international network with headquarters in the UK, a registered not-for-profit organization, and a member of the UK National Council for Voluntary Organizations. Cochrane produces systematic reviews, published in the Cochrane Library, to help people make informed health decisions.**
- Cochrane is for anyone interested in using high-quality information to make health decisions. Whether you are a clinician, patient or carer, researcher, or policy-maker, Cochrane evidence provides a powerful tool to enhance your healthcare knowledge and decision-making.
- Cochrane's members and supporters come from more than 190 countries, worldwide. We are researchers, health professionals, patients, carers, and people passionate about improving health outcomes for everyone, everywhere. Our global independent network gathers and summarizes the best evidence from research to help you make informed choices about treatment and we have been doing this for 30 years

Cochrane library

- The Cochrane Library consists of a collection of evidence-based medicine databases, including the Cochrane Database of Systematic Reviews. It provides up-to-date information on the effects of interventions in health care and evidence to support decisions taken in health care and to inform those receiving care. Search for systematic reviews, protocols, trials, methods studies, and more

The Cochrane Library (ISSN 1465-1858) is a collection of databases that contain high-quality, independent evidence to inform healthcare decision-making.

Databases:

- ***Cochrane Database of Systematic Reviews (CDSR)***
- **Cochrane Central Register of Controlled Trials (CENTRAL)**
- **Cochrane Clinical Answers**

Cochrane library



Trusted evidence.
Informed decisions.
Better health.

Review language : English Website language : English Sign In

Title Abstract Keyword ▾



Browse

Advanced search

Cochrane Reviews ▾

Searching for trials ▾

Clinical Answers ▾

About ▾

Help ▾

About Cochrane ▶

Search Reviews (CDSR)

Browse Reviews

Issues

Editorials

Special Collections

Supplements

About Cochrane Reviews



Improving ADE reporting
Read the review

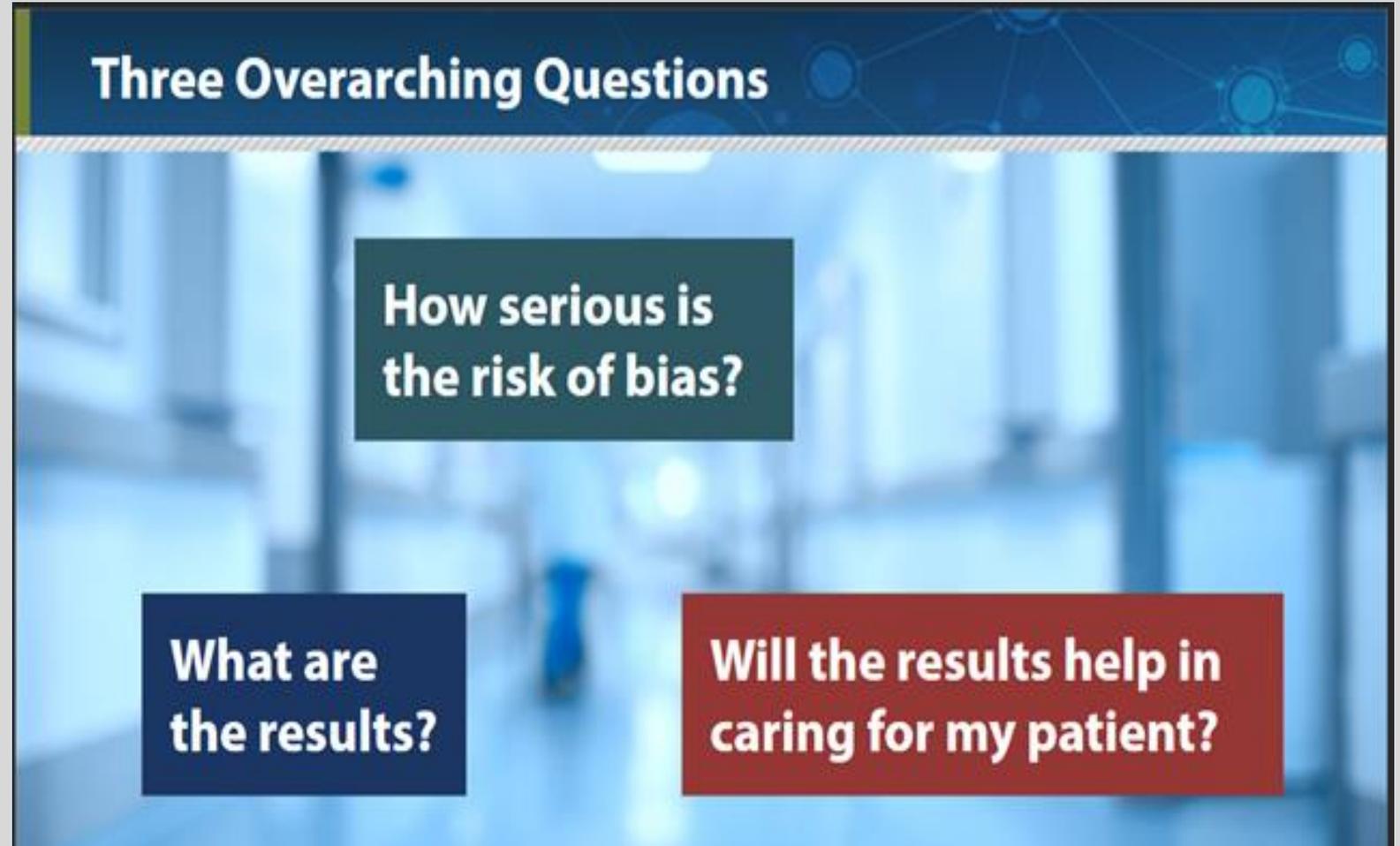


Appraise

Validity= truthfulness of information- should be checked in the method

Randomization, blinding & follow-up ensure that the study results are not overly biased by the investigators or the patients

Then check the results and their applicability to the patient



Appraise



Appraise/Resources & tools

- [CASP Checklists](#)The questions in the checklist's are designed to help you think about several aspects in a structured way.
- [EQUATOR Network Reporting Guidelines](#)Search or Browse reporting guidelines by study type (RCT, Systematic Reviews, Case reports, etc.)
- [GRADE](#)The GRADE working group "has developed a common, sensible and transparent approach to grading quality (or certainty) of evidence and strength of recommendations."
- [JBI Critical Appraisal Tools](#)JBI's critical appraisal tools assist in assessing the trustworthiness, relevance and results of published papers.

Critical Appraisal/ Worksheets

- [Centre for Evidence-Based Medicine \(CEBM\)](#) Critical appraisal worksheets to help you appraise the reliability, importance and applicability of clinical evidence.
- [AGREE Reporting Checklist](#) The checklist is intended to guide the reporting of clinical practice guidelines
- [Assessment form for Qualitative Studies](#)
- [Appraisal of a RCT](#)
- [Assessment form for RCTs](#)
- [Appraisal of a Systematic Review](#)

Apply the evidence

- **Does this evidence matter for this patient with this problem?**
 - • Is the study(studies) population similar to the patient?
 - • If not does it matter?
 - • Would the benefit be worth potential risk or harm?
 - • Does the intervention fit into patient beliefs and values?
 - • Is the intervention affordable and available?
 - • What are the implications of “doing nothing”