INTRODUCTION TO EVIDENCE BASED MEDICINE

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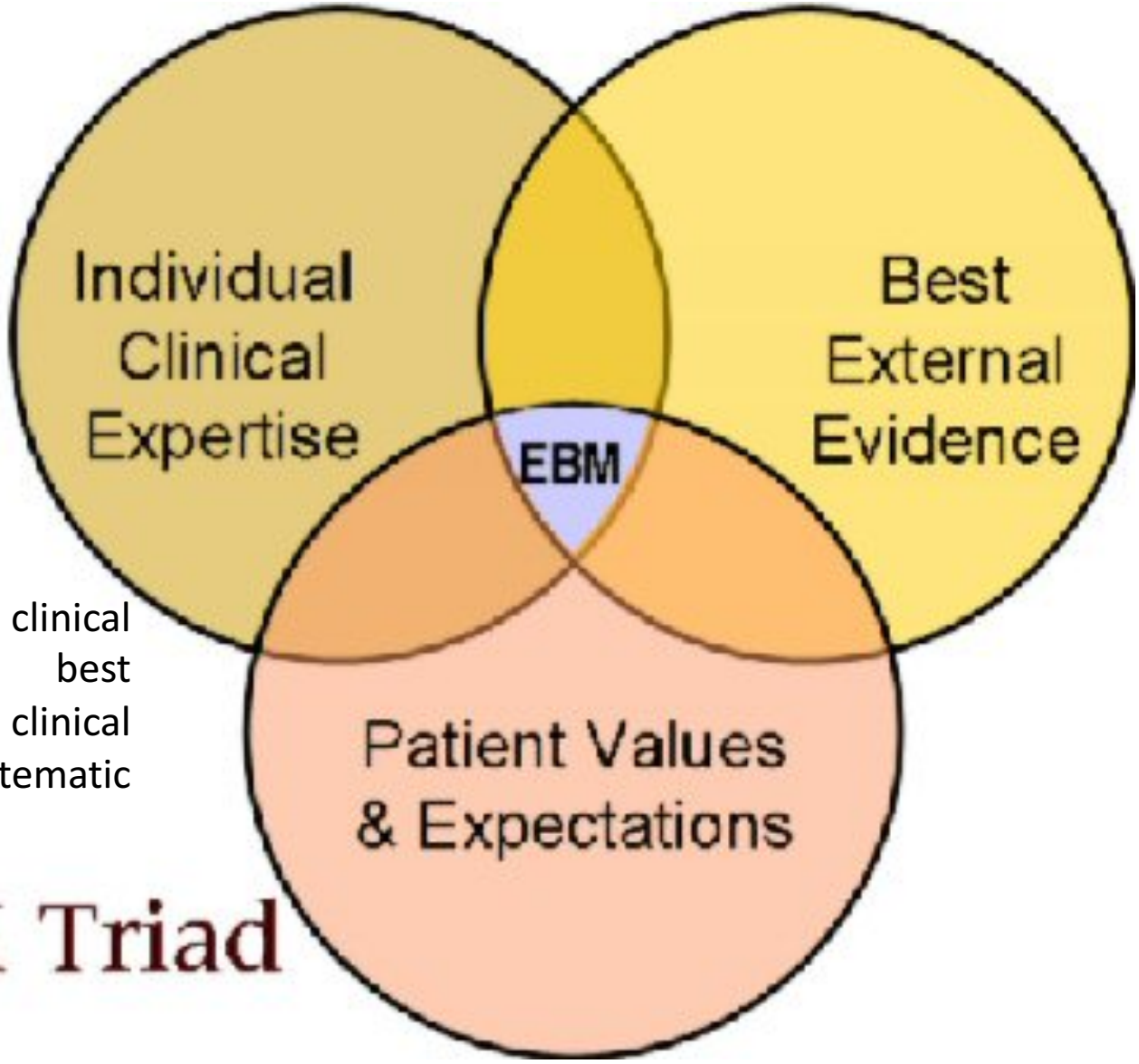
UP COLLEGE OF MEDICINE

WHAT IS EVIDENCE BASED MEDICINE?

- the conscientious, explicit, judicious use of current best evidence in making decisions about the care of individual patient.

- a SYSTEMATIC approach to the ACQUISITION, APPRAISAL, and APPLICATION of research evidence to guide healthcare decisions.

…integrating individual clinical expertise with the best available external clinical evidence from systematic research.



The EBM Triad

In our day to day encounter with patients we often find ourselves facing a dilemma or questions in regard to:

Therapeutics

Diagnostics

Differential diagnoses

Prognosis

Harm

Diagnosis	**How to select and interpret the appropriate diagnostic tests**
Therapy	**How to select treatments to offer patients that do more good than harm and that are worth the efforts and costs of using them**

Looking for answers

The usual thing.....

When asked or in doubt,

> we get it from books and journals

> ask other: friends, colleagues, mentors, subspecialty experts

OUR INFORMATION NEEDS ARE NOT MET.

- Our textbooks are out of date by the day they are published.
- Our journals are disorganized and inaccessible to us.
- Our colleagues may not have the answers that we seek.

STEPS IN EBM PROCESS

The patient	**1. Start with the patient – a clinical problem or question arises out of the care of the patient**
The question	2. Construct a well built clincial question from the case
The resource	3. Select the appropriate resource(s) and conduct the search
The evaluation	4. Appraise the evidence for its **validity** and **applicability**
The patient	5. Return to the patient – integrate the evidence with the clinical expertise, patient preference and apply it to practice
Self evaluation	6. Evaluate your performance with this patient

- Patients usually serve as the starting point

- Searching for the right answers is usually the hardest step.

Good questions are the backbone of EBM!

BACKGROUND QUESTIONS

- Ask for general knowledge about a disease or disease process, tests, treatments, etc.

  Usually asked because of the need for basic information.

  Answering the background question.

  Textbooks

  Handouts

  Databases

FOREGROUND QUESTIONS

- About patient care decisions and actions
- Clinical question

4 (or 3) Components:

I. Patient, problem or population

II. Intervention, exposure, or manuever

III. Comparison (if relevant)

IV. Clinical outcomes

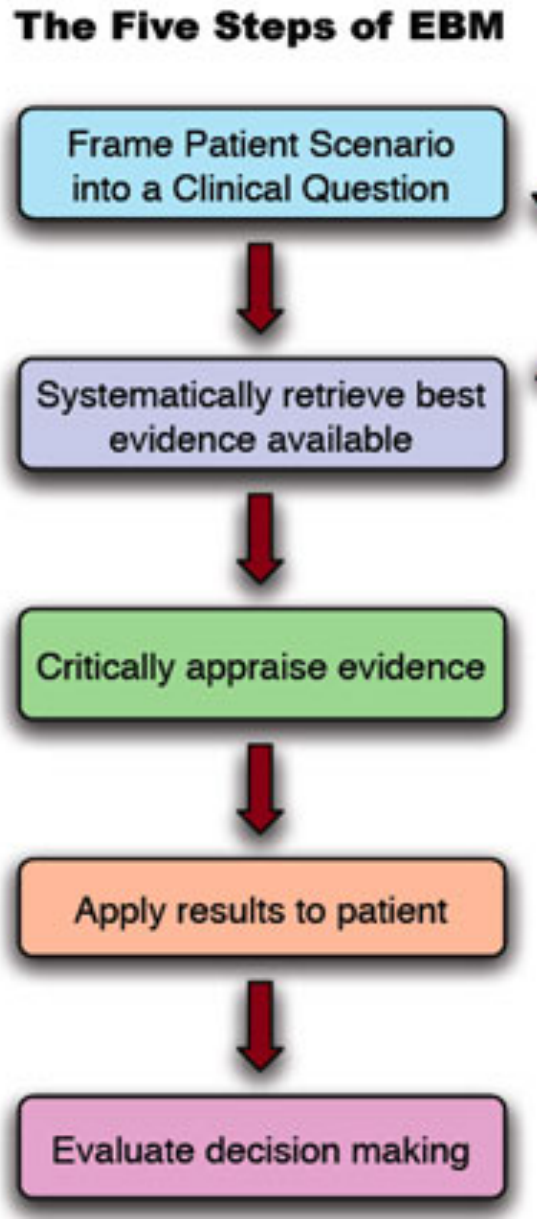
Example:

In young children with acute otitis media, is short-term antibiotic therapy as effective as long term antibiotic therapy in preventing complications?

CONSTRUCT A WELL BUILT CLINICAL QUESTION

ANATOMY OF A CLINICAL QUESTION	
POPULATION	• primary problem, disease, or co-existing conditions • sex, age or race of a patient
INTERVENTION OR TREATMENT (OR EXPOSURE)	• main intervention – can be a drug, a treatment approach, a diagnostic test. • prescribe a drug, Order a test? Order surgery? • It can also be a prognostic factor
COMPARISON OR CONTROL	• Main alternative to compare with the intervention • Another drug? Another test? Placebo? • Your clinical question does not always need a specific comparison
OUTCOME	• What do you hope to accomplish/measure/improve/affect? • What are you trying to do for the patient? • Symptoms? Number of adverse events? Functionality? Test scores? • Accuracy of a test (sensitivity/specificity)
METHODOLOGY	• Type of Evidence/Study


Meta-analysis
Systematic Reviews
Randomized Controlled Trials
Cohort Studies
Case-Control Studies
Case Series, Case Reports
Editorials, Expert Opinion



EVIDENCE-BASED MEDICINE

TYPE OF QUESTION: WHAT TYPE OF STUDY?

Type of Question	Suggested best type of Study
Therapy	RCT>cohort > case control > case series
Diagnosis	Cross sectional>prospective, blind comparison to a gold standard
Etiology/Harm	RCT > cohort > case control > case series
Prognosis	Cohort study > case control > case series

CONDUCT THE SEARCH

SEARCH STRATEGIES

- Identify the concepts: KEY TERMS
- Phrase search: “quotation marks”
- Boolean Principle: OR, AND
- MeSH
- Truncation and Wild Card
- Limits – act like filters

IDENTIFY KEY TERMS

- Identify the CONCEPTS in your focused clinical question. (i.e. P, I, C, O, M)

- Prioritize the concepts from most to least important.
  - Ask yourself: If you were allowed only one term to search, which concept would you search for?

  - If you could intersect the first concept with just one other concept, which one would it be?

IDENTIFY KEY TERMS

- Example:

"Among adult patients with type 2 diabetes mellitus, what is the effectiveness of luseogliflozin compared to standard treatment in preventing chronic kidney disease among type 2 diabetes mellitus patients?"

- **PICOM Breakdown:**

P (Population):
Patients with type 2 DM

I (Intervention):
Luseogliflozin

O (Outocome):
Prevention of chronic kidney disease

M (Methodology):
Randomized Controlled Trial

Which term/s will you prioritize in your search strategy?


luseogliflozin
Advanced
Create alert
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luseogliflozin and chronic kidney disease
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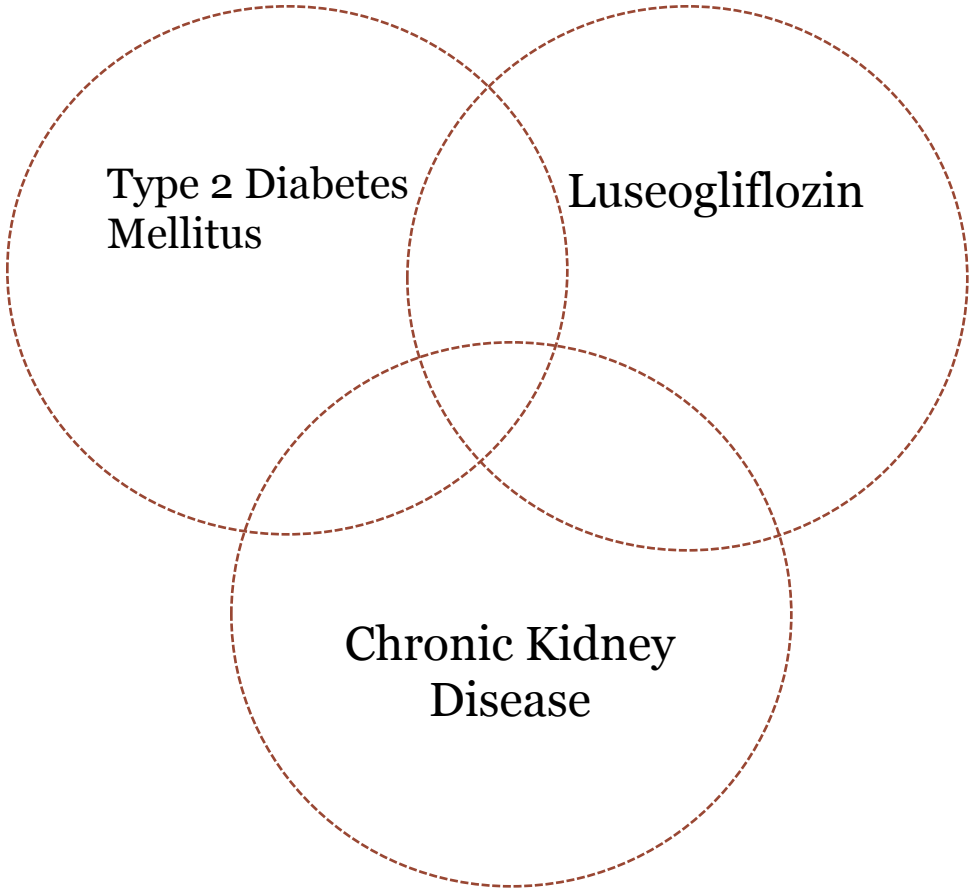
Sci Rep. 2024 Sep 2;14(1):20386. doi: 10.1038/s41598-024-71416-0.
SGLT2 inhibition mitigates transition from acute kidney injury to chronic kidney disease by suppressing ferroptosis
Yutaro Hirashima 1, Toshiaki Nakano 2, Kumiko Torisu 1 3, Seishi Aihara 1, Masanori Wakisaka 4, Takanari Kitazono 1
Affiliations + expand
PMID: 39223189 PMCID: PMC11369184 DOI: 10.1038/s41598-024-71416-0
Full text links
Cite
Abstract
Sodium-glucose cotransporter 2 (SGLT2) inhibitors have been shown to be renoprotective in ischemia-reperfusion (I/R) injury, with several proposed mechanisms, though additional mechanisms likely exist. This study investigated the impact of luseogliflozin on kidney fibrosis at 48 h and 1 week post I/R injury in C57BL/6 mice. Luseogliflozin attenuated kidney dysfunction and the acute tubular necrosis score on day 2 post I/R injury, and subsequent fibrosis at 1 week, as determined by Sirius red staining. Metabolomics enrichment analysis of I/R-injured kidneys revealed suppression of the glycolytic system and activation of mitochondrial function under treatment with luseogliflozin. Western blotting showed increased nutrient deprivation signaling with elevated phosphorylated AMP-activated protein kinase and Sirtuin-3 in luseogliflozin-treated kidneys. Luseogliflozin-treated kidneys displayed increased protein levels of carnitine palmitoyl transferase 1α and decreased triglyceride deposition, as determined by oil red O staining, suggesting activated fatty acid oxidation. Luseogliflozin prevented the I/R injury-induced reduction in nuclear factor erythroid 2-related factor 2 activity. Western blotting revealed increased glutathione peroxidase 4 and decreased transferrin receptor protein 1 expression. Immunostaining showed reduced 4-hydroxynonenal and malondialdehyde levels, especially in renal tubules,
NEXT RESULT
2 of 12

BOOLEAN OPERATORS

- Boolean operators allow the combination of words to refine a search.
  1. **AND**
     - Using **and** between words requires that both words must be present somewhere in the same document or result.
     - **Narrows the search** by combining concepts.
  2. **OR**
     - Using **or** between words requires that either word can be present somewhere in the document or result
     - **Widens the search**

BOOLEAN PRINCIPLE



By using OR & AND…

BOOLEAN OPERATORS

- **NOT**
  - Excludes articles containing the specified term.
  - **Narrows the search** by eliminating irrelevant terms.
  - Example:
    - Diabetes NOT type 1
    - Retrieves articles about diabetes but excludes those mentioning "Type 1".

- **Additional TIPS for Using Boolean Operators:**
  - Boolean operators are case-**insensitive** (e.g. AND or and both work)
  - You can use parentheses to clarify the order of operations when combining multiple terms.
    - e.g. (diabetes OR hyperglycemia) AND "chronic kidney disease"

USE OF QUOTATION MARKS FOR EXACT PHRASES

- Placing quotation marks around the words (e.g. “chronic kidney disease” vs. chronic kidney disease) will result in search yields with exact phrases instead of individual words.

Show additional filters

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Review
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1. 2-[18F]-fluoro-2-desoxy-D-glucose positron emission tomography initial staging impacts on survival in Hodgkin lymphoma.
Cerci JJ, Linardi CC, Pracchia LF, Junior JS, Trindade E, Delbeke D, Cerci RJ, Carr R, Meneghetti JC, Buccheri V.
World J Radiol. 2013 Dec 28;5(12):484-90. doi: 10.4329/wjr.v5.i12.484.
PMID: 24379935 [PubMed]
Related citations

2. A theory-based exercise intervention in patients with **heart failure**: A protocol for randomized, controlled trial.
Rajati F, Mostafavi F, Sharifirad G, Sadeghi M, Tavakol K, Feizi A, Pashaei T.
J Res Med Sci. 2013 Aug;18(8):659-67.
PMID: 24379841 [PubMed]
Related citations

3. Short-term vs. long-term **heart** rate variability in ischemic cardiomyopathy risk stratification.
Voss A, Schroeder R, Vallverdú M, Schulz S, Cygankiewicz I, Vázquez R, Bayés de Luna A, Caminal P.
Front Physiol. 2013 Dec 13;4:364. doi: 10.3389/fphys.2013.00364.
PMID: 24379785 [PubMed]
Related citations

4. Proteinuria and its relation to cardiovascular disease.
Currie G, Delles C.

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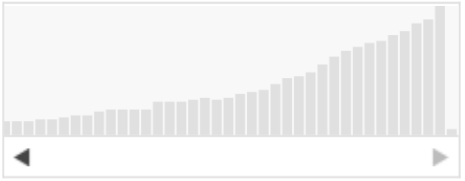
New feature
Try the new Display Settings option - **Sort by Relevance**

Results by year

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congestive heart failure review
acute **congestive heart failure**
congestive heart failure pathophysiology

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1. Intensive care unit-acquired bacteremia in mechanically ventilated patients: clinical features and outcomes.
Ko HK, Yu WK, Lien TC, Wang JH, Slutsky AS, Zhang H, Kou YR.
PLoS One. 2013 Dec 23;8(12):e83298. doi: 10.1371/journal.pone.0083298.
PMID: 24376683 [PubMed - in process]
Related citations

2. Severe bioprosthetic mitral valve stenosis in pregnancy.
Munoz-Mendoza J, Pinto Miranda V, Tanawuttiwat T, Badiye A, Chaparro SV.
Gen Thorac Cardiovasc Surg. 2013 Dec 29. [Epub ahead of print]
PMID: 24374988 [PubMed - as supplied by publisher]
Related citations

3. Use of novel oral anticoagulants for patients with atrial fibrillation: Systematic review and clinical implications.
Albert NM.
Heart Lung. 2014 Jan-Feb;43(1):48-59. doi: 10.1016/j.hrtlng.2013.10.014. Epub 2013 Nov 11.
PMID: 24373340 [PubMed - in process]
Related citations

4. Left Atrial Remodeling and Recurrence of **Congestive Heart Failure** in Patients Initially Diagnosed with Heart Failure.
Yamaguchi K, Yoshitomi H, Ito S, Ito S, Adachi T, Sato H, Watanabe N, Kodani N, Sugamori T, Endo A, Takahashi N, Tanabe K.
Echocardiography. 2013 Dec 24. doi: 10.1111/echo.12497. [Epub ahead of print]

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Results by year

PMC Images search for *"congestive heart failure"*

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Display Settings: Summary, 20 per page, Sorted by Recently Added **Send to:**

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1. [**Digoxin**: the results of the DIG study in the XXI century].
Helber I, Tucci PJ.
Arq Bras Cardiol. 2010 Oct;95(4):e108-11. Multiple languages.
PMID: 21180781 [PubMed - indexed for MEDLINE] **Free Article**
Related citations

2. BNP-guided vs symptom-guided heart failure therapy: the Trial of Intensified vs Standard Medical Therapy in Elderly Patients With **Congestive Heart Failure** (TIME-CHF) randomized trial.
Pfisterer M, Buser P, Rickli H, Gutmann M, Erne P, Rickenbacher P, Vuillomenet A, Jeker U, Dubach P, Beer H, Yoon SI, Suter T, Osterhues HH, Schieber MM, Hilti P, Schindler R, Brunner-La Rocca HP; TIME-CHF Investigators.
JAMA. 2009 Jan 28;301(4):383-92. doi: 10.1001/jama.2009.2.
PMID: 19176440 [PubMed - indexed for MEDLINE]
Related citations

3. Atrial fibrillation and **congestive heart failure**.
Roy D, Talajic M, Dubuc M, Thibault B, Guerra P, Macle L, Khairy P.
Curr Opin Cardiol. 2009 Jan;24(1):29-34. Review.
PMID: 19102036 [PubMed - indexed for MEDLINE]
Related citations

4. Drug treatment of chronic heart failure in the elderly.
Leibundgut G, Pfisterer M, Brunner-La Rocca HP.
Drugs Aging. 2007;24(12):991-1006. Review.

Filters: Manage Filters

New feature
Try the new Display Settings option - **Sort by Relevance**

2 free full-text articles in PubMed Central
Enhanced External Counterpulsation (E [Ont Health Technol Assess Ser. 2006]
Atrial fibrillation after cardiac surgery: a major morbid event? [Ann Surg. 1997]
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Search details
"congestive heart failure" [All Fields] AND ("digoxin" [MeSH Terms] OR "digoxin" [All Fields]) AND ("hospitalisation"[All

Arq Bras Cardiol. 2010 Oct;95(4):e108-11.

[Digoxin: the results of the DIG study in the XXI century].

[Article in Multiple languages]

Helber I, Tucci PJ.

Author information

Abstract

After the report that there was no statistical significance in the general mortality of the DIG study, the indication of digoxin in the treatment regimens for congestive heart failure (CHF) drastically decreased. Post hoc studies that reassessed the DIG study data, indicated that an aspect that was not considered in this multicenter study has a critical influence on the prognosis of patients: the serum levels of digoxin. Regarding those that received a placebo, the general mortality and hospitalization were decreased in patients with a digoxin level < 0.9 ng/ml. At the first study that assessed the influence of digitalis in an experimental model of CHF, we verified in our lab that female rats with congestive syndrome secondary to myocardial infarction have a prolonged survival when undergoing treatment with digitoxin. The current information recommends that the merits of digoxin continue to be analyzed in order to adequately establish its importance in the treatment of CHF.

PMID: 21180781 [PubMed - indexed for MEDLINE] Free full text

Publication Types, MeSH Terms, Substances

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2009; 53: e1-e90.

2. Arnold JMO, Liu P, Demers C, Dorian P, Giannetti M, Haddad H, et al. Canadian Cardiovascular Society consensus conference recommendations on heart failure 2006: diagnosis and management. Can J Cardiol. 2006; 22: 23-45.

3. Uretsky B, Young JB, Shahidi FE, Yellen LG, Harrison MC, Jolly MK. Randomized study assessing the effect of digoxin withdrawal in patients with mild to moderate chronic congestive heart failure: results of the Proved trial. J Am Coll Cardiol. 1993; 22: 955-62.

4. Packer M, Gheorghiade M, Young JB, Costantini DO, Adams KF Jr, Cody RJ, et al. Withdrawal of digoxin from patients with chronic heart failure treated with angiotensin-converting-enzyme inhibitors. N Engl J Med. 1993; 329: 1-7.

5. The Digitalis Investigation Group. The effect of digoxin on mortality and morbidity in patients with heart failure. N Engl J Med. 2007; 336: 525-33.

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7. Eichhorn EJ, Lukas MA, Wu B, Shusterman N. Effect of concomitant digoxin and carvedilol therapy on mortality and morbidity in patients with chronic heart failure. Am J Cardiol. 2000; 86: 1032-5.

8. Pitt B, Zannad F, Remme WJ, Castaigne A, Perez A, Palensky J, et al. The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized Aldactone Evaluation Study Investigators. N Engl J Med. 1999; 341: 709-17.

9. Young JB, Gheorghiade M, Uretsky BF, Patterson JH, Adams KF Jr. Superiority of "triple" drug therapy in heart failure: Insights from the PROVED and RADIANCE trials. Prospective randomized study of ventricular function and efficacy of digoxin. randomized assessment of digoxin and inhibitors of angiotensin-converting enzyme. J Am Coll Cardiol. 1998; 32 (3): 686-92.

10. Gheorghiade M, Dirk J, Van Veldhuisen DJ, Colucci WS. Contemporary use of digoxin in the management of cardiovascular disorders. Circulation 2006;

heart failure: importance of low doses and low serum concentration. J Gerontol A Biol Sci Med Sci. 2007; 62: 323-9.

15. Adams KF Jr, Patterson JH, Gattis WA, O'Connor CM, Lee CR, Schwartz TA, et al. Relationship of serum digoxin concentration to mortality and morbidity in women in the Digitalis Investigation Group Trial. A retrospective analysis. J Am Coll Cardiol. 2005; 46: 497-504.

16. Ahmed A, Gambassi G, Weaver MT, Young JB, Wehrmacher WH, Rich MW. Effects of discontinuation of digoxin versus continuation at low serum digoxin concentrations in chronic heart failure. Am J Cardiol. 2007; 100: 280-4.

17. Rathore SS, Curtis JP, Wang Y, Bristow MR, Krumholz HM. Association of serum digoxin concentration and outcomes in patients with heart failure. JAMA. 2003; 289: 871-8.

18. Ahmed A, Waagstein F, Pitt B, White M, Zannad F, Young JB, et al. Effectiveness of digoxin in reducing one-year mortality in chronic heart failure in the Digitalis Investigation Group trial. Am J Cardiol. 2009; 103: 82-7.

19. Ferguson DW, Berg WJ, Sanders JS, Roach PJ, Kempf JS, Kienzle MG. Sympathoinhibitory responses to digitalis glycosides in heart failure patients: direct evidence from sympathetic neural recordings. Circulation. 1989;80:65-77.

20. Gheorghiade M, Ferguson D. Digoxin: a neurohormonal modulator in heart failure? Circulation. 1991; 84: 2181-6.

21. Adams KF Jr, Gheorghiade M, Uretsky BF, Patterson JH, Schwartz TA, Young JB. Clinical benefits of low serum digoxin concentrations in heart failure. J Am Coll Cardiol. 2002; 39: 946-53.

22. Slatton ML, Irani WN, Hall SA. Does digoxin provide additional hemodynamic and autonomic benefit at higher doses in patients with mild to moderate heart failure and normal sinus rhythm? J Am Coll Cardiol. 1997; 29: 1206-13.

23. Pfeffer MA, Pfeffer JM, Steinberg C, Finn P. Survival after an experimental myocardial infarction: beneficial effects of long-term therapy with captopril. Circulation. 1985; 72: 406-12.

TRUNCATION AND WILDCARDS

- Allows users to search for words that share the same root but have different endings.
- Uses an asterisk (*) as the truncation symbol. It is placed at the end of a root word.
- Helps expand the search by capturing multiple variations of a word.

Example: diabet* - retrieves results containing:

- diabetes
- diabetic
- diabetics

TRUNCATION AND WILDCARD

- Useful when exact variants for key terms are uncertain.
- Truncation works for individual words but not for phrases.
- You must use at least the first 4 characters of a word before adding the *.
  - Example: diab* works but dia* will not.
- Can be combined with Boolean Operators:
  - Example: (diabet* OR hyperglycem*) AND kidney*.

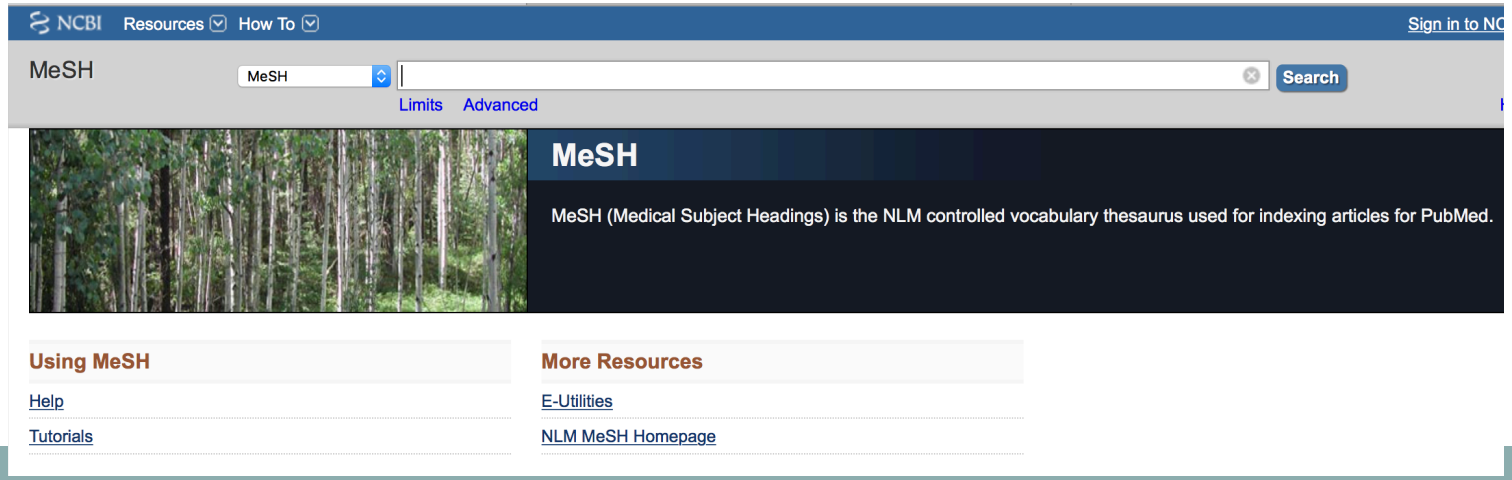
MeSH

Medical Subject Headings

- MeSH thesaurus is a controlled and hierarchically-organized vocabulary produced by the National Library of Medicine.

- When labelling an article, indexers select **terms** only from the official **MeSH** list

- **MeSH terms** are standardized vocabulary used to index articles, ensuring that all relevant articles, regardless of specific terminology used by the authors, are included.



MeSH

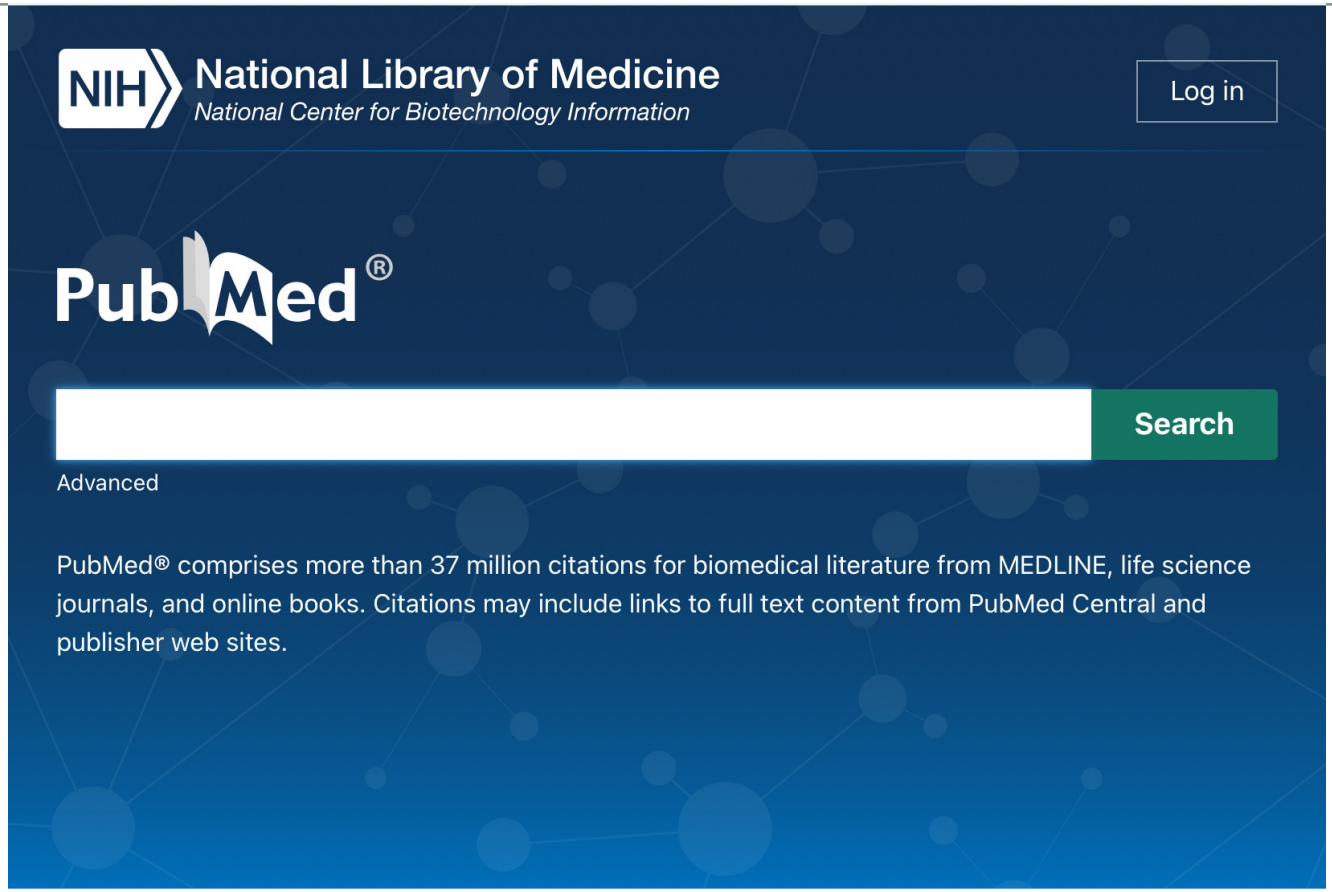
Medical Subject Headings

- Example: Searching for the MeSH term “Myocardial infarction”[MeSH] retrieves articles about heart attacks even if authors used terms like “heart attack” or “cardiac infarction”.

- improves the accuracy and relevance of your PubMed searches.

- Comprehensive coverage.
  - MeSH terms group synonyms and related concepts under a single heading, reducing the need to search for multiple variations of a term.

- you can use the MeSH hierarchy to explore broader or narrower terms.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Limits Advanced Help

MeSH

MeSH (Medical Subject Headings) is the NLM controlled vocabulary thesaurus used for indexing articles for PubMed.

Using MeSH

Help

Tutorials

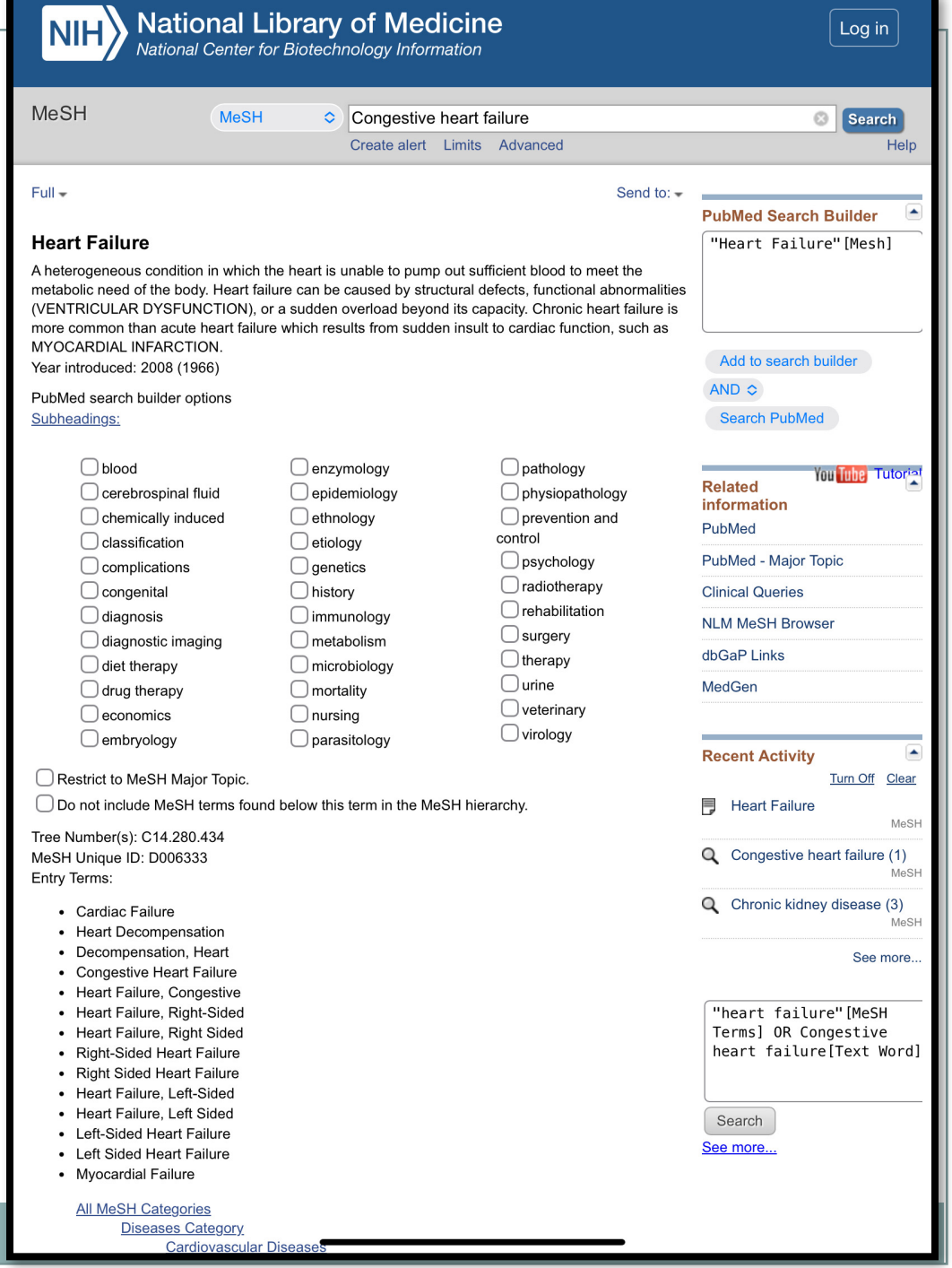
More Resources

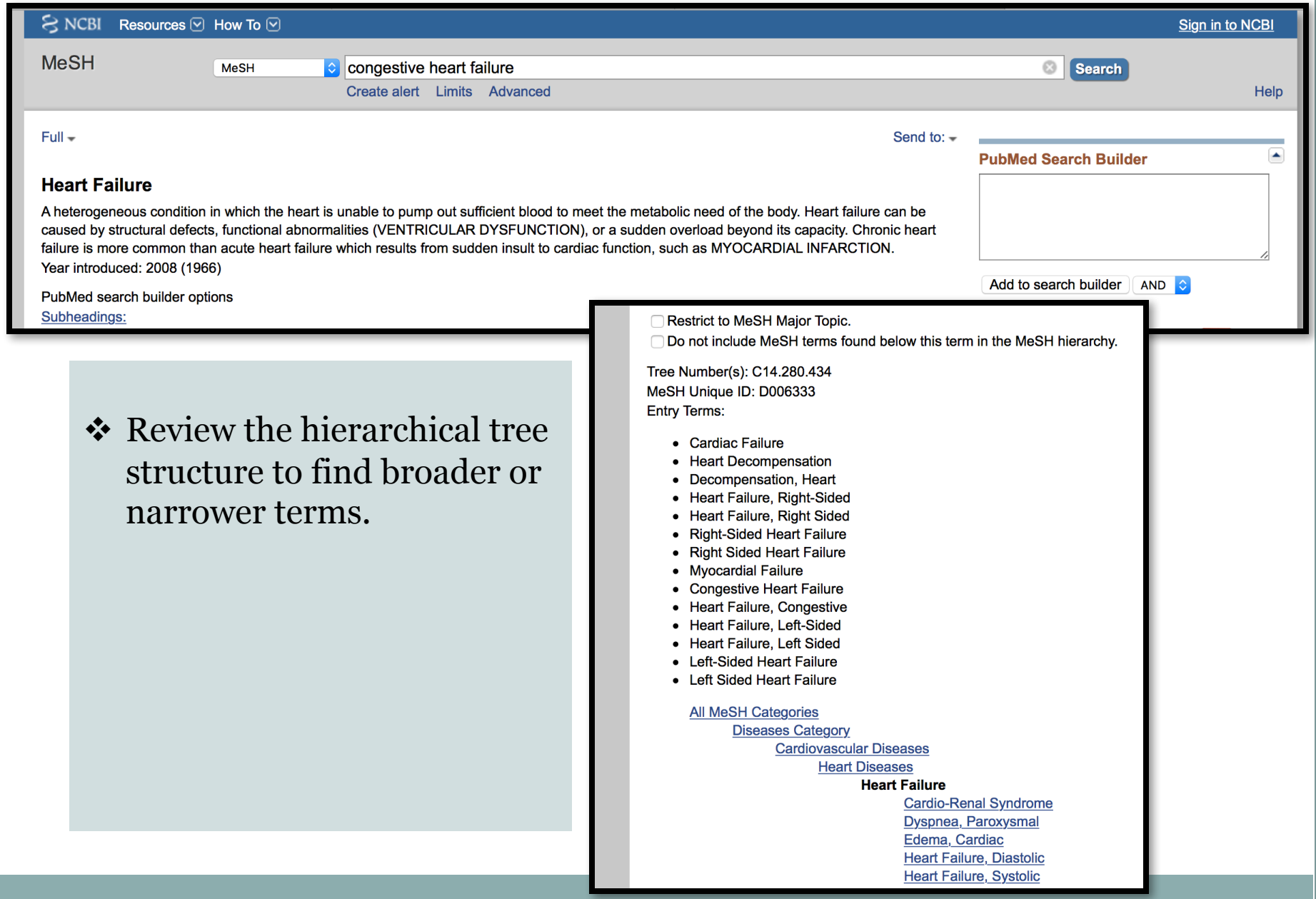
E-Utilities

NLM MeSH Homepage

- Type a keyword related to your topic of interest.
- Click SEARCH.

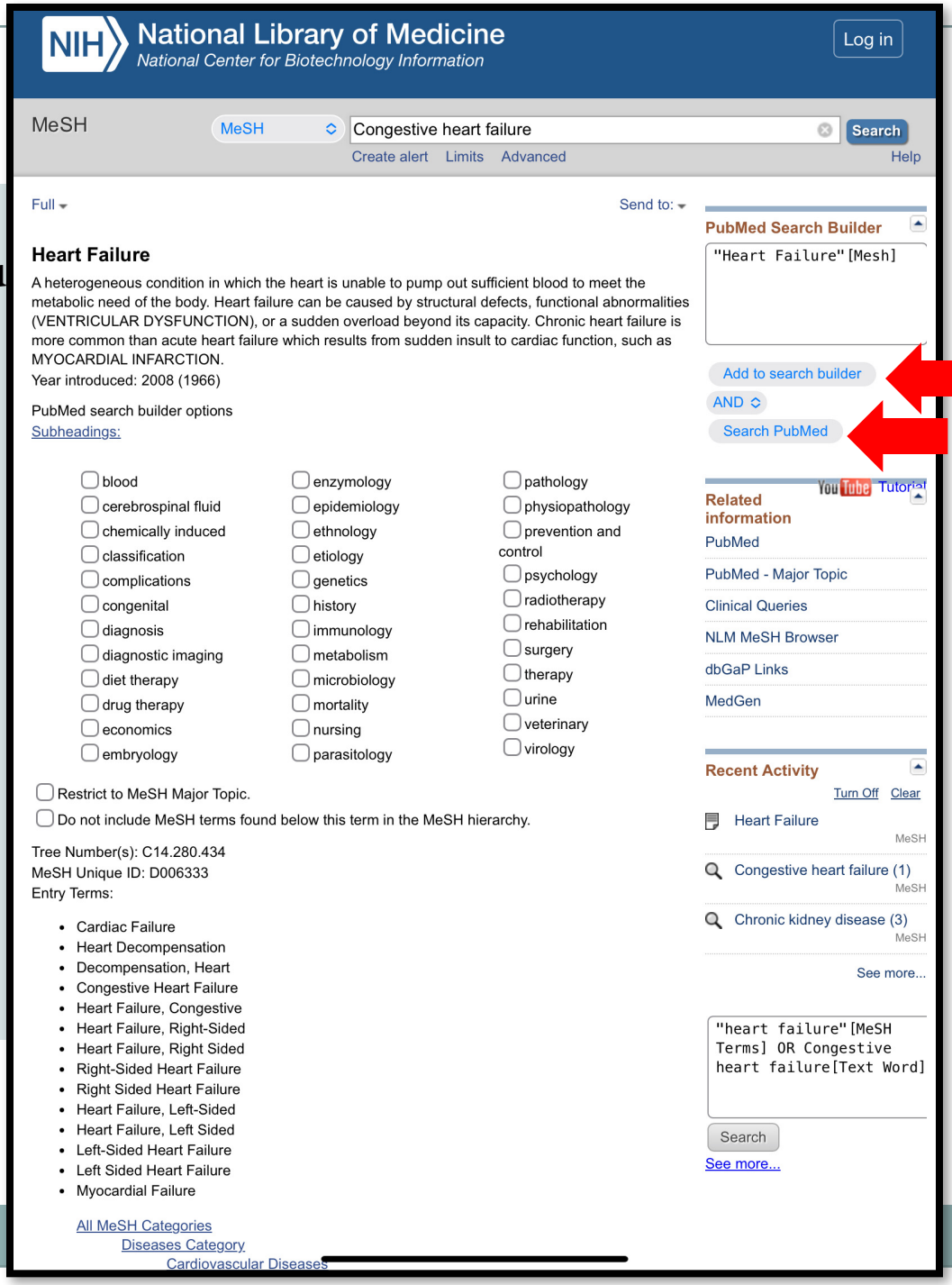
- Click on a MeSH term to open its detailed page.
- Look at the definition of the MeSH term to ensure it matches your topic.
- Check the subheadings (e.g. therapy, diagnosis) to narrow the focus of your search.





- Review the hierarchical tree structure to find broader or narrower terms.

- Add the MeSH term to you search.
- Click **“Add to search builder”.**
- Click **Search PubMed** to retrieve results.



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"Heart Failure"[Mesh]

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1 Cite Share

Comparison of Catheter Ablation in Patients with Paroxysmal Non-valvular Atrial Fibrillation and Heart Failure with Preserved Ejection Fraction.

Zhang Z, Lin Q, Wang C, Wu K, Huang Y, Tu T, Zhang Z, Tang H, Xiao Y, Liu Q.

Int J Med Sci. 2025 Jan 1;22(2):371-382. doi: 10.7150/ijms.103170. eCollection 2025.

PMID: 39781528 Free PMC article.

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[Cardiac β-adrenergic receptor regulation of mitochondrial function in heart failure].

Liu AM, Xu WL, Xiao H, Dong ED.

Sheng Li Xue Bao. 2024 Dec 25;76(6):865-880.

PMID: 39780564 Review. Chinese.

3 Cite Share

Impact of Standardized Heart Failure Management Center Construction on the Management of Patients With Chronic Heart Failure.

Guo X, Jing L, Zhai C, Shen L, Hu H.

Clin Cardiol. 2025 Jan;48(1):e70076. doi: 10.1002/clc.70076.

PMID: 39780449

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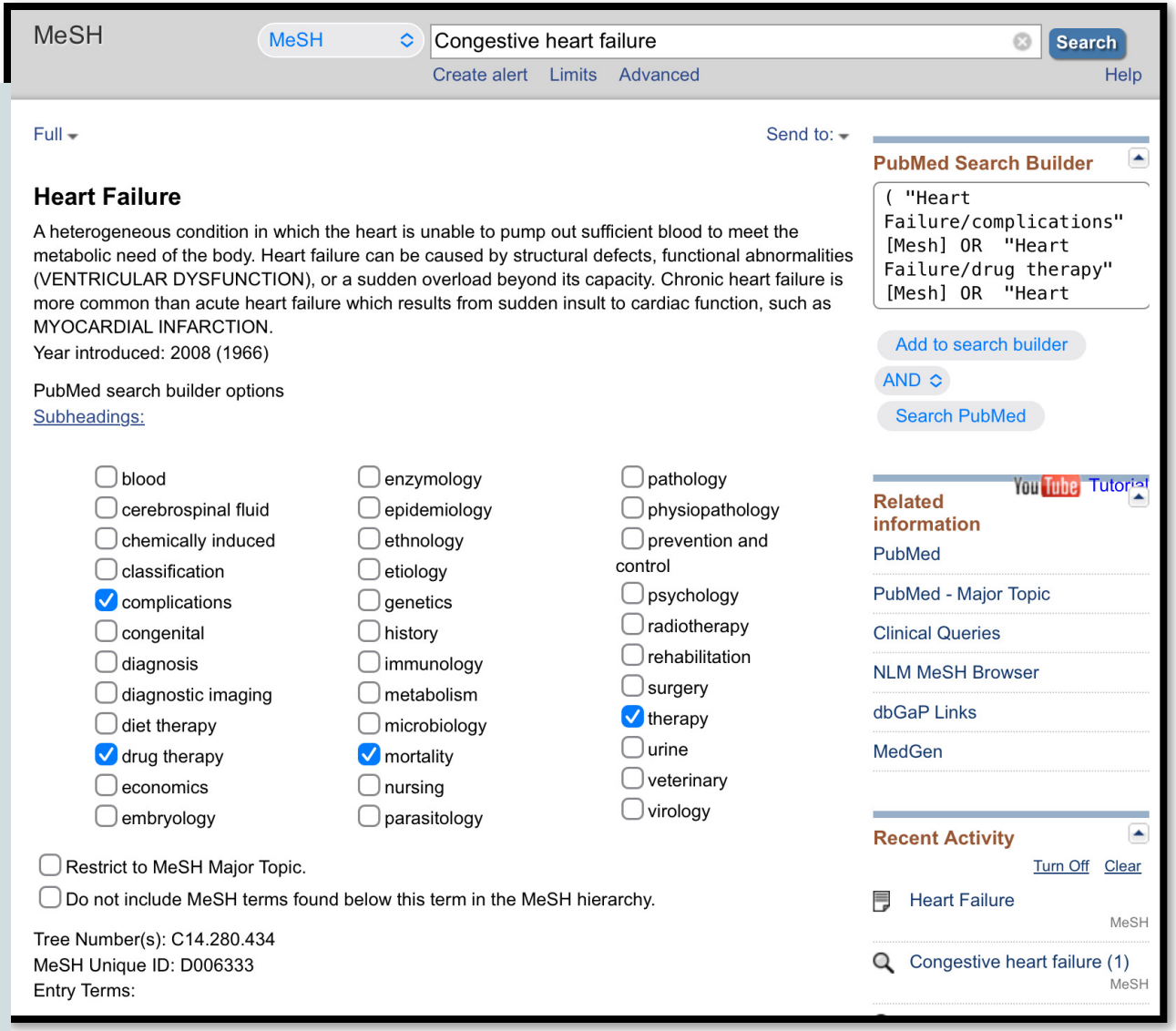

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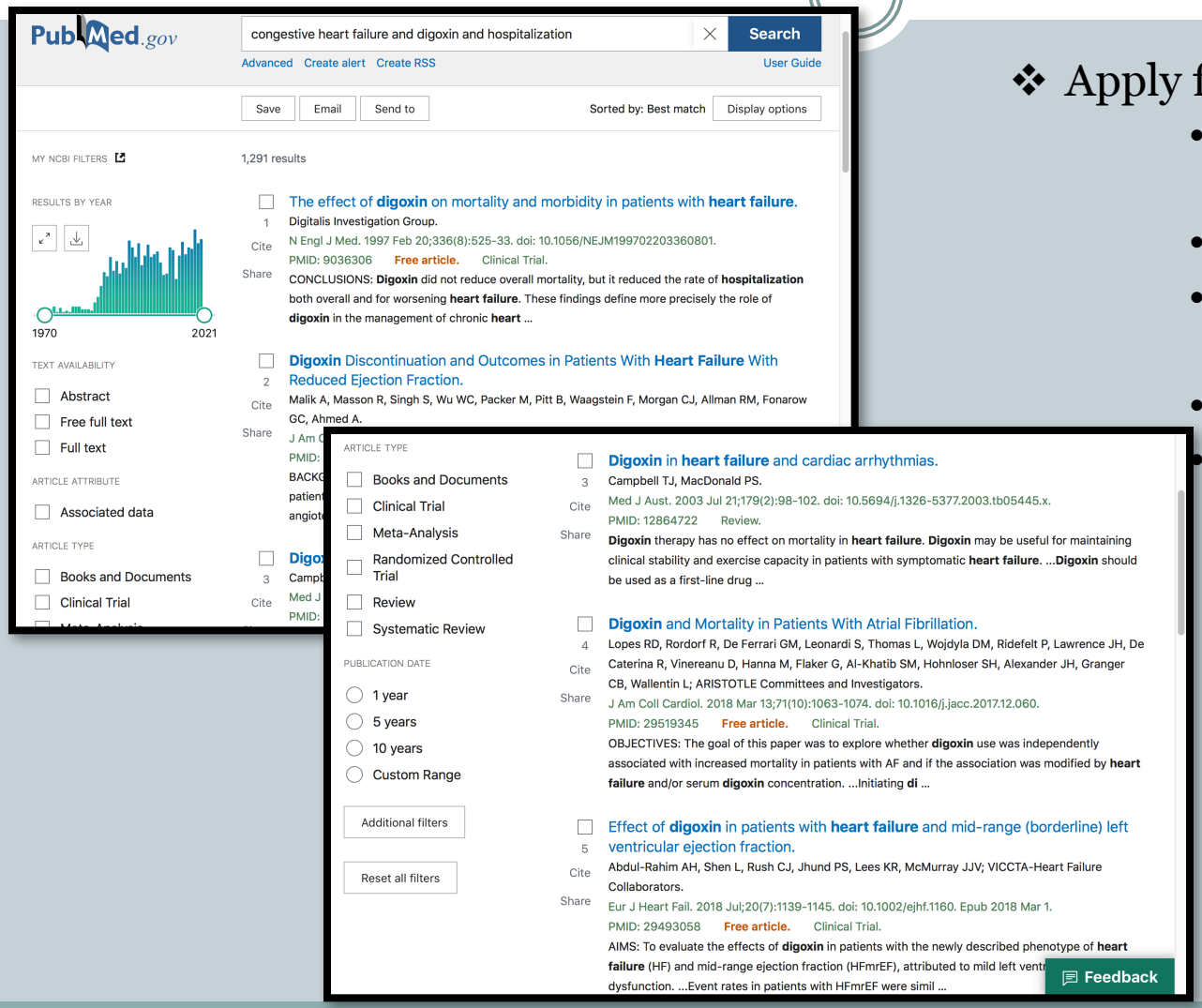

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