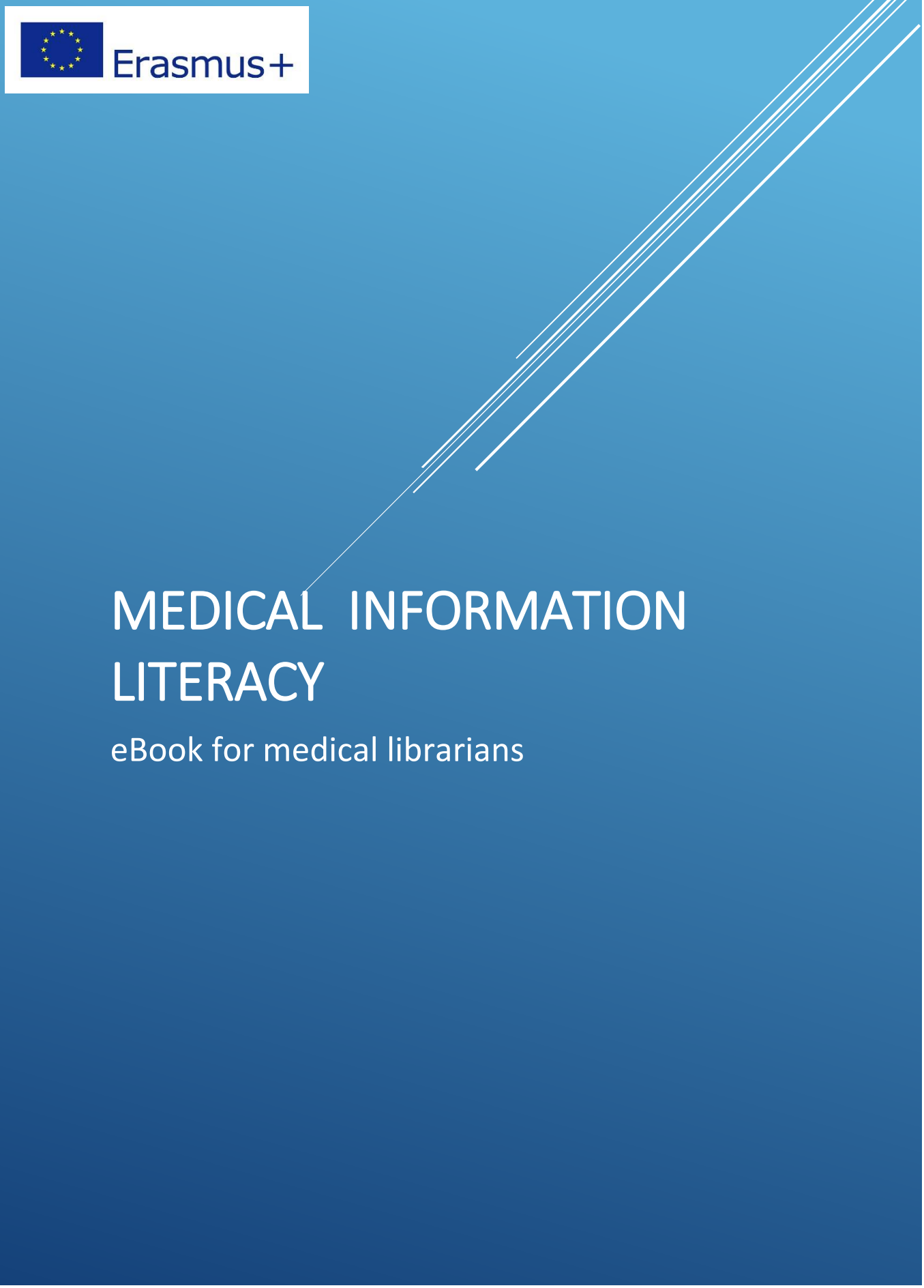

MEDICAL INFORMATION LITERACY

eBook for medical librarians

Under the programme:
ERASMUS + STRATEGIC PARTNERSHIP PROJECT
AGREEMENT No – 2019-1-LV01-KA204-060371 – P4
Medical Information Literacy

MEDICAL INFORMATION LITERACY
QUALITATIVE INFORMATION IMPROVES HEALTH

Project partners:
Riga Stradins University
Lithuanian University of Health Sciences
Tartu University Hospital
Tallinn University

Medical Information Literacy*:* eBook for medical librarians/Authors: Sirje Virkus, Riina Kuik, Ivika Rande, Keiu Saarniit, Piret Truu, Žaneta Brazdžiūtė, Zane Bondare, Signe Riekstiņa-Pāla, Daiga Spila, Daiga Šļahota, Inga Znotiņa, Meilė Kretavičienė, Asta Burbulytė, Laura Petrauskienė. [PDF]. Kaunas, 2021. ISBN 978-9955-15-706-9.

UDC 37.011.2
MeSH: Information Literacy; Medical Librarians; Information Resources; Information Retrieval

Peer reviewer:
Linda Rudzite

Editor:
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ISBN 978-9955-15-706-9.

Kaunas, 2021

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Introduction

Four libraries and one university from Latvia, Estonia and Lithuania created a strategic partnership to educate librarians on medical and health information literacy. This methodological material has been elaborated through an innovative multifaceted perspective, integrating the fields of expertise of each partner.

The aim of the methodological material is to give recommendations to librarians and information specialists who will lead theoretical and practical classes for librarians and information specialists in “Medical Information Literacy”. The materials offered in the book will be useful for all librarians and information specialists who interact on a daily basis with users who need medical or health information.

The content is organized into chapters and subsections to discover the principles of how and where to look for medical and health information. The authors of the e-book offer specific recommendations and information to help prepare for the learning process, the learning content, which is grouped into three modules and the most commonly used terminology.

The development of the material is supported by the Erasmus + program KA204 - Strategic Partnerships for adult education.

Inga Znotina, Project manager

CHAPTER I: DESIGN FOR MEDICAL INFORMATION LITERACY ONLINE COURSES USING PRINCIPLES OF ANDRAGOGY

Author: Sirje Virkus, professor of Information Science, Tallinn University

1. Overview

The first module of Medical Information Literacy (MIL) Course describes the principles of Andragogy, as just one example of how online learning may be organised for adult learners. This Module also describes task-based learning, a typical framework for supporting online learning.

In this Module, we ask you to explore the concepts behind andragogy and examine how you can make online learning effective. We also consider technology, its role in the learning process, and how it can be effectively incorporated. As the main task for this Module we ask you to look at how existing material can be designed for adult learners.

1.1 Objectives

At the end of this Module you will be better able to:

- define the core elements of andragogy and online learning;
- describe the challenges for online learning and teaching;
- distinguish between goals, aims and objectives;
- write testable objectives;
- define delineation;
- list and describe the various levels of testing;
- describe and use Self-Assessment Questions, In Text Questions, Tutor Marked Assignments, Exercises and Reflection Points;
- use an efficient method for course design;
- describe a task structure;
- place material into a learning framework;
- develop techniques to utilize andragogy in your online classroom;
- implement the concept of andragogy into an instructional strategy for online teaching.

In your personal experience, if you have already achieved any of the objectives for this Module please let your group and tutor know. Your experience may help others.

Resources

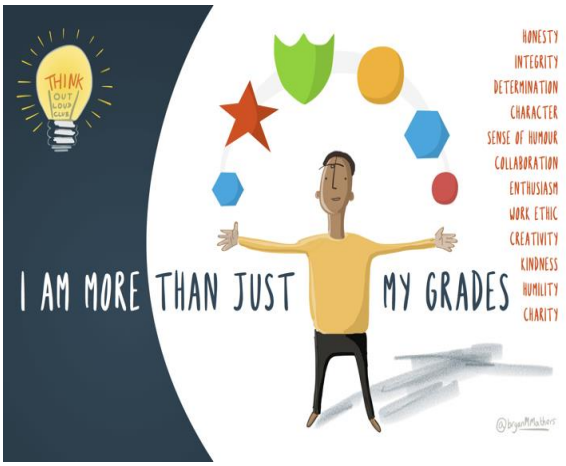
1.2 Open Digital Badge

While studying in the Module you have the option to work towards gaining an **Open Digital Badge**. Open Badges, also referred to as Digital Badges or Educational Badges, are visual symbols or digital representation of knowledge and skills, learning achievements or experience for certifying and recognising learning acquired from different educational providers, and packed with data and evidence that can be shared across the web. While a Digital Badge is an online representation of a skill the learner has earned, Open Badges take that concept one step further, and allow learners to verify their skills, interests and achievements through credible organisations.

Open Digital Badges are:

- evidence based
- free and open
- stackable
- transferable

Open Digital Badges are a great way to demonstrate your interest in the subject and to provide evidence of continuing professional development.



You can learn more what Open Digital Badges are in the following videoclip.

1.3 How to Get an Open Digital Badge?

Getting an Open Digital Badge is straightforward! Here's what you have to do:

- read each week of the Course
- do all assignments and activities of the Course

When you gain your Open Digital Badge you will receive an email to notify you and you will be able to view and manage your badge.

1.4 User Guide

This Module makes use of a range of different learning materials and resources and different ways of learning. The module is based on a constructivist approach to learning, which means that you as a learner are responsible for constructing your own meaning and interpretations. This Module assumes that you are active in your engagement with both the theoretical and practical tasks set and that you will work through the Module in both a critical and reflective way. A number of the tasks set allow you to work on your own or in learning groups. The constructivist method also means that it is up to you how much you learn on this Module.

For example, the first Module providing a theoretical framework and context for this MIL Course is written in a way which demands that you interact with the content through responding to questions set down at regular intervals. It is recommended that you take the time to respond to these questions as you go through the Module One, and write down notes which will provide a basis for assessing how your situation may be explained through the general theoretical approach.

Each Unit of this Module contains within it a number of **Assignments** or **Activities** for learners to undertake. Some of these will involve you in tasks that may only require a moment's thought whilst others may involve you in collecting new information and developing new expertise. In order to enhance your learning, it would be useful to have a 'critical friends' within your group or community who can offer you both objective appraisal and suggestions for strategies for constructive development. It will also provide a basis for sharing ideas.

An important part of the module is the **discussions** you will have with your fellow students and the communications with your teachers and tutors. Thus, you have many opportunities to:

1. Discuss concepts, theories, principles and models.
2. Reflect on your own experiences.
3. Assess the relevance of other people's experience to your own contexts.
4. Contribute constructively to group discussions.
5. Support and challenge the Module members to share their experiences or ideas, and
6. Assess your own learning outcomes, both expected and unexpected.

You should begin your study of this Module with Unit One, and follow the Units in the order presented.

Last sections of each Unit under the heading **Resources** give details of the sources of information that are used to compile this Module.

The Module suggests textbooks or articles which are essential for this Module and are presented in the Section **Literature**.

Recommended additional readings - **Additional Resources** - are presented within each Unit. You are encouraged to review additional resources as time permits. On the other hand, you are coming from a wide variety of backgrounds and experiences. There may be terms and concepts used in the Module which are familiar and clear to some learners but which are foreign and obscure to others. Therefore, we have organized the additional resources into the two categories:

For Beginners

For Advanced Learners

In addition, we have added short **videos** to each Unit to illustrate some of the concepts or approaches.

Participants who wish to study some of these aspects of Andragogy or Online Learning Design in more depth may refer to these Additional

2. Andragogy and Online Learning

2.1. Definitions of Andragogy and Online Learning

To discuss what andragogy is, is to discuss who **Malcolm Knowles** is. Malcolm Knowles (1913-1997) is often called the father of andragogy, though the term *andragogy* pre-dates him, coined in 1833 by Alexander Kapp, a German educator, to distinguish the study of adult learning from pedagogy, which deals with teaching children.

In 1973, Knowles publishes *The Adult Learner*, a classic in the field of andragogy which outlines key assumptions, or principles, about how and why adults learn.

Knowles's andragogical model is grounded in six principles:

1. The need to know. Adults need to know why they need to learn something.
2. The learners' self-concept. Adult learners expect to be responsible for their own decisions.
3. The role of the learners' experiences. What adult learners know and have done already impacts how they learn.
4. Readiness to learn. Adults become ready to learn when they need to know or do something in their life.
5. Orientation to learning. Adult learners are life-centred (or task- or problem-centred) rather than subject-centred.
6. Motivation. Internal motivators are more effective than external ones.

We can use these six principles to guide our design, development, and delivery of learning products and services for adult learners.

Online learning is also referred to as distance learning and e-learning, and those phrases refer to the use of technology as a means of creating a learning environment. Online learning has rapidly emerged and is now found in every area of education. More people than ever learn through online courses and even traditional 'face to face' courses, online tools and interactions have become a key part of the learning experience.

For an online classroom environment, technology is integrated into all aspects of the design, development, delivery, and functionality of the course and educational program. Online learning has helped change the traditional educational model by allowing adults to actively participate in the learning process without an instructor's physical presence. One of the most important developments within the field of education that occurred with the development of an online learning platform is the ability of a technologically-based classroom to provide adults with a greater access to education. The online classroom provides a learning environment for adults who may be restricted from attending a traditional school because of geographical, financial, or physical limitations.

With the increased demand for online learning, instructors have had to quickly adapt their communication methods, teaching style, and instructional materials to this new, virtual environment. The challenge for most instructors is being able to help their students feel 'connected' to their class and to the instructor.

Exercise 1:

Thinking about Andragogy and Pedagogy

Please think for a minute about andragogy and pedagogy and:

- provide at least two definitions of andragogy;
- remember at least two major statements about andragogy;
- enumerate more than two positive aspects of andragogy;
- sort out more than two negative aspects of andragogy;
- enumerate more than two positive aspects of pedagogy;
- sort out more than two negative aspects of pedagogy;
- discover three or more reasons to choose andragogy over pedagogy.

Use the discussion forum in the Moodle if you wish to discuss any difficulties you may have encountered during this process with your tutor or colleagues.

2.2 What is Special About Online Learning Material?

Reflection Point 1

What are the fundamental characteristics of online learning materials? In what way does online learning material differ from conventional course materials? You may prepare hand-outs for your students to accompany lectures that you deliver. How do online learning material differs from such handouts? What specific difficulties must online learning material address?

You may wish to discuss these with your course colleagues in the discussion forum in the Moodle, or with your teacher/tutor.

Consider the following three views:

1) Open online learning material must anticipate the learner's problems

Remember that when your open online learning student is using your materials you are not there. As a teacher, you perform one of the most skilful and difficult tasks in the world. Your experience will enable you to tell when a student has failed to grasp a concept, or has interpreted something the wrong way. In a face-to-face situation, you can intervene immediately to clear up any confusion.

You may decide, for very good reasons, that certain ideas are best expressed face-to-face or through personal delivery. For example, you may wish to demonstrate the complex practical working of an equation by using a whiteboard and have therefore excluded the equation from your notes. In an open online learning text all the necessary material must be present and present in the correct order.

You will vary your teaching mode, bearing in mind your students' attention span. You may even deviate from the syllabus to relate your own experiences, possibly from your time in another job or when teaching something else. You may give some general background not strictly related to the material you are teaching. This is good teaching practice. In the open online learning environment you must also anticipate the student's needs, vary the learning method and take account of attention spans. You must distinguish carefully between what is necessary for the course, and what is background. You should strive for the light touch, just as you do when teaching, but the open online learning student cannot see the smile on your face and may take a phrase you have used more seriously than you had intended.

Sometimes it is necessary to understand topic A before going on to topic B, and to understand topic B before going on to topic C. Thus, the topics will be taught in the order A, B then C. If this is not adhered to strictly in face-to-face teaching, then the situation can be retrieved by the skilled teacher. Topics may also need to be in the correct order in open online learning.

There are topics which you know students will find difficult. Draw on your tutorial experience. You can use exercises and Self-Assessment Questions to reinforce learning.

We all have days where we are in a talkative mood and talk too much. Unless you do this too often your face-to-face students will forgive you. If you write too much, your open online learning students will not.

2) Open online learning material is public

If you make a mistake in the face-to-face situation you can correct it, even make a joke of it. The error will go no further than the lecture room. Your hand-outs may contain the occasional typographical error and a few amendments made by hand. They are unlikely to be seen by anyone other than your students.

If, on the other hand, you produce open online learning material for wide distribution, colleagues (and rivals) can see your efforts. If your material is published on the World Wide Web the whole world can see it! Your face-to-face students will judge you on the entire learning experience you provide for them. Open online learning students do not know you and will judge you solely on the material they are given. If there are errors, if they feel they have not received good quality material, students will complain.

3) Open online learning material can be inflexible

Inflexibility was more of a problem in the days when printed notes were the only or main open learning medium. Economic and printing constraints meant that materials were printed in bulk and errors could haunt the author for years. The use of electronic media has reduced the time required to correct errors or update material, but this time is still finite. In the face-to-face situation, you can hand out notes and say, “By the way, there’s something new on this topic that was just announced this morning.” Printed notes are still used. Even if delivery is fully electronic, students will still print out and keep material.

Reflection Point 2

Issues

Think about the views above and the issues they raise. Are there further issues to consider? What about the isolation of the student? How can we be sure that the student has learned? What structure for open online learning materials can enhance the learning process?

Do you agree with the views expressed above? You may wish to discuss these with your course colleagues in the discussion forum, or with your teacher/tutor.

Resources

- Johnson, B. (2013). *Appreciative Andragogy: Taking the Distance Out of Distance Learning*. North Charleston, SC: CreateSpace.
- Johnson, B. (2016). *Transform Online Teaching: Expert Strategies and Essential Resources Every Educator Needs*. North Charleston, SC: CreateSpace.
- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Palis, A. G. & Quiros, P. A. (2014). Adult learning principles and presentation pearls. *Middle East African Journal of Opthamology*, 21(2), 114-122.
- Virkus, S. (2019). The use of Open Badges in library and information science education in Estonia. *Education for Information*, *35*(2), 155-172.

Literature

- Blondy, L.C. (2007). Evaluation and application of andragogical assumptions to the adult online learning environment. *Journal of Interactive Online Learning*, 6(2), 116-130.
- Johnson, B. (2013). *Appreciative Andragogy: Taking the Distance Out of Distance Learning*. North Charleston, SC: CreateSpace.

- Knowles, M. S., Holton, E. F., & Swanson, R. A. (2005). *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development*. 6th ed. Burlington, MA: Elsevier.
- Merriam, S. B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. Merriam, S. B. (Ed.), The new update on adult learning theory: New directions for adult and continuing education. (pp.1-13).

Additional Resources: For Beginners

- Anderson, T. (Ed.). (2008). *The theory and practice of online learning*. Athabasca University Press.
- Steele, C. An Essential Guide to Andragogy for Learning Businesses
- Andragogy: Adult Learning Theory
- ACRL. Keeping Up With... Andragogy
- Malcolm Knowles, informal adult education, self-direction and andragogy

Additional Resources: For Advanced Learners

- Arghode, V., Brieger, E. W., & McLean, G. N. (2017). Adult learning theories: implications for online instruction. *European Journal of Training and Development*, 41 (7), 593-609.
- Chametzky, B. (2018). The interconnectedness of learning: how andragogy can improve the online learning experience. *American Journal of Educational Science*, *4*(4), 93-99.
- Chametzky, B. (2014). Andragogy and engagement in online learning: Tenets and solutions. *Creative education*, *2014*.
- Conner, T. R. (2012). The Relationship between Self-Directed Learning and Information Literacy among Adult Learners in Higher Education. PhD diss., University of Tennessee, 2012.
- Henschke, J. A. (2011). Considerations regarding the future of andragogy. *Adult Learning*, *22*(1), 34-37.
- Taylor, D. C. M. Taylor & Hamdy, H. (2013) Adult learning theories: Implications for learning and teaching in medical education: AMEE Guide No. 83, Medical Teacher, 35:11, e1561-e1572.

Videoclips

- Adult Learner Theory: Andragogy
- What is ANDRAGOGY? What does ANDRAGOGY mean? ANDRAGOGY meaning, definition & explanation
- Principles of Andragogy
- Andragogy - The Adult Learner
- Introduction to Online Learning
- Online Learning advantages and disadvantages

3. Behavioural Learning

Behavioural Learning is based on measurable and testable differences in what the student can do at the end of a section of training compared to what he or she could do at the start. Students demonstrate an understanding or demonstrate familiarity by succeeding in a number of measurable tests, proving they have met the measurable and testable objectives of the course. These objectives are precise, and students can test themselves to determine whether they have met them and are ready to proceed with the next part of their course. There are no subjective judgements as to whether students have 'understood' or 'become familiar with' a concept.

Behavioural learning can seem a little simplistic. Some types of learning are clearly behavioural, but others cannot be demonstrated as a skill. It may be possible to understand a concept, but demonstrating that understanding might be difficult.

Behavioural learning

Behavioural learning is the acquisition of competence in the actual performance of procedures, operations, methods, and techniques. Students must be able to demonstrate their competence in a particular objective.

3.1 Aims, Goals and Objectives

An Aim is something to be achieved, but at the top level. For example, the aim of this course is to enable you to produce open online learning material to a measurable standard using principles of andragogy and the methods and techniques described. Aims are often formative. That is, they aim to alter opinions as well as teach skills and give information. At present, you have not yet become familiar with the recommended methodology for writing open learning material using principles of andragogy. If this course does not teach you this method, and convince you that it is a good idea to use it, then it will have failed in its aim. This aim is entirely measurable. Either you will use the method to produce good open online learning material using principles of andragogy, or you will not.

An aim can be broken down into a number of goals. A Goal is a measurable achievement, which can be seen to consist of a number of smaller achievements. For example, it may be a goal to achieve a particular professional qualification. To do so you may have to pass a number of examinations.

A goal may be broken down into a number of objectives. An Objective is a single, measurable task to be achieved and tested, usually by means of Self-Assessment Questions.

Objectives are precise and testable. They may be used to specify a course, to assist the student and, in particular, to assist the author. If you have not defined your objectives, you are liable to write far too much, to put down everything you know, whether it is relevant to the course and the students' needs or not. If a course has been specified by an academic institution or accrediting body, it will almost certainly be specified in terms of aims, goals and objectives.

Writing Good Objectives

Appropriate words for objectives will be those which demand that the student can demonstrate that they have achieved the objective. For instance, it is difficult to determine whether a student has an awareness of a specific topic - so this phrase is inappropriate. In contrast, if a student can show using a diagram some concept, then they will be demonstrating a knowledge or understanding of that concept, so this is an appropriate phrase.

Objectives indicate what successful learners should be able to do, to demonstrate that they have learned.

There are several resources online that provide lists of active verbs you can use to express measurable learning achievement. These lists are based on the six levels of learning of "Bloom's Taxonomy."

Self-Assessment Questions 1

Sort these words and phrases into those to use when writing objectives and those to avoid. Remember, appropriate words for objectives will be those which demand that the student can demonstrate that they have achieved the objective.

list use know state believe compare apply assess appreciate explain	evaluate understand describe calculate analyse summarise demonstrate believe in pick out	really know carry out be aware of distinguish between really understand be familiar with give examples of learn the basics of have a good grasp of

A suggested answer for this Self-Assessment Question is available at the end of this section.

Exercise 2:

Writing Course Objectives

Choose a single topic which you could teach, perhaps representing 3-4 hours of study for a student. Write a set of objectives for that topic. Make sure it is a fairly small topic and that, by achieving the objectives you have stated, the student will demonstrate that they have mastered the material and are ready to proceed to the next part of the course.

Use the discussion forum if you wish to discuss any difficulties you may have encountered in writing course objectives with your tutor or colleagues.

3.2 Delineation

Delineation is what a student needs to know in order to begin to study a unit or section of open online learning material. Once you have your course design defined, delineation for most units is straightforward - the student should have met the objectives of the previous unit. However, if you are considering the first unit of a module, and especially the first module of a course, it is necessary to define entry requirements. These should be carefully defined and stated.

Where entry requirements are high you should give some thought to pre-training and access courses so that the open online learning ideal can be approached more closely.

Courses, Modules, Units and Sections

The terminology for the individual elements within an open online learning course can be confusing. Other open online learning courses may use related, but different terms. For the purposes of the MIL course, we have chosen the following terminology.

A COURSE can contain several MODULES. Some modules can consist of more than one UNIT. Within a module (or unit) there may be more than one SECTION.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Rowntree, D. (1977). Assessing Students. London: Harper & Row.

Literature

- Peel, D. (2005). The significance of behavioural learning theory to the development of effective coaching practice. *International Journal of Evidence Based Coaching and Mentoring*, *3*(1), 18-28.
- Skinner, B. F. (2011). About Behaviorism. Vintage.
- Watson, J. B. (2013). Behaviorism. Read Books Ltd.

Additional Resources: For Beginners

- Behaviourism. Stanford Encyclopedia of Philosophy
- Behaviorist Learning Theory. Innovative Learning.
- O'Reilly, F., Chande, R., Groot, B., Sanders, M., & Soon, Z. (2017). Behavioural Insights for Education: A practical guide for parents, teachers and school leaders. Pearson.

Additional Resources: For Advanced Learners

- Kizilcec, R. F., Reich, J., Yeomans, M., Dann, C., Brunskill, E., Lopez, G., ... & Tingley, D. (2020). Scaling up behavioral science interventions in online education. *Proceedings of the National Academy of Sciences*, *117*(26), 14900-14905.
- Murtonen, M., Gruber, H., & Lehtinen, E. (2017). The return of behaviourist epistemology: A review of learning outcomes studies. *Educational Research Review*, *22*, 114-128.
- Rogaten, J., Rienties, B., Sharpe, R., Cross, S., Whitelock, D., Lygo-Baker, S., & Littlejohn, A. (2019). Reviewing affective, behavioural and cognitive learning gains in higher education. *Assessment & Evaluation in Higher Education*, *44*(3), 321-337.

Videoclips

- Behaviourism
- Behavioural Learning Theory
- Behavioural Theory
- Behavioural Theory - Nature vs Nurture Personality?

Self-Assessment Question 1 ANSWER

USE WORDS SUCH AS	AVOID WORDS SUCH AS
list	know
use	believe
state	appreciate
compare	understand
apply	believe in
assess	really know

explain evaluate describe calculate analyse summarise demonstrate pick out carry out distinguish between give examples of	be aware of really understand be familiar with learn the basics of have a good grasp of

4. Self-Assessment Questions

The purpose of self-assessment is to allow learners to systematically review their knowledge and skill in a given area of practice, identify gaps, and to remediate the identified gaps through the use of a rationale or other materials provided as part of the learning activity.

Self-assessment activities usually focus on assessing a particular area of practice and cover knowledge and skills that are considered foundational to successful practice.

Self-Assessment Questions (SAQs) test your Objectives. They are Self Assessed, which means that it is up to the student to be certain that he or she has answered them correctly. SAQs and the objectives they test must reflect the level of the course.

There have been examples of courses where the SAQs asked the students merely to repeat lists of items from memory. This does not test understanding of a high-level subject.

There are a number of situations where SAQs may be appropriate, for example you may wish to ask your students to:

- recall
- construct
- calculate
- analyse/apply
- design
- evaluate critically

4.1 Writing Self-Assessment Questions

Some textbooks will tell that the higher the level, the more difficult it is to write the SAQ. This is not necessarily the case. The higher the level, the more difficult it is to write the answer to the SAQ.

4.1.1 Types of Question: Recall

The student is asked to remember facts, concepts or principles.

For example:

- List the main principles of andragogy.
- Who is often called the father of andragogy?
- Define the concept of online learning.
- What is the aim of this online course?

4.1.2 Types of Question: Construct

This tends to test physical skills. Having learned to use something, the student is asked to demonstrate their ability.

For example:

- Use the Microsoft VISIO software package to draw the following diagram.
- Type the following at a minimum speed of fifty words per minute with an error rate of one per page or better.

4.1.3 Types of Question: Calculate

The student is required to apply a formula.

For example:

- Given the length of two sides of a right angled triangle, calculate the length of the third side.

4.1.4 Types of Question: Analyse/Apply

The student is asked to apply a set of rules or criteria to a given situation.

For example:

- Which of the following procedures are acceptable in the situation described?
- Apply the quality criteria described to your own organisation. How well does it conform?

4.1.5 Types of Question: Design

The student is required to apply concepts and principles in order to analyse, interpret or plan for a new stuation.

For example:

- Design a set of procedures to prevent the following from occurring.
- Basing your answer on your own organisation, state the case for and against ISO 9000 compliance.

4.1.6 Types of Question: Evaluate Critically

The student is asked to look at concepts and principles and determine whether they meet every case, or whether they need to be amended or expanded. Critical evaluation is a postgraduate level requirement.

For example:

- Given your experience within your own organisation, are there any circumstances in which the principles of McGregorís Theory X and Y cannot be applied? Suggest additions or amendments to those principles which would make them more suitable to these cases.

Exercise 3:

Writing Self-Assessment Questions

Write a small number (no more than 3) of SAQs to test the objectives you have written. Make sure that you match the questions you write to the level of course you have been specifying.

Use the discussion forum if you wish to discuss any difficulties you may have encountered in writing SAQs with your tutor or colleagues.

4.2 Writing SAQ Answers

SAQs should, where possible, have single word or short phrase answers. If the question demands an essay type answer it will be very difficult to give the student guidance as to whether he or she has answered correctly.

Where the SAQ asks for a calculation the whole calculation should be shown in the answer, not just the result. The student must demonstrate that they understand the process.

For higher level SAQs where short answers are not possible, the SAQ answer should cover the salient points. Answers to high level SAQs often start “Your answer should be similar to the following ...”, followed by a short essay type answer which covers the points that you, as the tutor, consider to be important.

Exercise 4:

Writing self-assessment answers

Write answers to the Self-Assessment Questions you wrote earlier.

Use the discussion forum if you wish to discuss any difficulties you may have encountered in writing answers to the Self-Assessment Questions with your tutor or colleagues.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Boud, D. (1995). Enhancing learning through self assessment. London: Kogan Page.
- Rowntree, D. (1977). Assessing Students. London: Harper & Row.

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- Andrade, H. & Valtcheva, A. (2009) Promoting learning and achievement through self-assessment. *Theory Into Practice.* 48(1), 12-19.
- Boud, D. (1995). Enhancing learning through self assessment. London: Kogan Page.
- Hillocks, G., Jr. (1995). *Teaching Writing as Reflective Practice.* New York: Teacher's College Press.
- Taras, M. (2010). Student self-assessment: processes and consequences. *Teaching in Higher Education,* 15(2), 199-209.

Additional Resources: For Beginners

- MacBeath, J. (2005). Self-evaluation: Models, tools and examples of practice. National College for School Leadership.

- Self-assessment. Desire2Learn Resource Center.
- Wride, M. (2017). Guide to Self-Assessment. Academic Practice, University of Dublin Trinity College.

Additional Resources: For Advanced Learners

- Boud, D., Falchikov, N. (1989). Quantitative studies of student self-assessment and peer assessment. *Higher Education*, 18(5), 529–49.
- Brown, G.T.L., Andrade, H.L., Chen, F. (2015) Accuracy in student self-assessment: directions and cautions for research, Assessment in Education: Principles, Policy & Practice, 22 (4), 444-457.
- Cowan, J. (2006). On becoming an innovative university teacher: Reflection in action. 2nd ed. Oxford: Oxford University Press.
- Leach, L. (2012) Optional self-assessment: some tensions and dilemmas. *Assessment & Evaluation in Higher Education*, 37(2), 137-147.
- Sharma R, Jain A, Gupta N, Garg S, Batta M, Dhir SK. (2016). Impact of self-assessment by students on their learning. *Int J App Basic Med Res*, 6, 226-9.

Videoclips

- Empowering Students to Own the Assessment Process
- Module 3: Self Assessment
- Module 3: Self and Peer Assessment Overview

5. Active Learning

We have considered so far a rather one-dimensional view of learning. Objectives are set, facts are presented, questions are posed, and the learner tests their understanding of the learning material. However, this approach suffers from a fundamental flaw: learning delivered by straightforward presentation of facts can be ineffective.

Learning should be broken up by activities. SAQs are activities, but they have a very specific role - to test that objectives have been met. They are relatively inflexible. There has to be a right answer and the student must be able to self-assess. Exercises and Assignments are an acceptance of the fact that not everything has single word answers. An exercise or Assignment could be to write a paragraph describing the student's opinions on a particular aspect of the topic being explained.

5.1. Designing Activities

It is important to be clear about what you are attempting to achieve when designing activities. As well as changing the learning mode activities must have value and relevance in themselves. Students should know what you expect.

Remember the objectives you wrote when you are designing activities. Activities are part of the course and should assist in meeting the objectives. Using your experience in teaching the subject, consider points in the course which students will find difficult or where misconceptions may occur. Use activities to reinforce and clarify these points.

Reflection Point 3

Issues

Think about how you learned this topic yourself. What difficulties did you have? What help and advice did you wish your tutor had given you? Was there something you could have done at certain points in the course to help your own learning?

You may wish to discuss these with your course colleagues in the discussion forum, or with your teacher/tutor.

Avoid vague activities. Avoid both trivial activities way below the level of the course, and activities which are so complex or advanced that the student cannot make a "satisfying" attempt.

Also, avoid activities which the student might regard as irrelevant. If necessary, explain why the activity is important to the course.

Remember that if students come across unsatisfactory activities they will start skipping them. If they get used to skipping the activities, they will skip the useful as well as the useless.

5.2 Frequency of Activities

In open online learning it is rarely acceptable to present several pages of reading without some activities. Too many activities will add an unacceptable time burden. Once the student says, "I would like to do that but I don't have the time" then it is likely that they will start skipping important aspects of the course. Basically, put in activities where you, as a teacher, consider them appropriate.

5.3 Reflection Points

Reflection Points may not work in lower level courses, but in more advanced material they can be very useful, particularly when there is no single correct answer to a particular problem. Reflection Points are designed to make the student think. They are particularly useful in formative teaching where the ideas, opinions and preconceptions of students are challenged.

5.4 Discussion

Where appropriate, discussion can be used as an effective extension of Reflection Points. By encouraging students to exchange views in formal or informal debate, role-playing etc., these views can be developed and extended.

5.5 Tutor Marked Assignments

Tutor Marked Assignments **(**TMAs) are an activity, but they can also form part of a course assessment. If there is a final examination, TMAs should have a format similar to the examination. They can be in essay format if required.

Assignment 5:

Activities

- Specify Activities (Assignments, In Text Questions and Reflection Points) to complement the aims, objectives and SAQs you have written previously.
- Note your ideas for activities down in your personal workbook.
- Don't spend too much time on this, but remember activities must be relevant to the objectives of the course.

Use the discussion forum if you wish to discuss any difficulties you may have encountered in this process with your tutor or colleagues.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Misseyanni, A., Papadopoulou, P., Marouli, C., & Lytras, M. D. (Eds.). (2018). *Active Learning Strategies in Higher Education*. Emerald Publishing Limited.

Literature

- Creekmore, J., & Deaton, S. (2015). *The Active Learning Classroom: Strategies for Practical Educators*. New Forums Press, Incorporated.
- Harmin, M., & Toth, M. (2006). *Inspiring Active Learning: A Complete Handbook for Today's Teachers*. ASCD.
- Misseyanni, A., Papadopoulou, P., Marouli, C., & Lytras, M. D. (Eds.). (2018). *Active Learning Strategies in Higher Education*. Emerald Publishing Limited.
- Rutherford, P. (2012). *Active Learning and Engagement Strategies: Teaching & Learning in the 21st Century*. Just ASK Publications.

Additional Resources: For Beginners

- Brame, C., (2016). Active learning. Vanderbilt University Center for Teaching.
- Active Learning Strategies
- Getting started with Active Learning
- Keep Learners at the Center of the Design Process
- Active Learning in an Online Course

Additional Resources: For Advanced Learners

- Prince, M. (2004). Does active learning work? A review of the research. *Journal of engineering education*, *93*(3), 223-231.
- Settles, B. (2009). *Active learning literature survey*. University of Wisconsin-Madison Department of Computer Sciences.
- Welsh, A. (2012). Exploring undergraduates' perceptions of the use of active learning techniques in science lectures.
- Williams, J., & Chinn, S. J. (2009). Using Web 2.0 to support the active learning experience. *Journal of Information Systems Education*, *20*(2), 165.

Videoclips

- What is Active Learning?
- Active Learning Strategies
- Active Teaching and Learning Strategies

6. Course design

- Course design is a cyclical process for which several models exist. The advantage of employing one of these models is that they provide a research-driven and systematic approach to designing instruction.
- The most well-known model is referred to by its acronym: ADDIE.
- A - Analyse learners: Who are the students? What do they already know? What do they need to know?
- D - Design instruction: What are the course goals? What are the learning objectives? What assessments and activities will help students achieve those objectives?
- D - Develop learning materials and activities: What textbooks, readings, simulations, interactive digital materials, and online resources are needed for the activities and assessments that have been designed? Identify and create these resources. Prepare support materials such as rubrics, handouts, and templates; request library e-reserves.
- I - Implement instruction: Teach the course.

- E - Evaluate: Evaluate whether students achieved the learning goals (grade the students) AND evaluate the course: what worked, what didn't, request student input on course activities and expectations. Begin again.

Thus, whether designing a new course or preparing to adopt a standardized curriculum, you will find it helpful to begin your course preparation by clearly defining what you expect your students to have learned by the end of your course or section. You can then put together course materials, or select new ways of presenting course materials, that serve the learning outcomes you have chosen.

Every successful educational organisation generates material by considering the individual elements first:

- Determine your aims, goals and objectives.
- Design your course structure using a technique such as concept analysis.
- Write your module and unit overviews.
- Revise your objectives. You will find that designing the course structure has moved certain objectives from one unit to another.
- Write the SAQs to test these objectives.
- Design exercises.
- Write your SAQ answers.

What you have done is to construct a mould. Now, write your course material so that the objectives are met. If you already have good conventional course material you should use it, but you will find yourself editing it, re-ordering it, taking sections out. If you are writing from scratch you will have a framework to tell you what to write and where, a much more efficient system than a wasteful and time consuming “braindump”. This method is like pouring the jelly into the mould. If you start with the jelly and try to make the mould fit it, you will end up with a sticky mess.

So far in this unit we have primarily discussed behavioural learning. However, we have seen that the behavioural model has its limitations. Behavioural learning works well when there are clear right and wrong answers, but may work less well when deeper concepts need to be taught.

The remainder of this Unit describes a more powerful approach. Developing the concept of active learning, we can present learning materials as a series of tasks which convey the concepts to be taught. By carrying out the task, the student gains a greater understanding of the subject matter.

Assignment 6:

Applying Design

You have already written a set of objectives, designed a structure, written SAQs and answers, as well as various activities.

Now use this work as the basis for a piece of open online learning material. Follow the techniques outlined in this Unit. Note where you

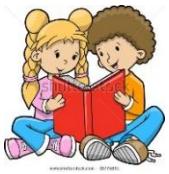
used each technique. Record in your personal workbook whether you considered the techniques described in this course to be relevant. Suggest improvements.

To check that the material you have designed is workable, make a note of the results as you try the following:

1. Take an objective. Highlight the sections of text and activities that help meet that objective. Highlight the SAQ or SAQs that test the objective. Repeat this for the other objectives.
2. Was there any objective which was NOT covered in the text and tested by at least one SAQ?
3. Were there any areas of text NOT highlighted at the end of the exercise?

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Wiggins, G., McTighe, J. *(2005). Understanding by Design* (2 ed.). New Jersey: Pearson.



Literature

- Bean, C. (2014). *The Accidental Instructional Designer: Learning Design for the Digital Age*. American Society for Training and Development.
- Bloom, B., Englehart, M. Furst, E., Hill, W., & Krathwohl, D. (1956). *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain.* New York, Toronto: Longmans, Green.
- Mery, Y., & Newby, J. (2014). *Online by Design: The Essentials of Creating Information Literacy Courses*. Rowman & Littlefield.
- Posner, G. J., & Rudnitsky, A. N. (1994). *Course Design: A Guide to Curriculum Development for Teachers*. Longman, 10 Bank Street, White Plains, NY.

- Rothwell, William J., Kazanas, H. C., Benscoter, Bud, King, Marsha & King, Stephen B. (2015). Mastering the Instructional Design Process: A Systematic Approach.
- Vai, M., & Sosulski, K. (2015). *Essentials of Online Course Design: A Standards-Based Guide*. Routledge.
- Wiggins, G., McTighe, J. *(2005). Understanding by Design* (2 ed.). New Jersey: Pearson.

Additional Resources: For Beginners

- Basics of Course Design
- Bowen, Ryan S., (2017). Understanding by Design. Vanderbilt University Center for Teaching.
- Riviere, J., Picard, D. R., & Coble, R. (2016) *Syllabus Design Guide*.
- Dirksen, J. (2015). *Design for How People Learn*. New Riders.

Additional Resources: For Advanced Learners

- Baldwin, S. J., & Ching, Y. H. (2019). An online course design checklist: development and users' perceptions. *Journal of Computing in Higher Education*, *31*(1), 156-172.
- Lea, M. R. (2004). Academic literacies: A pedagogy for course design. *Studies in higher education*, *29*(6), 739-756.
- McGee, P., & Reis, A. (2012). Blended course design: A synthesis of best practices. *Journal of Asynchronous Learning Networks*, *16*(4), 7-22.
- Shepherd, C. (2012). *Digital Learning Content: A Designer's Guide*. Lulu. com.
- Vlachopoulos, D. (2016). Assuring quality in e-learning course design: The roadmap. *International Review of Research in Open and Distributed Learning: IRRODL*, *17*(6), 183-205.

Videoclips

- How to Design Your Online Course
- Course & Syllabus Design

- Grant Wiggins - Understanding by Design

7. A Framework for Online Learning

This section looks at the approach that is needed for developing online learning that is supported by technology. The previous section was concerned with the structure of a course. We now proceed to describe an overall framework for the design philosophy and style of a course.

The framework that is described does not depend on any particular technology, but can be used to show ways in which the framework can match modules to eventual delivery.

The components of the overall framework are:

- the model for learning. This describes the approach that has been adopted and determines the overall structure;
- applying the model. This applies the approach and guides the course design in matching a particular course component to the model.
- integrating the supporting technology. The range of technology that can be used to support online learning. This technology has different ways in which it can work with the model.

Reflection Point 4

The MIL course

What are the main themes that you can see in the MIL course? How does the way that the course has been designed attempt to keep you involved and active?

You may wish to record your reflections in your personal workbook.

This sort of question has been designed to get learners thinking about a subject before being given

direct information. Is this an effective approach for you?

Hirumi (2002) proposes a framework of interaction in online learning that consists of three levels:

- Level one is learner-self interaction, which occurs within learners to help monitor and regulate their own learning.
- Level two is learner-human and learner-non-human interactions, where the learner interacts with human and non-human resources.
- Level three is learner-instruction interaction, which consists of activities to achieve a learning outcome.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Hirumi, A. (2002). A framework for analyzing, designing, and sequencing planned e-learning interactions. *The Quarterly Review of Distance Education*, 3(2), 141–160.

Literature

- Alman, S. W., Tomer, C., & Lincoln, M. L. (Eds.). (2012). *Designing Online Learning: A Primer for Librarians.* ABC-CLIO.
- Anderson, T. (Ed.). (2008). *The Theory and Practice of Online Learning*. Athabasca University Press.
- Aragon, S. R. (Ed.). (2010). *Facilitating Learning in Online Environments: New Directions for Adult and Continuing Education, Number 100* (Vol. 103). John Wiley & Sons.
- Clark, R. C., & Mayer, R. E. (2016). *E-learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. John Wiley & Sons.
- Huhtanen, A. (2019). *The Design Book for Online Learning.* Aalto University
- Salmon, G. (2002). E-tivities: the key to teaching and learning online. Kogan Page.

Additional Resources: For Beginners

- A Framework for Developing Online Learning
- Hill, C. (ed.) (2009) *10 Principles of Effective Online Teaching: Best Practices in Distance Education*
- Online Learning Framework
- Smith, B. and Brame, C. Blended and Online Learning

Additional Resources: For Advanced Learners

- Khoo, E., & Cowie, B. (2011). A framework for developing and implementing an online learning community. *Journal of Open, Flexible, and Distance Learning*, *15*(1), 47-59.
- Murphya, J., Kalbaskac, N., Horton-Tognazzinia, L., Ryana, P., & Cantonic, L. A Framework for Online Learning.
- Wheeler, S. (2015). *Learning with e's: Educational Theory and Practice in the Digital Age*. Crown House Publishing.

8. Learning Theory

Different theories of learning have different merits. Knowledge reception, discovery learning, learning by doing, problem-based learning each offer some explanation of how learning can occur.

Of these, the model of knowledge reception, where it is believed knowledge transfers directly from the teacher to the learner, is most likely to lead to ineffective material. Adopting this model gives a simplistic view of what happens within the conventional lecture. If this route is followed there is often no attempt to incorporate those activities which are known to support learning and deeper memory.

Discovery learning and learning by doing both start from the view that learners need more than just exposition. Discovery learning offers exploration of information and a process of learning

through trying things out. Learning by doing has a similar basis but uses specified tasks to drive the learning process.

Resource:

Suggested reading

There are more examples of learning theories in the Theory into Practice database (http://www.instructionaldesign.org/theories/)

TIP (Theory into Practice) is a tool intended to make learning and instructional theory more accessible to educators. The database contains brief summaries of 50 major theories of learning and instruction. These theories can also be accessed by learning domains and concepts.

Although there are many different approaches to learning, there are three basic types of learning theory:

- behaviourist,
- cognitive constructivist, and
- social constructivist.

The following Table provides a brief introduction to each type of learning theory. The theories are treated in four parts: a short historical introduction, a discussion of the view of knowledge presupposed by the theory, an account of how the theory treats learning and student motivation, and, finally, an overview of some of the instructional methods promoted by the theory is presented.

	Behaviourism	Cognitive Constructivism	Social Constructivism
View of knowledge	Knowledge is a repertoire of behavioural responses to environmental stimuli.	Knowledge systems of cognitive structures are actively constructed by learners based on pre-existing cognitive structures.	Knowledge is constructed within social contexts through interactions with a knowledge community.
View of learning	Passive absorption of a predefined body of knowledge by the learner. Promoted by repetition and positive reinforcement.	Active assimilation and accommodation of new information to existing cognitive structures. Discovery by learners is emphasized.	Integration of students into a knowledge community. Collaborative assimilation and accommodation of new information.
View of motivation	Extrinsic, involving positive and negative reinforcement.	Intrinsic; learners set their own goals and motivate themselves to learn.	Intrinsic and extrinsic. Learning goals and motives are determined both by learners and extrinsic rewards provided by the knowledge community.
Implications for Teaching	Correct behavioural responses are transmitted by the teacher and absorbed by the students.	The teacher facilitates learning by providing an environment that promotes discovery and assimilation/accommodation.	Collaborative learning is facilitated and guided by the teacher. Group work is encouraged.

Social Learning Theory (Albert Bandura)

The social learning theory of Bandura emphasizes the importance of observing and modelling the behaviours, attitudes, and emotional reactions of others. Bandura (1977) states: "Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behaviour is learned observationally through modelling: from observing others one forms an idea of how new behaviours are performed, and on later occasions this coded information serves as a guide for action." (p22).

Social learning theory explains human behaviour in terms of continuous reciprocal interaction between cognitive, behavioural, and environmental influences. The component processes underlying observational learning are:

(1) Attention, including modelled events (distinctiveness, affective valence, complexity, prevalence, functional value) and observer characteristics (sensory capacities, arousal level, perceptual set, past reinforcement),

(2) Retention, including symbolic coding, cognitive organization, symbolic rehearsal, motor rehearsal),

(3) Motor Reproduction, including physical capabilities, self-observation of reproduction, accuracy of feedback, and

(4) Motivation, including external, vicarious and self-reinforcement.

Because it encompasses attention, memory and motivation, social learning theory spans both cognitive and behavioural frameworks. Bandura's theory improves upon the strictly behavioural interpretation of modelling provided by Miller & Dollard (1941). Bandura's work is related to the theories of Vygotsky and Lave which also emphasize the central role of social learning.

Application

Social learning theory has been applied extensively to the understanding of aggression (Bandura, 1973) and psychological disorders, particularly in the context of behaviour modification (Bandura, 1969). It is also the theoretical foundation for the technique of behaviour modelling which is widely used in training programs. In recent years, Bandura has focused his work on the concept of self-efficacy in a variety of contexts (e.g., Bandura, 1997).

Example

The most common (and pervasive) examples of social learning situations are television commercials. Commercials suggest that drinking a certain beverage or using a particular hair shampoo will make us popular and win the admiration of attractive people. Depending upon the component processes involved (such as attention or motivation), we may model the behaviour shown in the commercial and buy the product being advertised.

Principles

The highest level of observational learning is achieved by first organizing and rehearsing the modelled behaviour symbolically and then enacting it overtly. Coding modelled behaviour into words, labels or images results in better retention than simply observing. Individuals are more likely to adopt a modelled behaviour if it results in outcomes they value.

Assignment 7:

Create an activity for learning using technology in a Constructivist Learning Environment. Formulate the objectives, identify the level and the context, design or select the tools, provide the assessment schedule, etc.

Use the discussion forum if you wish to discuss any difficulties you may have encountered in this process with your tutor or colleagues.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Schunk, D. H. (2012). *Learning Theories an Educational Perspective. Sixth edition*. Pearson.

Literature

- Schunk, D. H. (2012). *Learning Theories an Educational Perspective. Sixth edition*. Pearson.
- Zhou, M. and Brown, D. (2015). Educational Learning Theories (2nd Ed.). Education Open Textbooks. 1.

Additional Resources: For Beginners

- Bates, B. (2019). *Learning Theories Simplified:... and how to apply them to teaching*. SAGE Publications Limited.
- Pritchard, A. (2017). *Ways of Learning: Learning Theories for the Classroom*. Routledge.
- 15 Learning Theories in Education (A Complete Summary)
- The top 10 learning theories

Additional Resources: For Advanced Learners

- Illeris, K. (Ed.). (2018). *Contemporary theories of learning: learning theorists... in their own words*. Routledge.
- Mowrer, R. R., & Klein, S. B. (Eds.). (2000). *Handbook of contemporary learning theories*. Psychology Press. (available via Google Scholar)
- Polly, D., Allman, B., Casto, A., Norwood. J. (2017). Chapter 12. Sociocultural Perspectives of Learning. In West, R. E. Foundations of Learning and Instructional Design Technology: Historical Roots and Current Trends.
- Säljö, R. (2009). Learning, theories of learning, and units of analysis in research. *Educational psychologist*, *44*(3), 202-208.
- Wang, L. (2007). Sociocultural learning theories and information literacy teaching activities in higher education. *Reference & User Services Quarterly*, 149-158.
- Sociocultural Perspectives of Learning by Drew Polly, Bohdana Allman, Amanda Casto, Jessica Norwood

Videoclips

- Learning Theories
- A Brief Overview of 4 Learning Theories
- Learning Theory and Online Course Design
- Piaget's Theory of Cognitive Development
- Vygotsky's Theory of Cognitive Development: How Relationships Increase Learning

9. Task-Based Learning

The concept of using tasks within the learning process is supported by consideration of the process of learning. Learning new information is easy if you know similar things already and have a structure that allows you to understand information. But learning is difficult when you are faced with building a new structure when you receive new information.

Thus, we need to concentrate on a model where effort to understand can be applied. This effort is provided by the tasks under the learning by doing model. Simply presenting information, however attractively this is done, does not give direct support to the learner through encouraging them to make the effort of understanding.

This leads us to adopt a task-based approach for material that will encourage learning by doing. Note that learning can be easy and even pleasurable if the learner already has the initial structure in place for the material. This form of learning can also be supported by offering access to additional resources and a community based on dialogue. Dialogue allows sharing of knowledge, reflection on issues, refinement of knowledge and transfer between the roles of learner and teacher.

9.1 Stages of Learning

Information must become inherent, "unconscious" knowledge for a person to become an expert within a knowledge domain. Initially, the learner struggles to remember the complexities and relationships between the new information and their previous experience and knowledge within the domain area. As learning progresses, it becomes easier for the learner to demonstrate how the new information fits with their previous knowledge of the domain. As the learner becomes expert, the knowledge gained becomes indistinguishable to the previous knowledge space. Once this has been achieved, application of this knowledge can need almost no mental effort.

Within these levels of learning, there is a need for:

- long reflection (shared on discussion lists);
- peer interaction (learners talking to learners);
- tutor interaction (learners talking to experts);
- exploration to try things out (self-assessment and completing tasks).

9.2 Framework Summary

Learning can be driven through a three-stage process. In conceptualisation, learners must appreciate the background and concepts they have to learn. In construction learners fit new knowledge to their internal understanding. Then in dialogue they reflect on their learning and see how actions can be built with their knowledge. Other labelling is possible for this structure, but it is important to recognise that appropriate ways are needed to carry people from one state to the other. This management of the learning cycle will occur as learners carry out tasks and work through dialogue.

The view of learning supported by this model can be summarised as:

- Learning is a by-product of understanding;
- Understanding occurs through performing tasks and getting feedback;
- Learning is socially driven and supported by dialogue.

Each of these must be supported within a single framework that offers:

- Visible tasks that lead learners through material;
- A resource based approach that supports the users to carry out the tasks;
- Support for dialogue with other learners and with experts.

The further layer that is identified in the approach is the need for a link between the tools that can support the learning activity of all forms: conceptualisation, construction, and dialogue. This needs to provide users of the system (teachers and learners) with orientation so they know what they are doing, when they can do it, with what resources, and who else might be involved.

9.3 Instructional Design

The instructional design that needs to be applied to adjust a module to match a framework draws on standard approaches where aims, objectives and dependencies must be identified. These are particularly important for online learning and should be made available to the learners. This aspect has been covered earlier in this module. Beyond this there is a need to re-examine the course under construction with a priority of identifying active tasks, dialogue tasks, and collaborative tasks. Each of these tasks is then linked with suitable resources and media support.

Reflection Point 5

Think for a minute. Why is task based learning important? What is difference between task and activity? What are examples of tasks?

You may wish to record your reflections in your personal workbook.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Lackman, K. (2012). Introduction to Task-based Learning.

Literature

- Lackman, K. (2012). Introduction to Task-based Learning.
- Littlewood, W. (2004). The task-based approach: Some questions and suggestions. *ELT journal*, *58*(4), 319-326.
- Vakkari, P. (2003). Task-based information searching. *Annual review of information science and technology*, *37*(1), 413-464.

Additional Resources: For Beginners

- Murphy, J. (2003). Task-based learning: the interaction between tasks and learners. *ELT journal*, *57*(4), 352-360.
- What is a Task-based Learning?
- Teaching approaches: task-based learning

Additional Resources: For Advanced Learners

- Chen, Y. L. (2014). A study on student self-efficacy and technology acceptance model within an online task-based learning environment. *Journal of Computers*, *9*(1), 34-43.
- Nunn, R. (2006). Designing holistic units for task-based learning. *Asian EFL Journal*, *8*(3).
- O'Halloran, D. (2001). Task-based learning: a way of promoting transferable skills in the curriculum. *Journal of Vocational Education & Training*, *53*(1), 101-120.
- Robinson, P., & Gilabert, R. (2012). Task-Based Learning: Cognitive Underpinnings. *The Encyclopedia of Applied Linguistics*, 1-6.

Videoclips

- Task-Based Learning - International TEFL Academy

- Task-Based Instruction

10. Task design

Tasks are clearly defined activities that help the learner towards the goal of increasing their understanding and experience in the learning process. These can range in scale and may contain smaller sub-tasks that could be performed independently. This provides one dimension for the definition of the task - the scale of the task. The other is provided by the category of a task - whether it is an active task, reflective task, collaborative task, or dialogue task. Treating these as two independent dimensions is simplistic but does encourage the consideration of each category when carrying out the process of instructional design.

Research has found key design attributes include the need for a variety of skills, the perceived importance of the task, the independence and autonomy given to people to determine how the task will be done, and the way task feedback is provided.

10.1 Active Tasks

These tasks are characterised by interactions and building towards a result. A good example would be to ask the learner to determine the parameters necessary for a specified result. Supplied resources could include suitable theory, and access to discussion and past experiences.

10.2 Reflective Tasks

These tasks might usually be relatively small and ask the learner to consider questions related to material. This can be on a self-assessed basis or lead into discussion. Such tasks can be set either before the learner is expected to have encountered resource material, to focus the learner on appropriate questions, or after. Support can come from automatic assessment, simulations, and discussion lists.

10.3 Collaborative Tasks

The formation of an active society of learners is explicit in the proposed framework. Setting tasks that ask for collaboration is part of this process. These tasks need to be supported by information about learners, including their schedule and availability together with collaborative tools, both synchronous and asynchronous.

10.4 Dialogue Tasks

The model of learning suggests that understanding can be aided by dialogue more than by standalone resource material. This suggests a special role for dialogue tasks specifically asking that learners work together. This is likely to be mainly through asynchronous discussion though synchronous forums should also be supported.

Assignment 8:

Please design an activity related to medical information literacy which includes one active task, one reflective task, one collaborative task and one dialogue task.

Use the discussion forum if you wish to discuss any difficulties you may have encountered in this process with your tutor or colleagues.

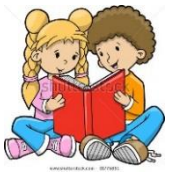
Synchronous and asynchronous

Synchronous discussions must take place in real-time, i.e. time passes as the conversation takes place: such as in face-to-face talking, telephone or video-conferencing.

Asynchronous discussions exist over longer periods of time. Messages can be sent at a time different to when the original message was received. Examples are electronic mail and discussion forums.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- Antonetti, J., & Stice, T. (2018). *Powerful Task Design: Rigorous and Engaging Tasks to Level Up Instruction*. Corwin Press.



Literature

- Antonetti, J., & Stice, T. (2018). *Powerful Task Design: Rigorous and Engaging Tasks to Level Up Instruction*. Corwin Press.

Additional Resources: For Beginners

- Designing Great Tasks
- Designing and writing assessment tasks
- 10 Ways to Design Tasks in CN
- Tips for Designing an Online Learning Experience Using the 5 Es Instructional Model
- What are best practices for designing group projects?

Additional Resources: For Advanced Learners

- Barzel, B., Leuders, T., Prediger, S., & Hußmann, S. (2013). Designing tasks for engaging students in active knowledge organization. *ICMI study*, *22*, 285-294.
- Sjöblom, M. (2014). Designing tasks and finding strategies for promoting student-to-student interaction. *Development of Mathematics Teaching: Design, Scale, Effects. Proceedings of MADIF 9;*.
- Woo, Y., Herrington, J., Agostinho, S., & Reeves, T. C. (2007). Implementing authentic tasks in web-based learning environments. *Educause Quarterly*, *30*(3), 36-43.

Videoclips

- Learning Tasks
- Designing Learning Experiences
- Meaningful Learning Activities
- 3 Minute Mini Lessons - Meaningful Learning

11. Roles for Teachers and Learners

Within this framework it is also necessary to identify roles for teachers. They are expected to move from knowledge delivery to the publishing of resources and the guidance of activities. The teacher is becoming more of a course organiser and less of a direct filter of information to the student. Thus, they need to provide the student with clear information about what they should be trying to achieve and the resources to achieve these targets. A classic approach has been to use the linear sequence of lectures to give the whole framework. A lecturer would use their own background knowledge and access to a range of texts to produce a filtered and personal view of a subject.

The framework has a greater focus on the student and the information available so we can expect a move from tutor directed, delivery based closed courses towards self-directed, problem and resource based open online courses. The role of the lecturer then moves from the traditional source and presentation of knowledge towards a facilitator of learning and route to knowledge. This role can be broken down further into possible categories of:

Motivator or educator	Setting objectives and providing tasks and problems to the learner, giving assessments
Moderator or reflector	Keeping learners on track, providing feedback and working with the learners
Editor	Filtering resources and matching then to the objectives of the course, pointing out new resources
Distributor	Gathering and classifying resources for the learners
Publisher	Publishing problems and tasks, not knowledge

Table 1: Roles for teachers providing open online learning

Alongside the identification of these roles for the teacher there are also new roles for the student. Again, there are various ways to label these new roles and only one possibility is given below:

Active	Current models of learning move from passive receipt of knowledge
Task directed	Learners respond to problems posed and learn by completing the tasks, not just validate learning received in other ways
Information seeking	Resources are found in wider and wider contexts
Communicating	An active role in the communication of their own ideas and views.
Support each other	Peer tutoring and sharing of work
Evaluative	Learners need to judge their own experiences and be prepared to face more choices as they learn

Table 2: Roles for learners taking part in open learning

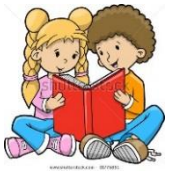
These roles for lecturers and for learners require more management than the old roles of presentation

and reception of knowledge. The lecturer requires a methodology to prepare the course, taking into account not only the content and overall objectives but also the tasks, resources, communication, timeliness, self-assessment and final assessment. The learner needs to be able to manage their own time within the course, matching with any schedule for synchronous contact, identifying and communicating with other students and carrying out and submitting tasks.

These models of activity are recognised in the instructional design and supporting technology.

Resources

- Learning About Open Learning (LOLA). PHARE Multi Country Programme for Distance Education Train the Trainers: Training in Distance Education Methods Programme Code: ZZ - 96.17.
- MacDonald, M., & Weller, K. (2017). Redefining our roles as teachers, learners, and leaders through continuous cycles of practitioner inquiry. *The New Educator*, *13*(2), 137-147.



Literature

- The Role of Teachers in the Learning Process
- The 7 Roles of a Teacher in the 21st Century

Additional Resources: For Beginners

- Anderson, T., & Garrison, D. R. (1998). Learning in a networked world: New roles and responsibilities. In *Distance Learners in Higher Education: Institutional responses for quality outcomes. Madison, Wi.: Atwood*.
- Keiler, L.S. Teachers' roles and identities in student-centered classrooms. *IJ STEM Ed* **5,** 34 (2018).
- MacDonald, M., & Weller, K. (2017). Redefining our roles as teachers, learners, and leaders through continuous cycles of practitioner inquiry. *The New Educator*, *13*(2), 137-147.

Additional Resources: For Advanced Learners

- Buchanan, R., & McPherson, A. (2019). Teachers and learners in a time of big data. *Journal of Philosophy in Schools*, *6*(1), 26-43.
- Mahini, F., Forushan, Z. J. A., & Haghani, F. (2012). The importance of teacher's role in technology-based education. *Procedia-Social and Behavioral Sciences*, *46*, 1614-1618.
- Thomas, N., Rose, H., & Pojanapunya, P. (2019). Conceptual issues in strategy research: Examining the roles of teachers and students in formal education settings. *Applied Linguistics Review*, *1*(ahead-of-print).

Videoclips

- Changing Roles of teachers and learners **Error! Hyperlink reference not valid.**
- Marc Prensky - What is the role of the teacher in todays world? Marc Prensky - What is the role of the teacher in todays world?
- 21st Century Teaching

12. Conclusions

This first module of MIL has looked at both the practicalities of structuring materials and the ideas that we need to bring to developing open online material. The framework described is one attempt to design material so that it is a good match to supporting learners as they use open online learning material, especially when that material is available online.

If you are producing open online learning don't forget to take into account the information you need about the learners themselves.

In this section, we considered:

- the elements of an open learning course;
- design for active learning;
- the background to a learning framework;
- a model for how learning occurs;
- consideration of learning theory;
- task-based learning;
- what characteristics tasks have;
- a way of labelling tasks and the resources people might use;
- the roles that lecturers and learners need to adopt.

13. Resources

References

This Module cites a wide range of resources and in many cases these resources are freely available either via the links provided of via copies made available online, which can be found through search engines such as Google Scholar. In some cases there will be cited books or other materials that have a cost to access them.

1. Alman, S. W., Tomer, C., & Lincoln, M. L. (Eds.). (2012). Designing Online Learning: A Primer for Librarians. ABC-CLIO.
2. Anderson, T. (Ed.). (2008). The theory and practice of online learning. Athabasca University Press.
3. Antonetti, J., & Stice, T. (2018). Powerful Task Design: Rigorous and Engaging Tasks to Level Up Instruction. Corwin Press.
4. Aragon, S. R. (Ed.). (2010). Facilitating Learning in Online Environments: New Directions for Adult and Continuing Education, Number 100 (Vol. 103). John Wiley & Sons.
5. Blondy, L.C. (2007). Evaluation and application of andragogical assumptions to the adult online learning environment. Journal of Interactive Online Learning, 6(2), 116-130.

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11. Huhtanen, A. (2019). The Design Book for Online Learning. Aalto University
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13. Johnson, B. (2016). *Transform Online Teaching: Expert Strategies and Essential Resources Every Educator Needs*. North Charleston, SC: CreateSpace.
14. Knowles, M. S., Holton, E. F., & Swanson, R. A. (2005). *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development*. 6th ed. Burlington, MA: Elsevier.
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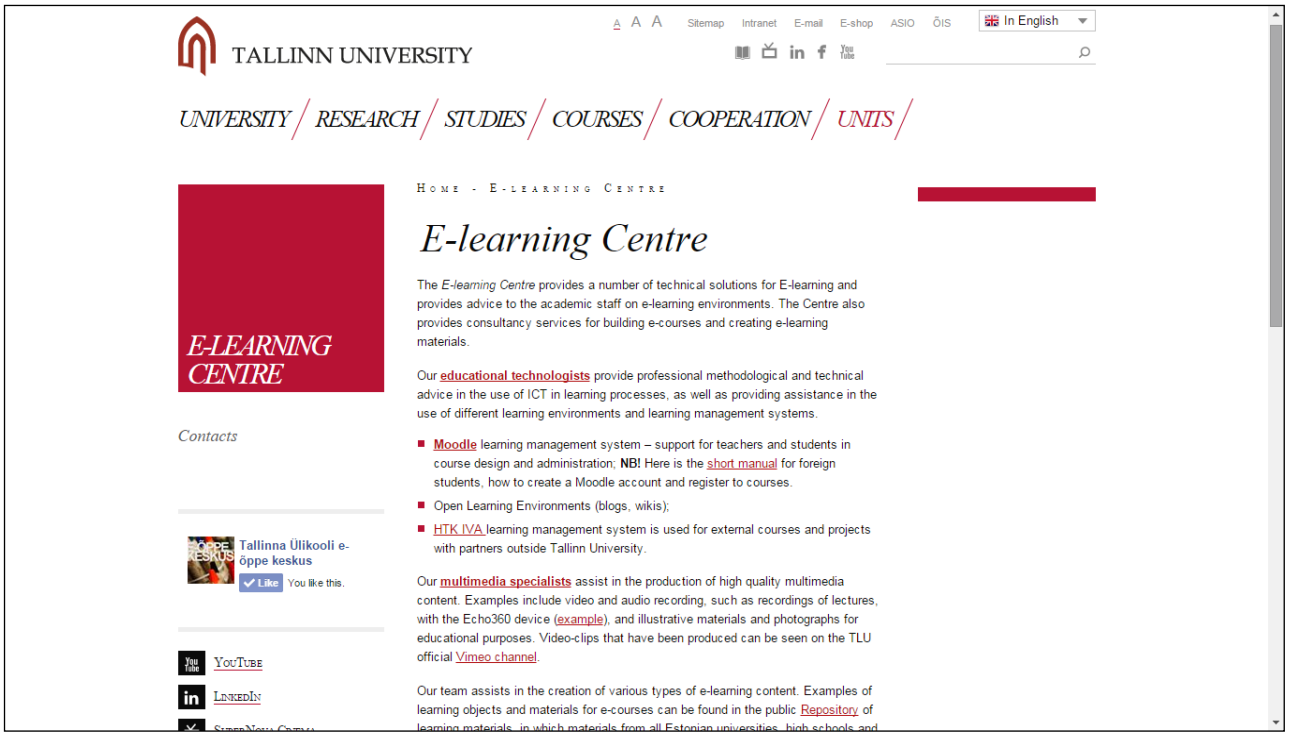
32. Wiggins, G., McTighe, J. *(2005). Understanding by Design* (2 ed.). New Jersey: Pearson.

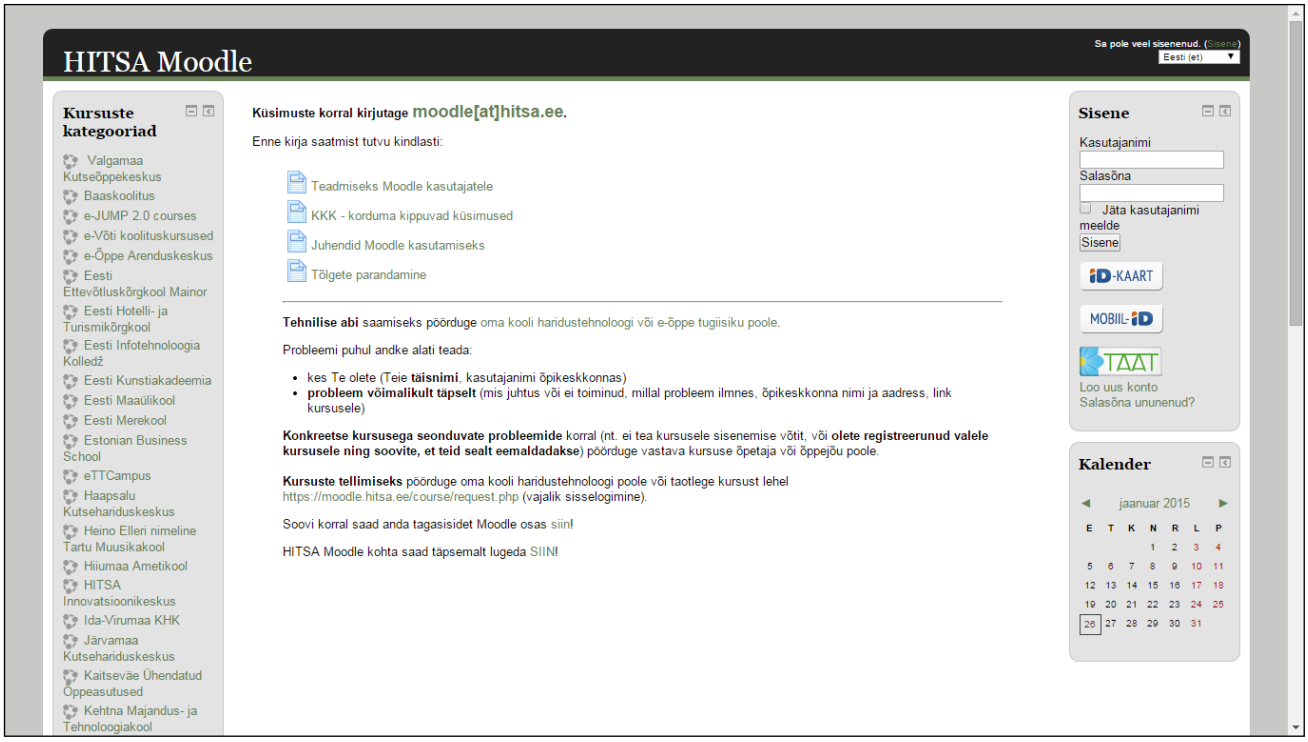
14. Technical Support and Requirements

Your learning process will be supported in many ways. We use a virtual learning environment called Moodle (https://moodle.hitsa.ee/) to support the delivery of this module. In case you need technical support because of access problems or other problems related to the performance of the platform, please contact Veronika Rogalevitš e-mail: veronik@tlu.ee or eope@tlu.ee. Veronika is responsible for the technical side of the platform at Tallinn University. If your problem is related to the use of different tools inside Moodle, then ask your group if anybody knows how to solve the problem. If the problem seems "unsolvable" then contact your tutor.

You can access to the virtual learning environment also via the homepage of Tallinn University http://www.tlu.ee/et/e-oppe-keskus/keskkonnad



or directly via the webpage https://moodle.hitsa.ee/.



Password is required to access the Modules which you have got after you registered to this Programme. A simple web browser is all that is needed to interact with Moodle online; we recommend the current versions of the most popular web browsers for accessing the module. For pdf files you need Acrobat Reader that you can download freely from the net http://get.adobe.com/reader/. For more information about Moodle – please visit http://docs.moodle.org/25/en/Moodle_manuals.

For communication via Skype you can download Skype software freely from the net http://www.skype.com/. Skype is software that allows users to make telephone calls over the Internet. Calls to other users of the service and to free-of-charge numbers are free, while calls to other landlines and mobile phones can be made for a fee. Additional features include instant messaging, file transfer and video conferencing. It was created by entrepreneurs Niklas Zennström, Janus Friis, and a team of software developers based in Tallinn, Estonia.

If you have information technology problems which are not connected with Moodle you can get support from our Information Technology Support Person Tanel Toova tanel.toova@tlu.ee.

CHAPTER II. THE BASICS OF MEDICAL AND HEALTH INFORMATION SEARCHING

Authors: Ivika Rande, Riina Kuik, Keiu Saarniit, Piret Truu
Tartu University Hospital

The aim of this module is to provide the basic knowledge of medical and health care information searching and to develop new skills for searching medical databases.

Objectives:

- to develop the knowledge of basic concepts of medical information literacy
- to support the skills of formulating health care questions
- to improve searching skills and critical appraisal in medical and health resources

Basic Concepts of Information Literacy

Technology is so much fun, but we can be drowned in our technology. Knowledge can be lost in the fog of information (American historian Daniel Boorstin 1983).

Information society, information fatigue syndrome

The society that we live in is often called „information society“. How can we define the concept of „information society“? There are many definitions of it in the Internet. Some of them are simple and some are more intricate, but in general, under „information society“ is meant a society, in which information and communication technology (ICT) transforms every aspect of cultural, economic or social life and which is based on the production and sharing of information (1). Fast development of information, as well as easy access to it are of significance. In addition to information, every member of the information society assumes easy access to services, data etc. Of course, these prerequisites can not be fulfilled without the use of computers and other means of communication or without the network of the Internet.

Figure 1. Information society. https://www.eifl.org/events/building-information-society

The amount of any kind of information (including scientific information) has grown fast as a result of scientific and technical progress. Already in the 1960s there was talk about „information flood“or „information explosion“. Although the drastic increase in the amount of information is associated with the ever increasing number of scientific journals in the 17th century and beyond, there is reason to speak about the total explosion of information, especially after World War II. It has been determined that between 1970 and 2002 more information was produced than in the previous 5000 years altogether. Of course, this is primarily related to the rapid development of information technology. Although people have now as easy access as possible to constantly growing data, the skills of acquiring and processing information, as well as of differentiating necessary information from unnecessary, have remained the same as in the antiquity and the Middle Ages when the amount of information was significantly smaller. Hence, it is ever more difficult to orientate oneself in the constantly growing flood of information (2).

Thus, the growth of data volume and the constant increase in information volume bring about not only obvious benefits, but also significant problems. When there is too much information, it is difficult to distinguish what is important, and so there can even occur „information overload syndrome“- also known as "information fatigue syndrome" (3). It is a disease-like state whose symptoms are decrease in the ability to concentrate because of the supersaturation of multitasking, which decreases productivity, and irritability, which can lead to rage etc. Ultimately, this can and often does end up in burnout.

Figure 2. Information overload. http://www.cambridgeblog.org/2019/08/information-overload-in-the-legal-sphere/

Information literacy or information competence or information searching skills

How can we skip these bottlenecks? How can we adjust the amount of information to our own needs and prevent the information fatigue syndrome? It is clear that no one needs all existing information. Everyone has to find just the part that he (she) needs at a given moment. Whoever has such a skill can be considered a person with information literacy. How can we explain the concept „information literacy“or “information competence“? The term "information literacy" was first coined and introduced by the American scientist Paul Zurkowski in 1974 (4).

There are several definitions of information literacy, let us list two of them here. According to a simple explanation, information literacy is „knowledge, skills and attitudes to finding, evaluating and using information“(5). There is also another way to define information literacy: „To be an information literate person, one has to recognise when he (she) needs information and has to be able to determine the location of it, as well as to evaluate and implement the information that he (she) needs“(6).

Thus, it is important to recognise the need for information, to find necessary information, to evaluate its quality and finally to implement it.

The American scientist C. Doyle has defined the skills of an information literate person as follows:

- ability to recognise the need for information
- understanding that smart decisions are based on accurate and exhaustive information
- ability to identify suitable sources of information
- ability to use successful search strategies to obtain information
- ability to use information sources on paper and in electronic carriers
- ability to evaluate information sources and the information found
- ability to organise the information found
- ability to integrate new information with existing knowledge

- ability to use information to solve problems (7)

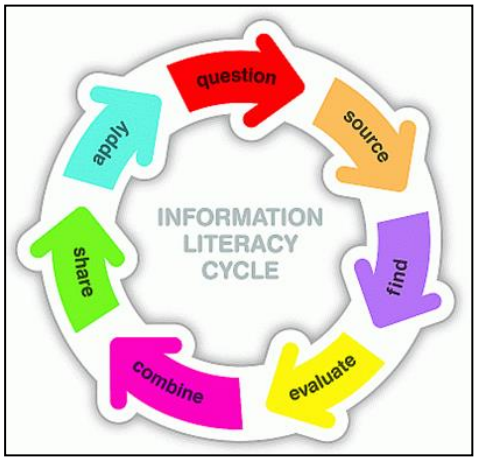


Figure 3. Information literacy cycle. https://daniellemariewalsh.wordpress.com/skills-2/information-literacy/

Need for information

As can be seen, the concept „need for information“ reoccurs in different definitions of the information literature. According to Raamatukogusõnastik (Library Dictionary), the term „need for information“ denotes a gap between the person’s knowledge and that what he or she would need to know in order to solve a problem caused by a lack of knowledge (8). Furthermore, the need for information is defined as a person's condition where the person perceives that he or she can no longer cope with existing knowledge until new knowledge is acquired and he or she needs additional information (5). There are many definitions of this concept but let us confine ourselves to these two.

Figure 4. Information literacy. http://www.lisbdnet.com/wp-content/uploads/2019/02/Information-Literacy-2.jpg

The need for information is felt by a person who at some point can no longer cope with their existing knowledge, either in everyday life, at work or while studying (8). However, he or she may not have a very thorough knowledge of how to fill the gap or gaps in his or her knowledge most effectively. At this point, it becomes highly necessary to be able to search for and find knowledge with the least possible time and energy, which in turn shows that the acquisition of the basics of information literacy is beneficial in any case.

Information acquisition, information search

When the knowledge or need for information is identified, a process called „information seeking“ follows. Information retrieval is formulated as follows: “Information retrieval is the search for information from all available information sources and channels. Information retrieval focuses on browsing, information retrieval is part of searching“ (9).

There are different ways to retrieve and search for information, we can obtain it from newspapers, books, mass communication tools (radio, television and reference books) and from other people (9). However, in today's information society the main and most common tool to retrieve high-quality information is the Internet.

Information retrieval and information searching are related concepts. However, the meaning of information searching is slightly narrower. It refers first of all to acquisition of information by means of computers and, in particular, Internet databases and other systematic sources of information (e.g. electronic journals) (10).

Figure 5. Information retrieval. https://www.vectorstock.com/royalty-free-vector/modern-technology-information-retrieval-the-vector-20311540

Boolean operators

Unlike the often chaotic acquisition of information, Internet-based information retrieval is systematically built up by using certain principles that ensure the relevance, timeliness and quality of the information found. When a search is built up, carefully selected search terms are used, which in turn will be connected by means of operators. Operators AND, OR and NOT are in the English language because most of the current databases are also in English. Depending on the operator used for information retrieval, the database "understands" what information is to be found.

Operator AND yields significantly narrower results than operator OR. When two search terms are connected by means of operator AND, only such results will be found where both concepts are definitely represented.

On the other hand, operator OR is much broader, but at the same time less precise. It finds the results in which both concepts are represented, as well as the ones in which only one of them occurs.

And operator NOT yields the results in which only one concept, but definitely not the other one, is represented, which allows to exclude the one that is not needed at the moment.

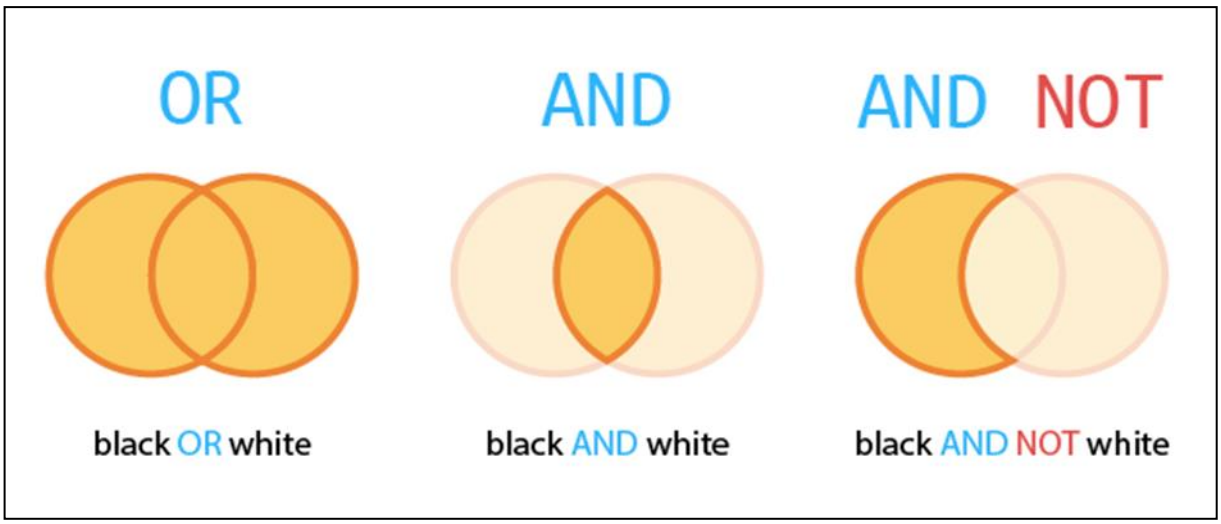


Figure 6. Boolean operators. https://awario.com/upload/blog/boolean-search-for-social-media-monitoring/3.png

Information request

If the information seeker knows what information he or she needs, i.e. what gaps in his or her knowledge need to be filled, then the next step is to formulate an information query. The term is defined as follows: "An information request is a verbal need for information. Formulating a query in an information search is a skilful combination of selected query words". An information request can be worded in several ways - as a descriptive sentence, a research question, a list of keywords (11).

Formulating the question

Still, it is most effective to initially ask a research question with a clear structure, to which the answer will be sought with the help of electronic information sources. A correctly asked question is, in fact, a prerequisite for finding high-quality information. Therefore, the wording of the question and the choice of terms to be included in it cannot be taken lightly. Through finding an answer to research questions or a confirmation of a hypothesis, the aim of research, i.e. the knowledge necessary to solve the research problem, is achieved (12). To find the most accurate information, the question also has to be formulated precisely. It is better, if the question is clear and short. It should not contain unclear and subjective concepts (for example „Which is the best…?", „What is the most useful…?" etc.). Also, the question must not consist of several questions – this would make search structure unnecessarily complicated and the search and analysis of the results too time consuming.

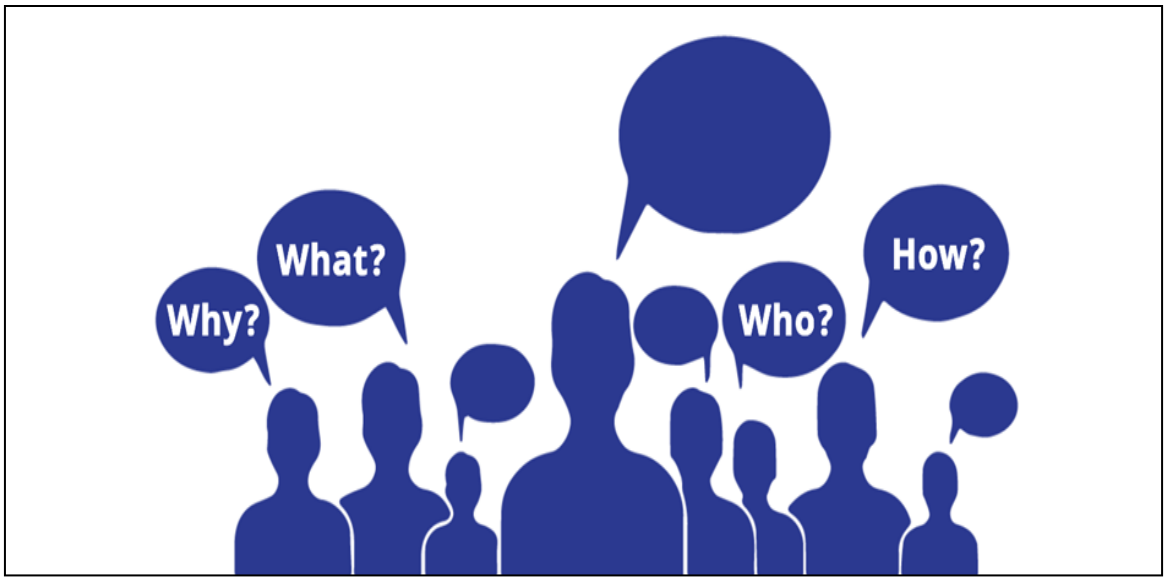


Figure 7. Formulating questions. https://www.nayidisha.com/wp-content/uploads/2018/07/2018-07-04.png

Search strategy

Once the correct question is formulated, you can start building up a search strategy. A search strategy is a plan for using search keys and performing search (13). So the search strategy is built up proceeding from the question. The question is, so to speak, divided into different concepts, which in turn are linked to the operators (see above), in this way necessary information is ultimately found in the database, which certainly provides information about the question asked. It is very important to emphasize that a correctly presented search strategy excludes the documents in which no answer can be found to the question.

Figure 8. Search strategy. https://library.albion.edu/sites/default/files/search-strategies.png

Keyword, keyword search

When building up a search strategy, you must first validate the keyword (keywords), i.e. important words in the text that refer to the content and can be used to make a query (14). A keyword is a word of your choice used to perform a (key) word search. A keyword search (also a word search) is a search for individual words in records or full texts in a database (15). Googling is also a keyword search.

When should the keyword search be preferred? This is more helpful if the topic you are looking for is very new and little researched, so you may not find many referrals or even created keywords. It is also worth searching by keyword if it is necessary to search the database in any field - title, abstract, author(s) or something else, or the keyword contains, for example, numbers, formulas, etc (16).

Subject heading (descriptor) – list of subject headings

The subject heading or the descriptor, differs in meaning from the keyword, i.e. the word describing the content of books, articles, etc. One word has been selected to express a concept under which all documents with the same content are grouped. The subject heading (descriptor) itself may not appear in the descriptive text (17). An ordered list of subject headings (descriptors) is called a list of subject headings (descriptors). Although the keyword dictionary for Estonian keywords (Estonian keyword dictionary) is available, the English keyword dictionary should be preferred when searching in English databases. The glossary of English medical terms is called MeSH (Medical Subject Headings).

Subheading search

In various scientific databases, the search strategy is primarily built up on keywords. This kind of search is called search by subheadings (18). The great advantage of keyword searching is that no matter what (key) word we enter, it is automatically converted to a subheading (descriptor) in the database. This process is called „automatic term mapping“. Thus, all words denoting the same term - synonyms - are included in the search.

However, usually one search method should not be preferred to another. Depending on the situation, sometimes it is more useful to perform a keyword search, while at other times search by subheadings appears preferable. However, it is even more effective to combine both search options in a search strategy. In this case, there is more hope that the search results have not left out any references in which particular information about the topic can be found.

Phrase search

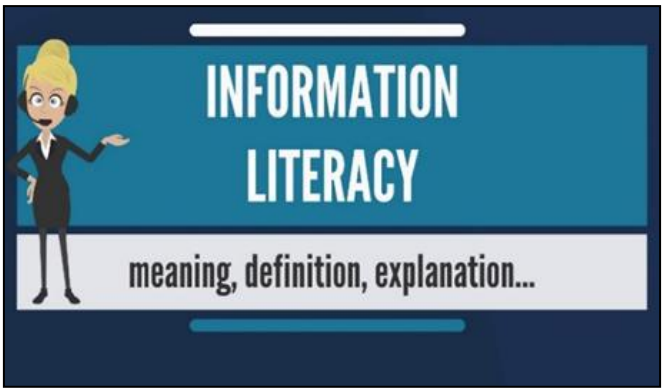
In addition to keyword search and search by subheadings, it is possible to perform also a phrase search in some databases. Phrase search is useful if you want to find a phrase with a specific word order, such as the title of a specific journal article. To do this, the phrase must be enclosed in quotation marks. This prevents the AND operator from being inserted between all words by default, which the database would otherwise do. In this way we can find only the references in which the entered words occur in a certain order, and we can avoid finding references in which these words exist, regardless of their location.

Term

There is one more concept related to the topic of information retrieval - the term. The term, or the technical word, is a strictly defined word or expression used in some kind of specialty (19). Thus, it is assumed that the term always has a definition. Different disciplines have their specific technical words or terms, which all together form terminology. Hence, medical terms constitute medical terminology.

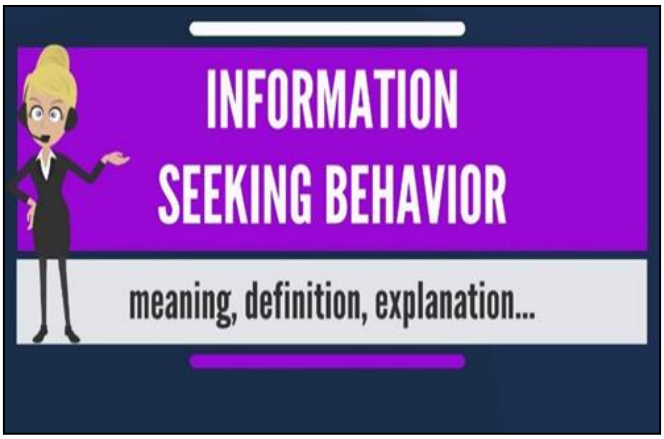
Videos

Information literacy



https://www.youtube.com/watch?v=I7GybCFErJM

Information seeking behaviour



https://www.youtube.com/watch?v=cIkqPEwedRM

Self-Control Test. Basic Concepts

1. Which of the following statements best describes the nature of information literacy?

    - Ability to find necessary information

- Reading skills
- Computer skills

2. Write the most suitable word in the blank. The information society is described as

   - Industrial society
   - Post-industrial society
   - Technology society
   - Communication society

3. What symptoms characterize a person suffering from information fatigue?

   - Sleep disorders, anxiety, burnout, stress, lack of time, etc.
   - Calmness, good sleep, good mood, etc.

4. Is the following statement true or false? Information retrieval refers primarily to the acquisition of information by means of computers, in particular Internet databases and other systematic sources of information

   - True
   - False

5. Which Boolean operator would be the best for finding information on the use of Covid-19 vaccine in pregnant women? Search keywords: Covid-19, vaccine, pregnancy

   - AND
   - OR
   - NOT

6. A retired elderly lady who has been suffering from low back pain for a long time has come to the library to ask for health information. She wonders if taking ibuprofen could alleviate her situation. What general search could find useful patient information for her?
7. The broadest search that searches for results in all fields is

   - Search by keyword
   - Search by author
   - Search by title
   - Search by topic

8. Which search produces fewer but more accurate results?

   - Search by phrase
   - Search by keyword

9. Which words are used to describe the special terms characterising a research article?

   - Keyword
   - Subheading or descriptor
   - Phrase

Answers

1. Ability to find necessary information
2. Communication society
3. Sleep disorders, anxiety, burnout, stress, lack of time, etc.
4. True
5. AND
6. Low back pain AND ibuprofen
7. Search by keyword
8. Search by phrase
9. Subheading or descriptor

Formulating Questions

When searching for information, correct formulation of questions is very important. Accurate formulation of the subject of interest helps us to obtain the best results for our search.

Medical questions can be generally divided into two types: background questions and foreground questions.

Background questions address general knowledge about a disease, symptom, or procedure. Examples of background questions are: "What is glaucoma?", "What are the symptoms of otitis media?", "What are medical reasons for Caesarean section?", "What are the side effects of this medication?".

Answers to background questions can usually found in textbooks, narrative reviews or specialized databases (for example, UpToDate).

Foreground questions are asked to make specific clinical decisions and they usually concern a particular patient or population. Examples of foreground questions are: "Does hormone replacement therapy increase the risk of breast cancer?", "Is it better to use paracetamol or ibuprofen to treat toddler's fever?", "Treating patients with hip osteoarthritis, is water therapy or land-based exercise more effective in restoring the range of motion?".

Answers to foreground questions can usually be found in bibliographical databases, search engines or specialized databases (for example, UpToDate).

The PICO method is a tool used for formulating questions, which helps to build a good search strategy. PICO is the acronym that stands for the words Patient, Intervention, Comparison, and Outcome. The PICO method helps to judge through which terms the further search strategy should proceed. For this purpose, we try to find the terms corresponding to the four different aspects of our question.

P	Patient (problem, population)	Description of patient or patient population
I	Intervention	Type of intervention considered – treatment method or analysis
C	Comparison (control)	Alternative to intervention – comparison treatment or placebo
O	Outcome	Desired effect of intervention

Figure 9. PICO question

For the question “Treating patients with hip osteoarthritis, is water therapy or land-based exercise more effective in restoring the range of motion?” the possible PICO table would be

P	hip osteoarthritis
I	water therapy
C	land-based exercise
O	restoration of range of motion

Figure 10. Example PICO question

We need not use all elements of PICO for every question. If there is no comparison treatment, C is left out. Sometimes the question does not specify any outcomes, so O is left out. Often only two first elements are used – for example, disease and intervention.

Let us look at an example presented in the article formulating a researchable question: A critical step for facilitating good clinical research (Indian J Sex Transm Dis AIDS. 2010 Jan-Jun; 31(1): 47–50., https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3140151/).

The case scenario is presented as follows: “A 2-year-old boy presents in an outpatient clinic with fever and severe pain in his right ear. He has a history of recurrent ear infections, and his mother expresses a concern that he has been on the antibiotic amoxicillin for the past few weeks. She is worried about the consequences of the long-term antibiotic use. She is also concerned about the outcome associated with recurrent ear infections. She wants to know if the prescribed amoxicillin is effective, or if it can be substituted for with another antibiotic because of its side effects such as frequent diarrhea.”

As stated in the article, a clinician needs to know about background and foreground questions about a particular disease and therapy. Once background questions are answered, more complex questions are addressed. Relevant background questions arising from this situation are “What is otitis media?” or “How does amoxicillin work?”. There are also several possible foreground questions, for example: “What are the outcomes associated with recurrent ear infection?”, “What are the possible effects of long-term use of antibiotic?”, “What are the harms associated with current treatment?” Using the PICO method the following more precise questions can be formulated: “In children with acute otitis media, is cefuroxime effective in reducing the duration of symptoms as compared to amoxicillin?”, “Does treatment with amoxicillin increase the risk of developing resistance in children suffering from otitis media?“

In the case of the first question “In children with acute otitis media, is cefuroxime effective in reducing the duration of symptoms as compared to amoxicillin?”, the PICO terms are: P - children with acute otitis media, I – cefuroxime (another antibiotic we consider instead of amoxicillin), C – amoxicillin, O - reducing the duration of symptoms.

In the case of the second question “Does treatment with amoxicillin increase the risk of developing resistance in children suffering from otitis media?“, the PICO terms are: P - children suffering from otitis media, I – amoxicillin, O - increasing the risk of developing resistance. As we can see, this question does not involve comparison of medicines, so C can be removed from PICO.

Task 1. Background and Foreground Questions

Which of the following questions are foreground questions and which are background questions?

1. Does washing of hands among healthcare workers reduce hospital acquired infections?
2. What are the causes of vitamin B12 deficiency?
3. How is lumbar radiculopathy diagnosed?
4. In patients with amblyopia, which is a more effective treatment: patching or glasses?
5. What causes migraines?
6. Is a yearly mammogram more effective in detecting breast cancer compared with a mammogram every 3 years in women under age 50?
7. How is hepatitis B diagnosed?
8. Should early or late parenteral nutrition be preferred in preterm infants?

Answers

1. Foreground
2. Background
3. Background
4. Foreground
5. Background
6. Foreground
7. Background
8. Foreground

Task 2. Formulating Clinical Questions

Try to recall your last visit to a doctor. What health problems were you discussing? Can you formulate the corresponding clinical questions? Are these background or foreground questions?

Databases

As mentioned above, the search strategy is built up in database(s) using various options. But what does the term "database" itself mean? In the simplest and shortest sense, a database is an “organized set of information” (20).

The textbook Information Sciences in Theory and Practice (TU Publishing House 2017) defines the database as follows: “A database is a systematically or methodically organized collection of independent works, data and other material that is individually accessible by electronic or other means.” (21)

The digital database is a set of data files connected by a common identifier, or a single file (20). A slightly longer, but somewhat clearer, definition of the database is the following: "A database is a set of data that needs to be stored for some reason." (22) The principles of the structure and operation of different databases are very different, and different databases are created and used in different fields of life and science.

Classification of databases

There are several ways to classify databases. One way is to classify them into factual databases (for example, Business Catalogue) and textual databases (for example, Estonian Articles Database ISE) (23).

Figure 11. Estonian 

Articles database *ISE*.
https://utlib.ut.ee/sites/default/files/styles/news_detail/public/uudised/ise-banner_1.png?itok=qndlcfgY

Thematically, databases can be divided into general content databases and professional content databases. General content databases include information from a number of different fields. An example of such a database is EBSCO. An example of a narrower or professional database is the biomedical database Medline, where you can find information related to medicine and medicine - related specialties.

In addition, databases can also be classified into:

- reference or bibliographic databases
- reference databases
- full-text databases
- factual databases

The reference databases are library databases (e.g. the joint catalogue ESTER, which brings together Estonia's largest libraries). In particular, a reference database provides information about where one can find original information, such as where exactly the book you are looking for is located in the library. Information on all relevant specialities (e.g. medicine) can be found in reference databases. The abstract database refers to all materials published in a particular field: journal articles, books, conference materials, dissertations, etc. An example of a medical reference database is Medline, where, in addition to bibliographic records, also abstracts of journal articles are published (24).

Figure 12. Library database *ESTER*. https://www.ester.ee/search~S1*est

In addition to bibliographic records and summaries, information (e.g. research articles) can also be found in full texts of full-text databases. Whether an article can be accessed in a database depends on a number of factors, such as whether the article was published in an open access journal, whether

the institution had purchased access to the journal, and so on. In most cases, it is also possible to purchase access to an interesting article directly in the database.

Full-text databases are also databases of various publishers, which provide access to the journals published by the respective publishing house. Examples of such databases are Science Direct, Oxford University Press, Oxford University Press, Springer Link, etc (24). Unfortunately, access to the databases of the above-mentioned publishers is only possible for a fee, and the full texts of articles cannot be read without purchasing access to these databases. However, bibliographic records and summaries of articles can usually be accessed in such databases.

Figure 13. Databases *ScienceDirect* (https://ntelt.com/) and *Springer*Link (https://link.springer.com/)

Open Access, OA

As mentioned briefly above, there is no possibility to get free access to all necessary research information; access to many databases has to be bought and it is quite expensive. On the other hand, the promotion of so-called "open access" has been gaining momentum in the world, especially over the last ten years.

The principle of open access is based on the notion that all kind research information must be available to all people at any time and free of charge. What is the justification for this? As taxpayers have already paid for scientific information in advance, so to speak, when paying state taxes, there is no right any more to charge them a separate fee.

"Open Access" is a general term that covers open publication of scientific information, meaning that it can be read, downloaded, copied, printed, distributed, re-used and published free of charge in the Internet. In this way, it benefits all parties: authors, including researchers, whose work will be available to the widest possible audience; readers, who can use the information they need for free; the level of professional education will be improved, as information will be available without restriction during its acquisition. Open access to scientific information benefits not only libraries, which no longer have to buy high-priced access to scientific information, but also publishers whose publications have a growing readership and, ultimately, the country with new opportunities for a new knowledge-based society.

Several declarations have been adopted to promote open access, such as: Budapest Open Access Initiative (2002), Bethesda Statement on Open Access Publishing (2003), Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (25).

There are a number of open access databases, such as the Directory of Open Access Books and the Direction of Open Access Journals database. Estonian open access publications can be found in the ROAD (Directory of Open Access Scholarly Resources) database.

Figure 14. *Open Access*. https://blogs.eui.eu/library/eui-open-access-roundtable-presentations-available-online/

What does a database consist of? Database structure

Record, elements of the record. In librarianship, a record signifies data in a catalogue or list. A search of (medical) databases usually results in a number of records. A record is a set of bibliographic data that is regularly presented, which allows the descriptive document to be fully identified (26). For example, the Medline database displays records of articles in the medical press as search results. You can change the order in which the entries are displayed according to your need, and you can also choose, for example, what data is displayed.

Record components

Each record in the medical databases consists of different fields, each of which provides some information about the corresponding document (e. g a book, a journal article, etc.).

The main fields of the record are:

- author(s)
- title
- publication (e.g. journal)
- journal's volume, number and pages
- publication date
- keyword
- abstract. An abstract is a short summary of a journal article that provides key information about the article. An abstract consists mainly of the following parts: introduction, methods, results, conclusion
- text

Review > Int J Infect Dis. 2020 Jul;96:710-714. doi: 10.1016/j.ijid.2020.04.090. Epub 2020 May 7.

From SARS to COVID-19: What we have learned about children infected with COVID-19

Meng-Yao Zhou [1], Xiao-Li Xie [2], Yong-Gang Peng [3], Meng-Jun Wu [4], Xiao-Zhi Deng [1], Ying Wu [5], Li-Jing Xiong [1], Li-Hong Shang [1]

Affiliations + expand

PMID: 32389849 PMCID: PMC7204709 DOI: 10.1016/j.ijid.2020.04.090

Free PMC article

Abstract

Introduction: Coronaviruses, both SARS-CoV and SARS-CoV-2, first appeared in China. They have certain biological, epidemiological and pathological similarities. To date, research has shown that their genes exhibit 79% of identical sequences and the receptor-binding domain structure is also very similar. There has been extensive research performed on SARS; however, the understanding of the pathophysiological impact of coronavirus disease 2019 (COVID-19) is still limited.

Methods: This review drew upon the lessons learnt from SARS, in terms of epidemiology, clinical characteristics and pathogenesis, to further understand the features of COVID-19.

Results: By comparing these two diseases, it found that COVID-19 has quicker and wider transmission, obvious family agglomeration, and higher morbidity and mortality. Newborns, asymptomatic children and normal chest imaging cases emerged in COVID-19 literature. Children starting with gastrointestinal symptoms may progress to severe conditions and newborns whose mothers are infected with COVID-19 could have severe complications. The laboratory test data showed that the percentage of neutrophils and the level of LDH is higher, and the number of CD4+ and CD8+T-cells is decreased in children's COVID-19 cases.

Conclusion: Based on these early observations, as pediatricians, this review put forward some thoughts on children's COVID-19 and gave some recommendations to contain the disease.

Keywords: 2019-nCoV; COVID-19; Children; Coronavirus; SARS; SARS-CoV-2.

Figure 15. Example of an article record in the *PubMed* database

Medical databases. Medline

In the field of medicine, one of the best-known databases for the transmission of scientific information is Medline (Medical Literature Analysis and Retrieval System Online, or MEDLARS Online). Medline is a bibliographic database created by the National Library of Medicine in Washington. The areas covered by Medline are clinical medicine, healthcare, nursing, pharmacology, healthcare system administration and economics, dentistry, veterinary medicine. Access to Medline is provided by several interfaces, and Medline is available free of charge through PubMed. Keep in mind that Medline is not a full-text database, which means that a search in Medline will only return bibliographic records for articles. Access to the full texts depends on the document in question (e.g. a book or journal) - whether it is a free access source or a document for a fee that can only be used by those who have purchased access to the book or journal.

The predecessor of today's Medline dates back to 1879, when the above mentioned US National Medical Library began publishing Index Medicus, a monthly guide to orientation in articles published in various medical journals. The Index Medicus (1960-2004 Index Medicus / Cumulated Index Medicus (IM / CIM), 1970-1997 Abridged Index Medicus) was published until 2004 and consisted of an alphabetical list of medical specialties, listing the journals of each specialty. The creation of the electronic database Medline (MEDLARS Online) began in the 1960s, and since 1971 libraries have been able to join an electronic network and make inquiries electronically (27).

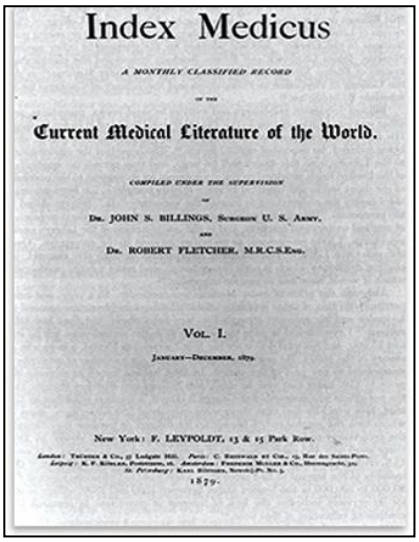


Figure 16. *Index Medicus*. https://www.historyofinformation.com/detail.php?id=522

The electronic database Medline currently contains more than 26 million records, which in turn come from about 5,200 medical publications in more than 40 languages. Information on Medline has been available since 1946 (28).

Figure 17. *Medline*. https://www.helenplum.org/medline

Medline is available to its user through multiple databases. The best known of these is certainly PubMed, which is also compiled by the US National Library of Medicine. Other databases that provide access to Medline are usually available for a fee, but PubMed has the advantage that it can be used completely free of charge from any computer with an Internet connection.

What makes Medline special and simplifies search for information is the thesaurus of medical keywords, or MeSH (Medical Subject Headings). A thesaurus dictionary is a dictionary that tries to capture the entire vocabulary of the respective specialty (in this case, medicine) and to present the connections between the concepts (29). Thus, when searching for information in Medline, it is specific that when we enter a term of interest into the corresponding field of the database, we are not first shown a list of sources (e.g. magazine articles), but are directed to the MeSH dictionary.

Figure 18. *MeSH*. https://en.wikipedia.org/wiki/Medical_Subject_Headings

A new edition of the MeSH Glossary is published annually by the U.S. National Library of Medicine, with appropriate changes: new keywords added, terms removed, or changed as needed. Currently, the MeSH dictionary contains about 25,000 medical keywords.

Example of a Medline search in the open database PubMed. The term is entered in the search field:

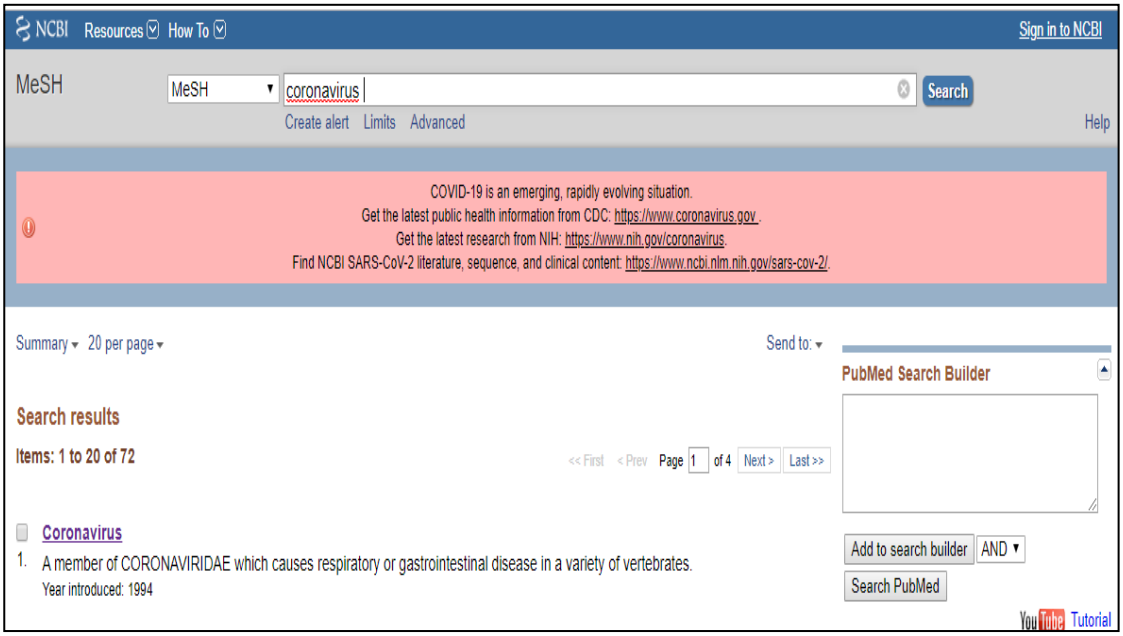


Figure 19. *MeSH* search in *Pubmed*

Instead of a list of articles, we are shown information about the entered term: definition of the term and its location in the MeSH hierarchic system. The terms found in the MeSH glossary are also called descriptors.

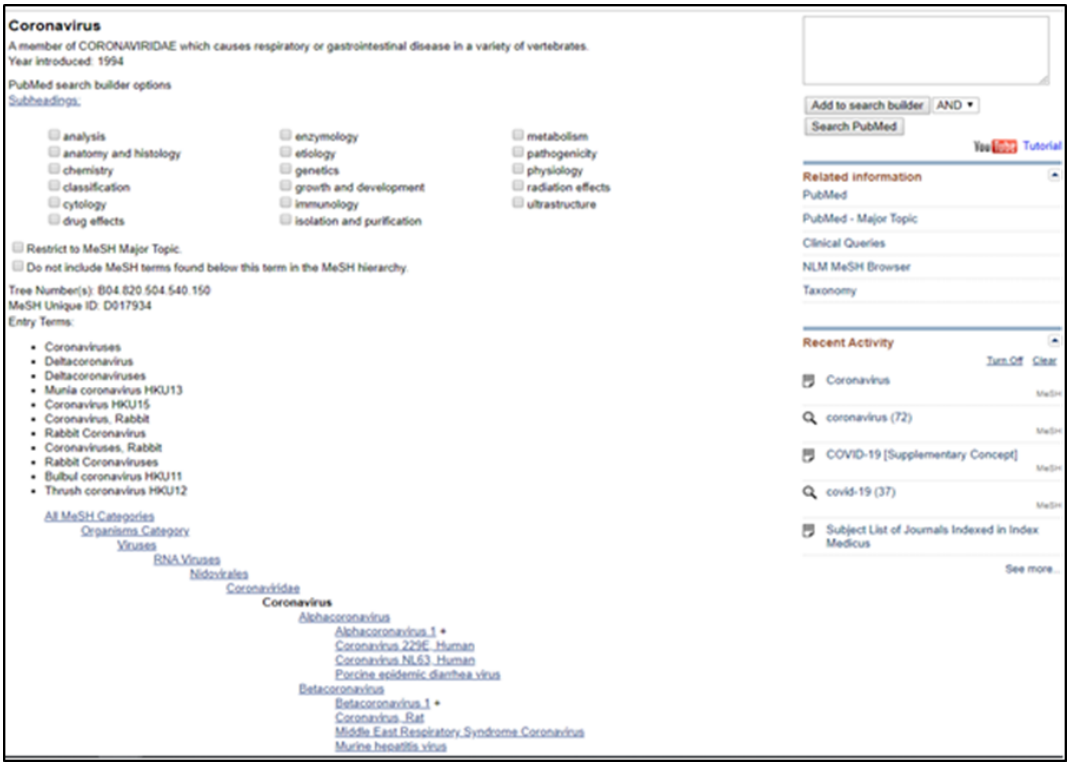
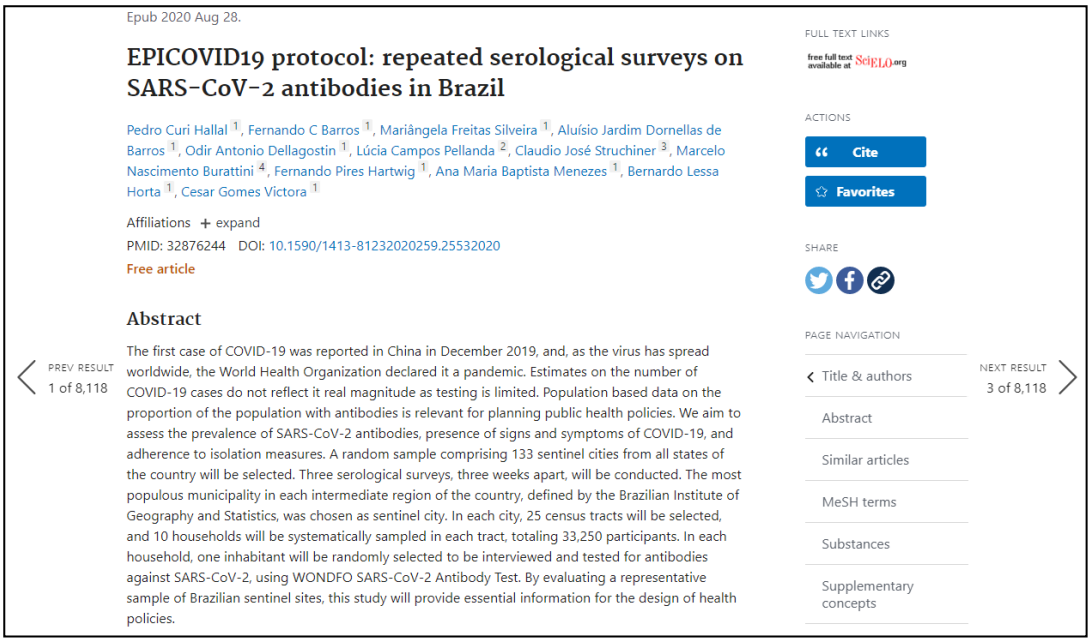


Figure 20. *MeSH* term Coronavirus

In addition, the term also includes subheadings or qualifiers, which denote a narrower aspect of the main term, e.g. anatomy, etiology, epidemiology, treatment, etc. This allows you to narrow down your search through searching the database by selecting only a few sub-terms.

Each Medline journal article is described in the U.S. Medical Library using the MeSH term which most accurately describes the subject matter of 10-12 corresponding articles, of which 3-4 are the main terms which are marked with an asterisk (*).

A record of an article in the Medline database. The main term is marked with an asterisk:



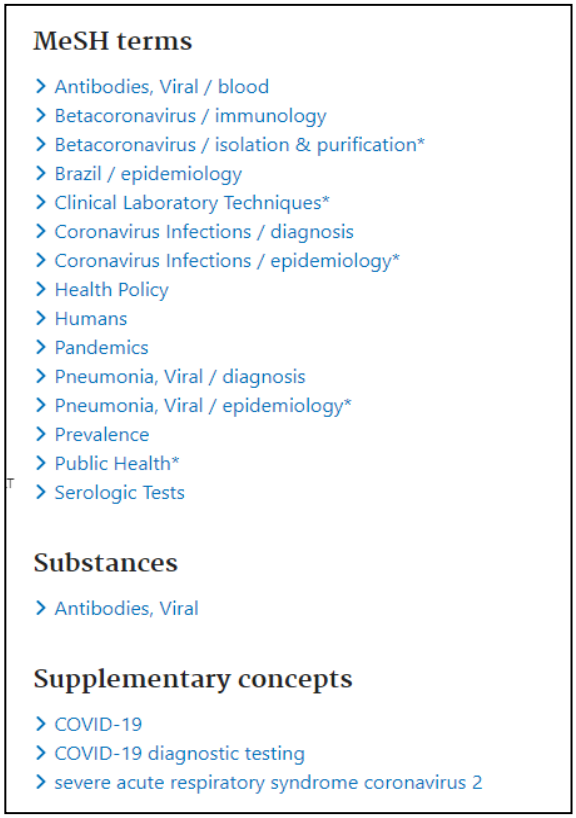


Figure 21. List of *MeSH* terms

In Medline, it is possible to build up a search very precisely; if the search topic or question is formulated as precisely as possible, the search can be performed by combining MeSH keywords and qualifiers so that ultimately we will surely find articles that are related to the topic. This will save the amount of time that would otherwise be spent processing excess and unnecessary material. Of course, the prerequisite for obtaining relevant search results is a precisely and clearly formulated search topic or question.

Automatic term mapping

An important specific feature of Medline, which greatly facilitates information retrieval, is automatic term mapping. Automatic term conversion means that information is searched not only for the keyword that we have entered in the database search box, but also for the keyword to be converted into various synonyms of that term in the database.

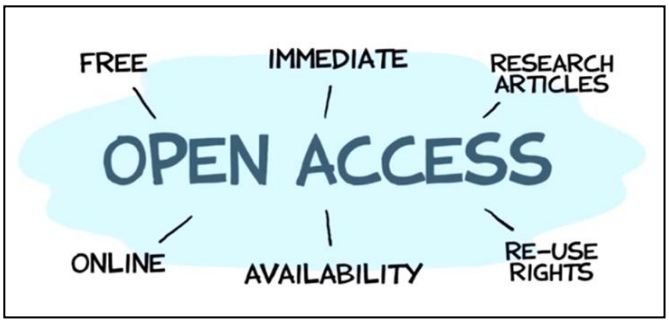
Let us enter, for example the term heart attack. In fact, the search proceeds as follows: "myocardial infarction"[MeSH Terms] OR ("myocardial"[All Fields] AND "infarction"[All Fields]) OR "myocardial infarction"[All Fields] OR ("heart"[All Fields] AND "attack"[All Fields]) OR "heart attack"[All Fields].

Videos

Full text database

https://www.youtube.com/watch?v=8siG_JY3v8w

Open Access



https://www.youtube.com/watch?v=L5rVH1KGBCY

Self-Control Test. Database

1. What is a database?

- The display on which magazines are shown
- The computer mechanism for storing and retrieving data
- The part of the computer that is the closest to data
- A specific type of hard drive

2. What is a bibliographic or reference database?

- A database containing bibliographic data
- A list of literature, a list of works or other set of records arranged according to the specific features of documents
- Automatic analysis of voluminous data for finding new patterns and unexpected links
- A small (periodical) publication with current information

3. What is a record?

- A word with a definite meaning in a professional language
- A set of bibliographic data submitted on a regular basis
- A word, phrase, or group of characters that commonly occurs in a publication and by which the publication or the work herein is named.
- An arranged list of keywords

4. Which of the following not included in the fields of a record in the Medline database?

- Author(s)
- Journal's name
- MeSH terms
- The last paragraph of an article

5. What is the name of one of the best known medical reference databases?

- Medlars
- Medline
- Clinical Information
- Medical Index Reference Database

6. Index Medicus was

- A thematic list of medical specialties, in which each speciality was provided with a list of journals dealing with this particular speciality.
- A comprehensive collection of patient information materials
- A thematic list of medicines for different diseases

7. What does Open Access mean?

- Scientific publications to which publishers provide access only for a fee

- The author has to pay every time when someone wants access to his publication
- Scientific publications are available free of charge to anyone
- Free access to publications of lower quality that were not classifying for quality databases.

8. What are the English names used by the US National Medical Library staff to describe research articles in the Medline database?

- Terms
- Medical Subject Headings or MeSH
- Authors' keywords
- Qualifiers

9. What does an asterisk added to a MeSH term in a database mean?

- An asterisk indicates a temporary MeSH term
- When using an asterisk, the definition of the term is displayed as a search result
- Asterisks can also find terms deleted from the MeSH dictionary.
- An asterisk is used to mark 3-4 main MeSH terms that describe an article

Answers

1. The computer mechanism for storing and retrieving data
2. A database containing bibliographic data
3. A set of bibliographic data submitted on a regular basis
4. The last paragraph of an article
5. Medline
6. A thematic list of medical specialties, in which each speciality was provided with a list of journals dealing with this particular speciality
7. Scientific publications are available free of charge to anyone
8. Medical Subject Headings or MeSH
9. An asterisk is used to mark 3-4 main MeSH terms that describe an article

MeSH

MeSH (Medical Subject Headings) is a vocabulary of medical terms. It is used for indexing records in the Medline database. MeSH was created and is being updated by the United States National Library of Medicine. MeSH is updated once a year.

MeSH contains over 28 000 descriptors (also known as headings or subject headings) which are arranged in a hierarchical structure. The uppermost level of the vocabulary consists of 16 categories, each with a tree branching into more specific terms, for which the descriptors are arrayed hierarchically from the most general to the most specific. These categories are: Anatomy; Organisms; Diseases; Chemicals and Drugs; Analytical, Diagnostic and Therapeutic Techniques, and Equipment; Psychiatry and Psychology; Phenomena and Processes; Disciplines and Occupations; Anthropology, Education, Sociology, and Social Phenomena; Technology, Industry, and Agriculture; Humanities; Information Science; Named Groups; Health Care; Publication Characteristics; Geographicals.

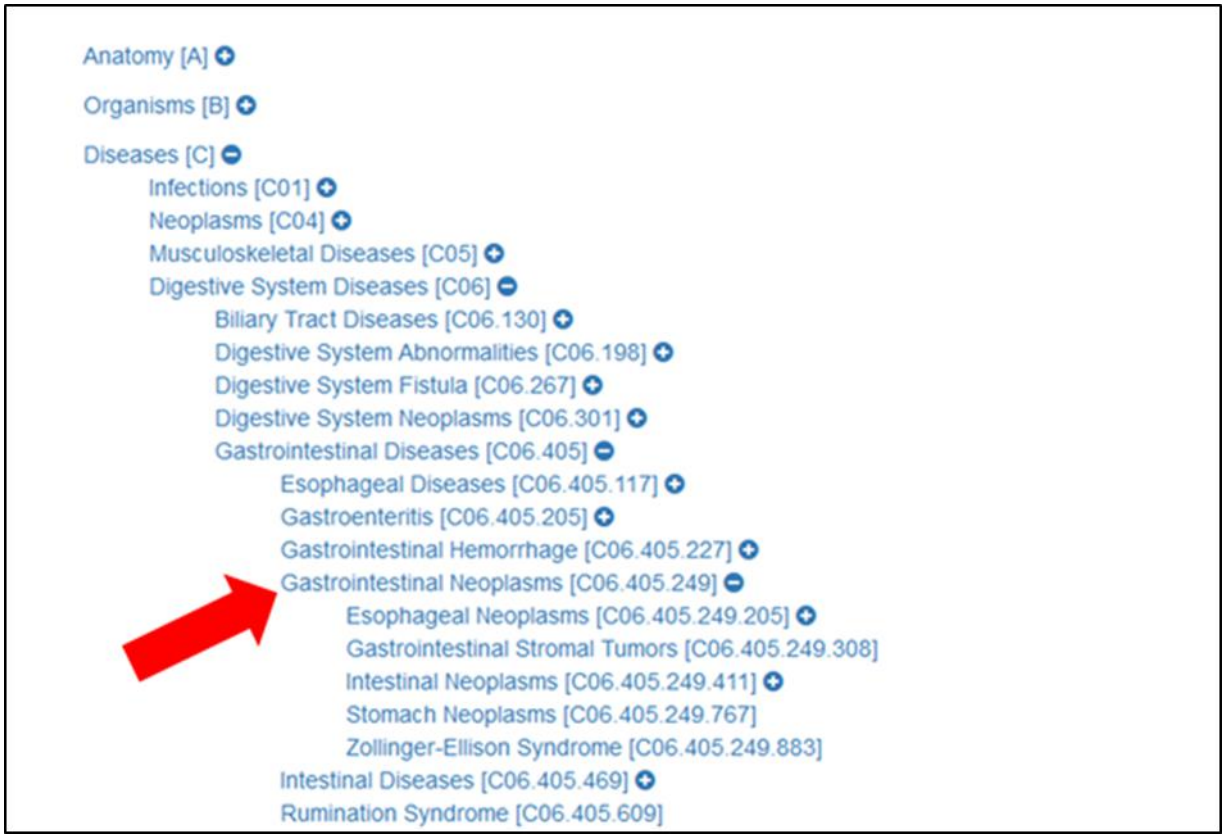


Figure 22. Location of the descriptor Gastrointestinal Neoplasms in the *MeSH* tree (https://meshb.nlm.nih.gov/treeView)

A MeSH descriptor may occur in several locations of the MeSH hierarchy. The term Gastrointestinal Neoplasms in the above figure occurs in the MeSH branch starting from the term Digestive System Diseases. The same term also occurs in the branch starting from the term Neoplasms. As seen in the figure, the term Gastrointestinal Neoplasms branches into five more specific terms, while two of these also have underlying terms. The MeSH Browser (https://meshb.nlm.nih.gov/search) is a useful tool for finding MeSH descriptors for browsing through the hierarchical tree.

MeSH qualifiers (or subheadings) are used together with descriptors to describe more precisely a particular aspect of a subject. For example, for the descriptor Measles, one possible qualifier is epidemiology. Their combination (usually displayed as Measles/epidemiology) is used for indexing the articles covering the epidemiology of measles. There are 78 qualifiers. The list of qualifiers that can be assigned to a descriptor depends on the descriptor. For example, the list of possible qualifiers for diseases is different from the one used for surgical procedures. Some examples of common subheadings used with disease descriptors are complications, diagnosis, epidemiology, prevention and control, surgery, therapy. The list of qualifiers and their descriptions can be found on the webpage https://www.nlm.nih.gov/mesh/qualifiers_scopenotes.html

Each MeSH descriptor also has a list of synonyms and similar terms connected to it – these are called entry terms. The descriptor can often be a very specific medical term, but its entry terms usually include more colloquial versions of the term. For instance, among the entry terms of the descriptor Myocardial Infarction are Heart Attack, Cardiovascular Stroke, Myocardial Infarct etc. Connection between descriptors and entry terms makes automatic term mapping in PubMed searches possible. When we search for the term “heart attack” in PubMed then automatic term

mapping finds its corresponding MeSH term (Myocardial Infarction) and includes in search results all records indexed with it. This helps us find as many relevant records as possible, even if not all of them use the same term for the subject that we used in our search.

When indexing an article in Medline, 10-15 MeSH descriptors are used to describe the content of the article. Only a descriptor (Myocardial Infarction) or a descriptor+qualifier combination (Myocardial Infarction/prevention and control) can be used. The major topics of an article are denoted with an asterisk (Myocardial Infarction/prevention and control*).

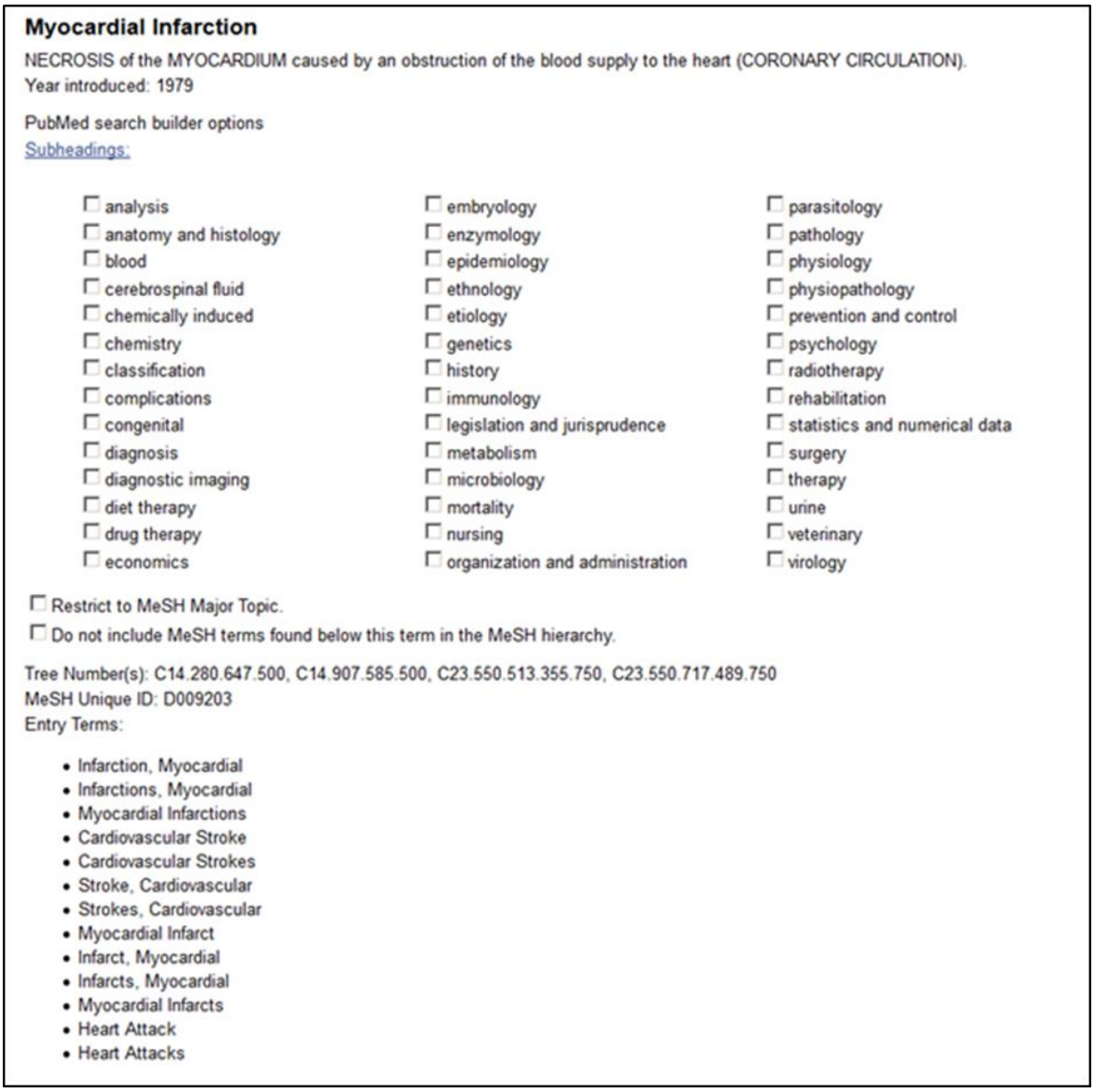


Figure 23. Page of a *MeSH* term in *PubMed*, upper part

The figure shows a MeSH descriptor page for creating a Pubmed search. The descriptor's name is followed by a concise definition (scope note) and the year of introduction in the MeSH vocabulary. The list of possible qualifiers with checkboxes can be used to specify the search. There are two more options to narrow down the search. Restrict to MeSH Major Topic finds only articles where the term is marked as a major topic. Do not include MeSH terms found below this term in the MeSH hierarchy, leaves out more specific subject headings in the MeSH tree. By default PubMed explodes

MeSH terms to include all narrower terms in the hierarchical tree into the search. The entry terms of the descriptor are shown in the lower part of the figure.

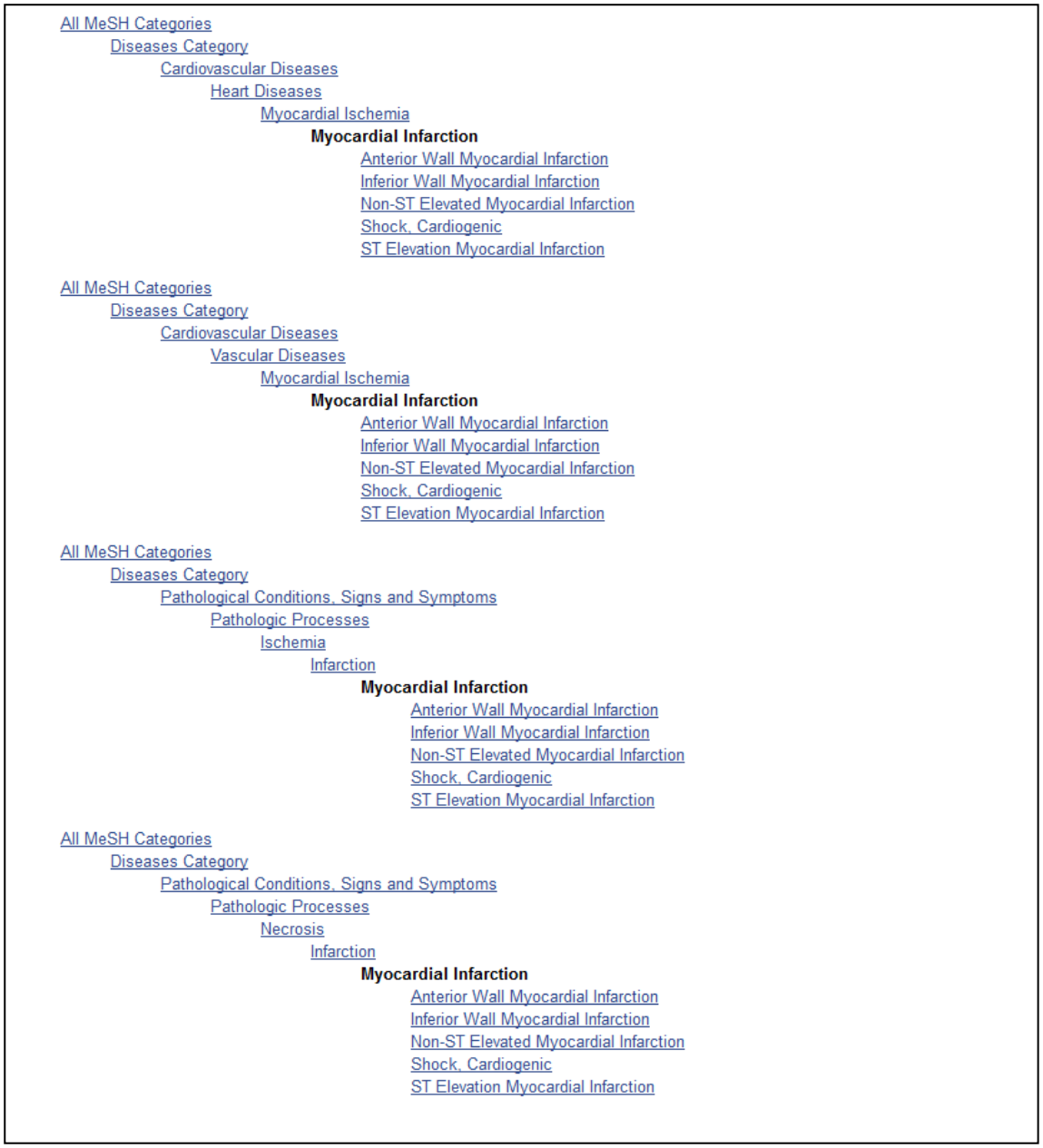


Figure 24. Page of a *MeSH* term in *PubMed*, lower part

At the bottom of the descriptor page different locations of our term in the MeSH hierarchical structure are presented. Also, we can see that the descriptor groups five more specific terms.

Example. Creating a Search in the PubMed Database Using a MeSH Term

We start creating a search from the PubMed webpage (https://pubmed.ncbi.nlm.nih.gov/). The link to the MeSH database can be found in the rightmost column in the lower part of the page.

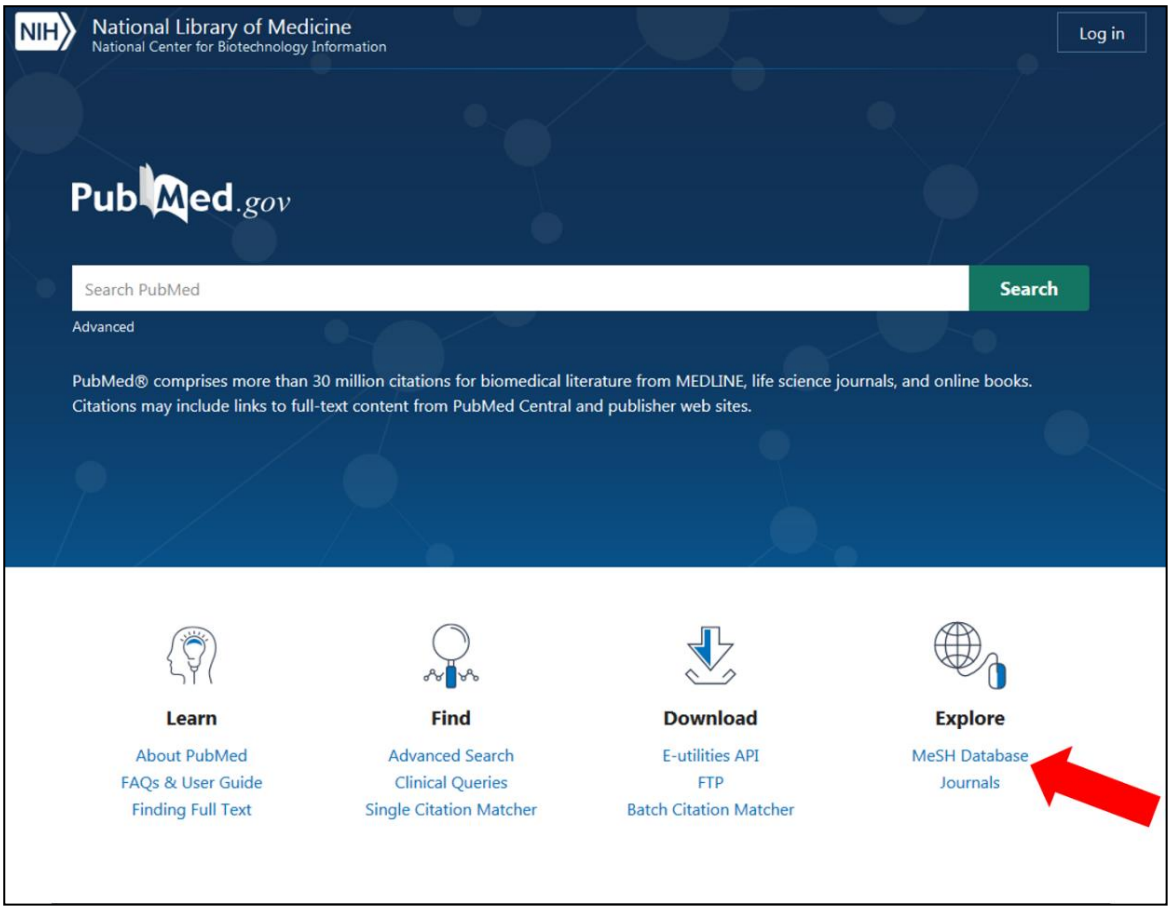


Figure 25. *MeSH* search in *PubMed*

We want to find a MeSH descriptor corresponding to the term "high blood pressure". For this, we insert this term into the search box and click on the button Search.

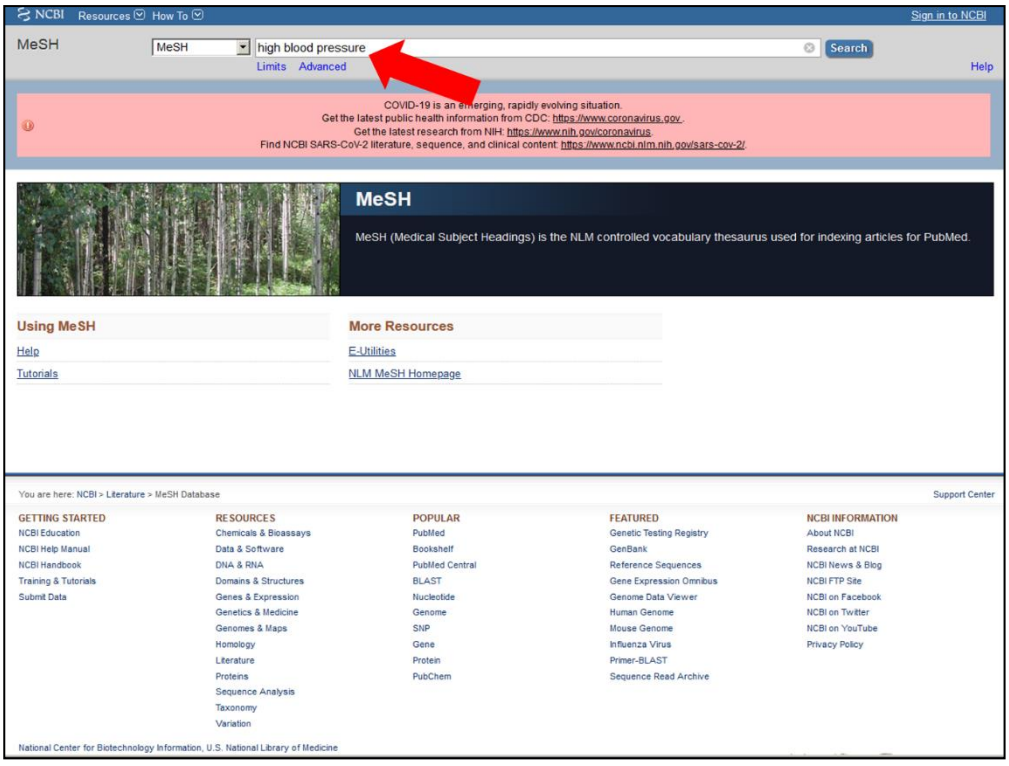


Figure 26. *MeSH* search in *PubMed*

Search results suggest possible equivalents in the MeSH database. The descriptor Hypertension seems to be the best match. To find out more about it, we click on the descriptor's name. If the search finds only one matching descriptor, then its page will automatically open.

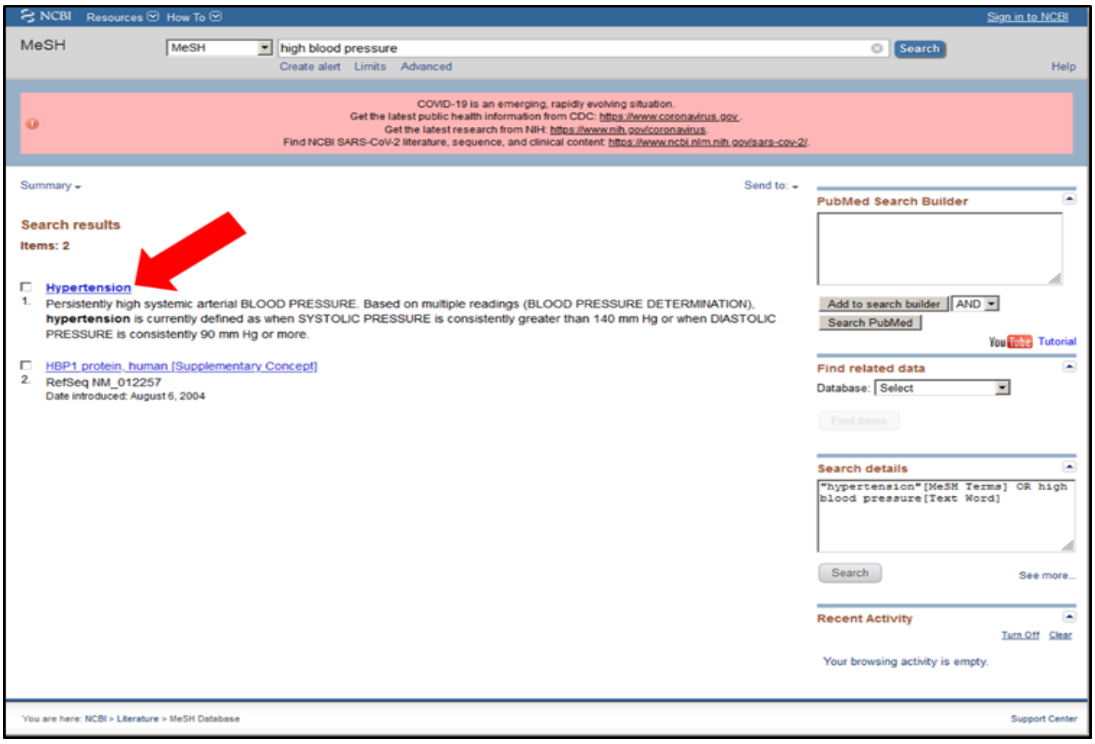


Figure 27. *MeSH* search in *PubMed*

On the descriptor's page, to narrow the search by choosing the qualifier "prevention and control", we mark the checkbox next to it. If all choices to specify the search have been made, we click on the button Add to search for the builder. Thereafter, we click on the button Search PubMed to run the search.

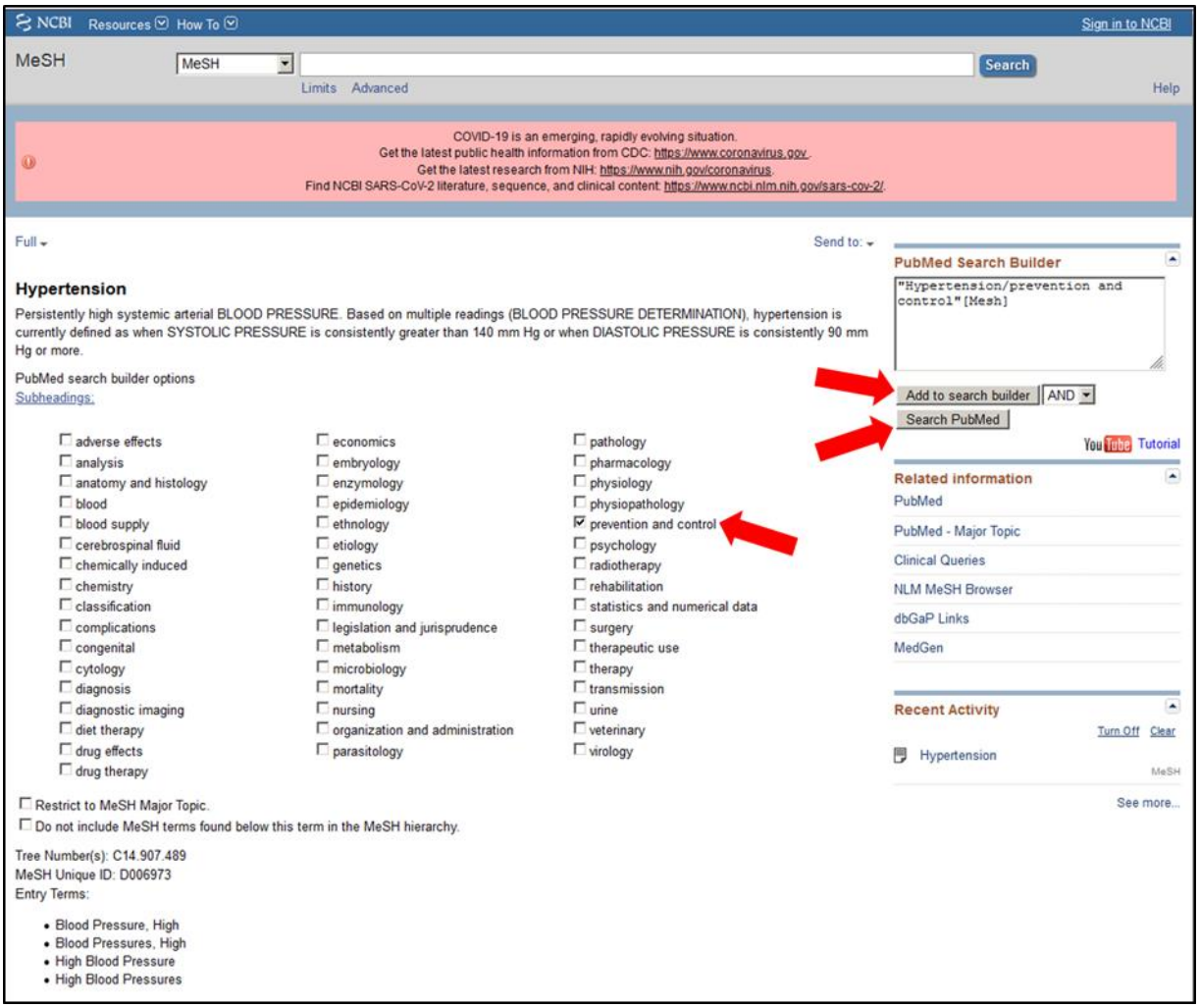


Figure 28. *MeSH* search in *PubMed*

The PubMed page displays the search results – the list of all Medline records indexed with the MeSH term Hypertension/prevention and control.

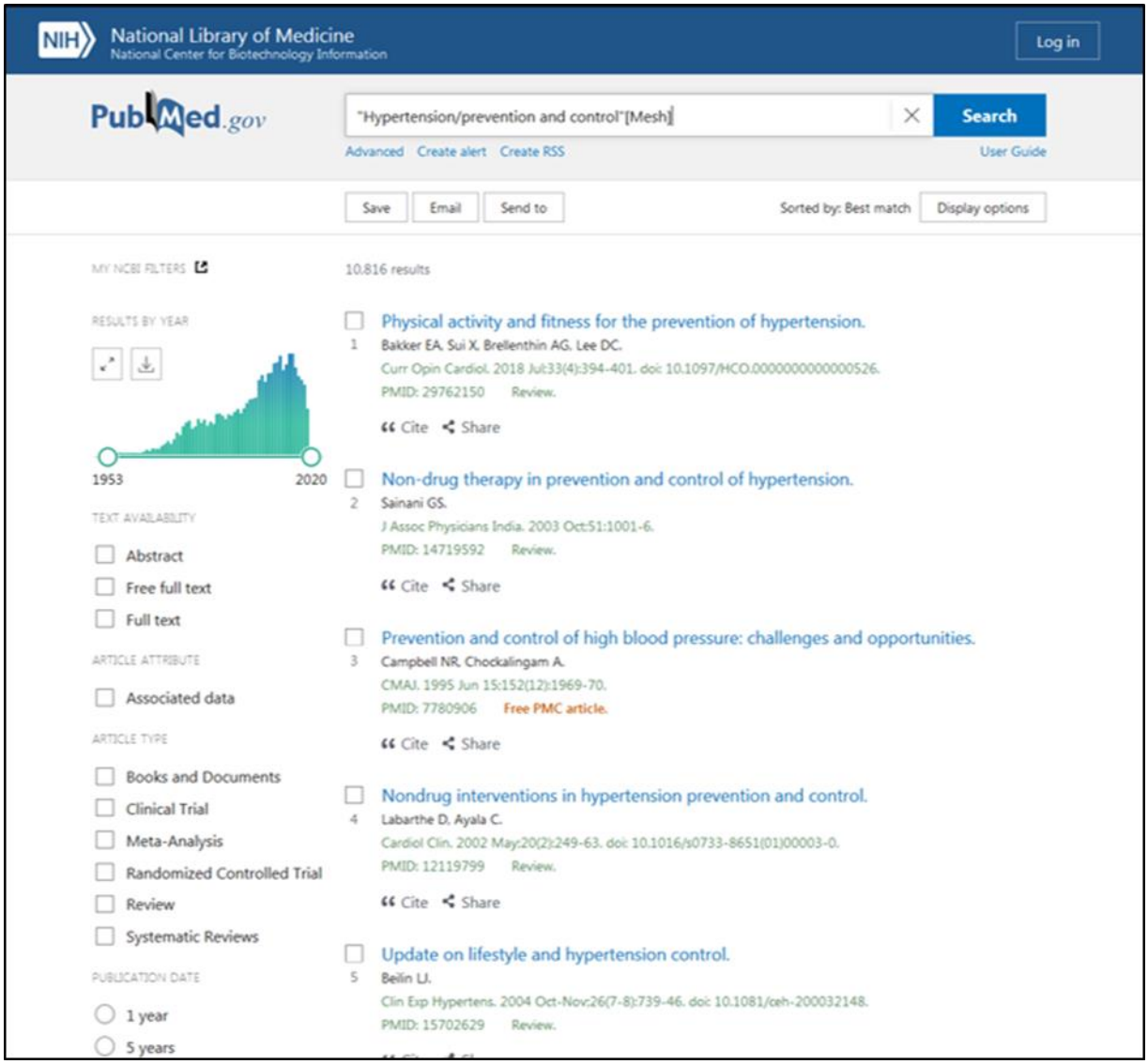


Figure 29. *MeSH* search in *PubMed*

Example. Using tree view in the MeSH Browser

We open the MeSH Browser in Tree View tab (https://meshb.nlm.nih.gov/treeView) where we can see 16 MeSH categories. To move on along the MeSH tree, we have to click on +-button next to the descriptor. We click on +-buttons beside the terms Diseases, Respiratory Tract Diseases, Lung Diseases and the branch of lung diseases will be open to us.

Figure 30. Using the *MeSH* Browser

To specify the term Cystic Fibrosis in the list of lung diseases, we click on the descriptor's name.

Figure 31. Using the *MeSH* Browser

Now we can see the information page for the descriptor Cystic Fibrosis. On the tab Details we can find general information. The tab Qualifiers shows the qualifiers that can be combined with this term. The tab MeSH Tree Structures presents location(s) of our term in the MeSH hierarchical tree.

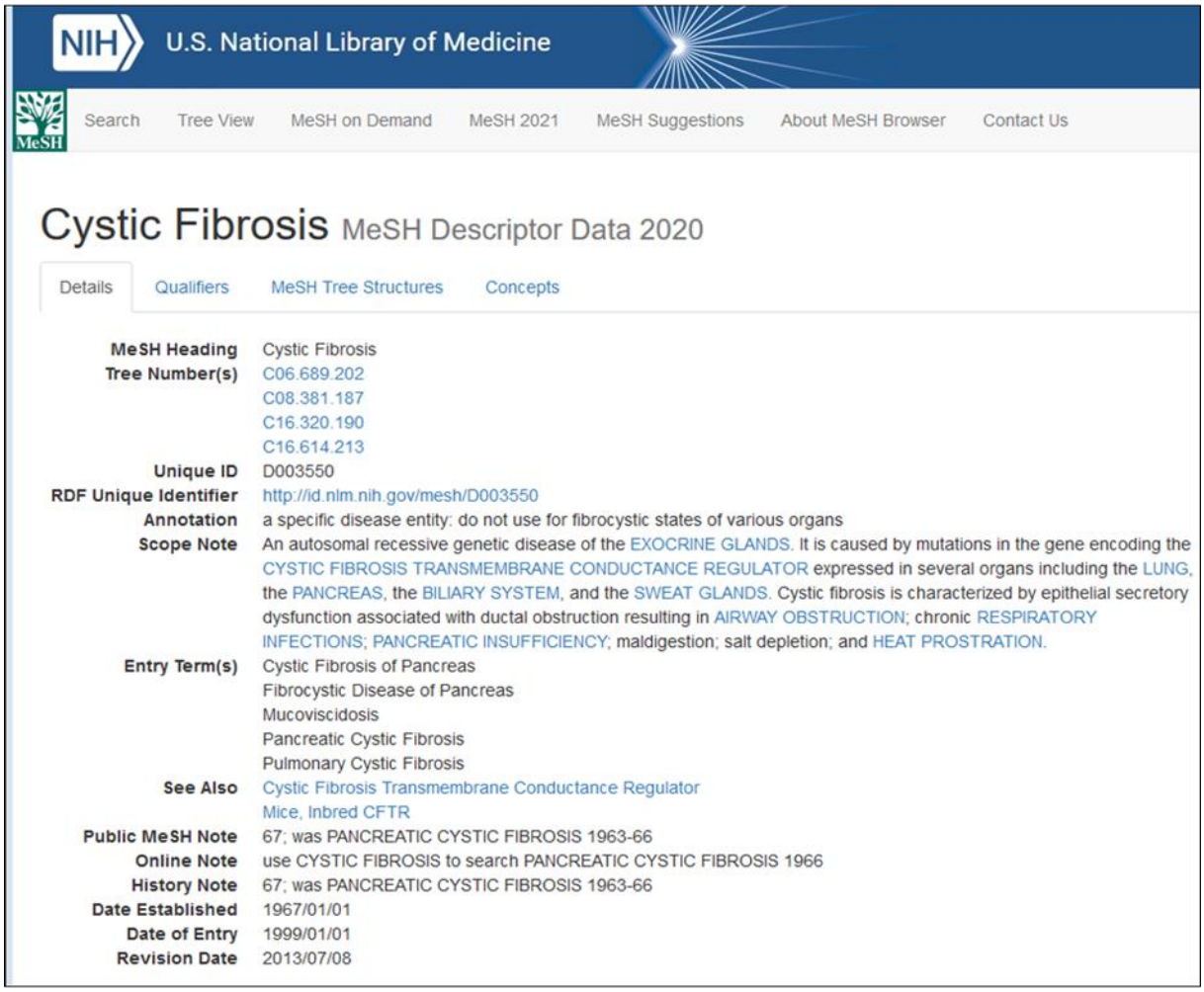


Figure 32. Using the *MeSH* Browser

Task 1. Using the MeSH Browser https://meshb.nlm.nih.gov/treeView

Move along the MeSH tree by opening the descriptors Analytical, Diagnostic and Therapeutic Techniques, and Equipment, Surgical Procedures, Operative, Cardiovascular Surgical Procedures, Cardiac Surgical Procedures until you can see the term Heart Transplantation.

1. Does this descriptor have more specific terms below it? If yes, name them.
2. Open the information page for the term Heart Transplantation. Is surgery among the descriptor's possible qualifiers?
3. Is rehabilitation among the descriptor's possible qualifiers?
4. Check the descriptor's location in the MeSH tree. In how many different locations does the term Heart Transplantation stand in the MeSH structure?

Answers

1. Yes, Heart-Lung Transplantation

2. No
3. Yes
4. 3

Task 2. Creating a Search in the PubMed Database Using a MeSH Term

Go to the PubMed webpage (https://pubmed.ncbi.nlm.nih.gov/) and open the link MeSH Database or go directly to the MeSH search page (https://www.ncbi.nlm.nih.gov/mesh/). Try to find the MeSH term for hip replacement. Insert hip replacement into the search box.

1. Which MeSH descriptor is displayed after clicking on the Search button?
2. Is Hip Prosthesis Implantation among the descriptor's entry terms?
3. In how many different locations does this term stand in the MeSH structure?
4. To narrow the search, select the qualifier 'rehabilitation' and also mark the option Restrict to MeSH Major Topic. Run the search in the PubMed database with these settings. How many results did the PubMed search find?

Answers

1. Arthroplasty, Replacement, Hip
2. Yes
3. 3
4. 848, search run in October 2020

Keywords

An effective search strategy combines subject headings with keyword search. Use of keywords is important because indexing is time-consuming and it can take a few weeks to a few months to index a record (30). So, if we use only subject headings in our search, we will risk missing the most recent records.

In this section, we will discuss what should be kept in mind when selecting keywords and where you can get help in case you have difficulty selecting them.

Principles of selecting keywords

Synonyms

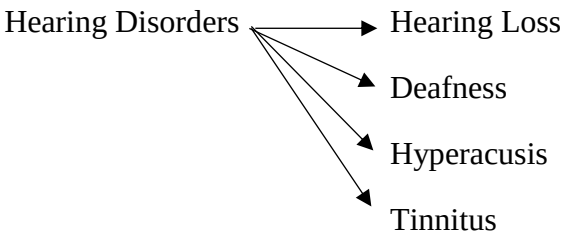
First, it should noted that authors may use different terms to describe the same problem, method of treatment, and the like. In order to find all articles on the topic we are interested in, all important synonyms should be included in the search strategy. For example:

heart attack or myocardial infarct
high blood pressure or hypertension
post natal depression or post partum depression
flu or influenza

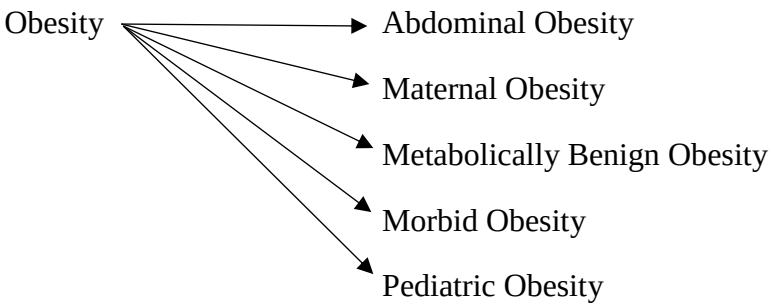
General terms, narrow terms

You should certainly consider whether it makes more sense to use general terms or narrow, more specific terms in your search strategy. For example, different search strategies have been tested for finding answers to questions related to people with disabilities, and specific terms have been found to be more effective in finding articles that did not come up with the general terms used (31). Thus, for your topic, you should consider both options and test which strategy would yield better results.

Example 1: Hearing disorders



Example 2: Obesity



Abbreviations and acronyms

If a medical term has an abbreviation or an acronym, both the abbreviation and the full term should be included in the search strategy. For example:

HIV or human immunodeficiency virus
ACE or inhibitors angiotensin converting enzyme inhibitors
CAP or community acquired pneumonia

Different spelling variants

It should also be borne in mind that a word can have several spelling variants, and the search strategy should include all possibilities. The most common differences between American and British English spelling are:

z/s
randomized or randomised
analyze or analyse

e/ae
pediatrics or paediatrics
leukemia or leukaemia
hemoglobin or haemoglobin

e/eo
estrogen or oestrogen
esophagus or oesophagus
fetus or foetus

o/ou
tumor or tumour
flavor or flavour
behavior or behaviour

one word/two word spelling
percent or per cent

Use of the hyphen

Differences may also arise from the fact whether a term is written with or without a hyphen, in this case too, both options should be included in the strategy. For example:

pregnancy-induced diabetes or pregnancy induced diabetes
rest-cure or rest cure
equine-assisted therapy or equine assisted therapy

Plural forms

Usually, plural is formed by adding letter "s" at the end of a noun. But in this case too, there are differences, sometimes –es or –ies is added to the root of the word. For example:

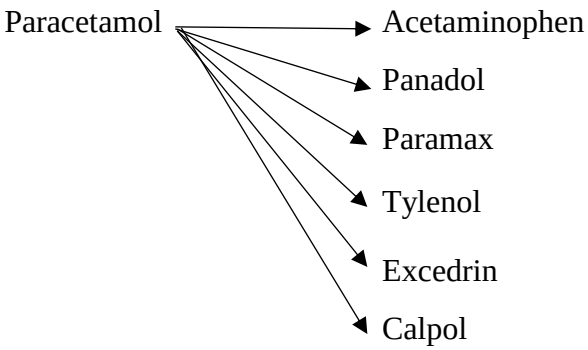
baby babies
injury injuries
allergy allergies
abscess abscesses
sinus sinuses

Irregular plural forms:

criterion criteria
woman women
tooth teeth
analysis analyses
child children

Drugs: active ingredient, brand name

For drugs, it is important to include both the name of the active ingredient and the brand name in the search strategy.



Where can you find keywords?

There are several ways to find important keywords. One way is to perform a search with the first keywords and thereafter to review the search results´ titles and abstracts to find new synonyms. You could also review the keywords suggested by authors. In an article dealing with fatigue, i.e. one of the symptoms of Parkinson's disease, the author suggests the terms “apathy” and “excessive daytime sleepiness” in addition to the term “fatigue” (32).

Review > Psychogeriatrics. 2018 Mar;18(2):143-150. doi: 10.1111/psyg.12302. Epub 2018 Feb 6.

Fatigue in Parkinson's Disease: Concepts and Clinical Approach

Daniel V Nassif [1], João S Pereira [1]

Affiliations + expand

PMID: 29409156 DOI: 10.1111/psyg.12302

Free article

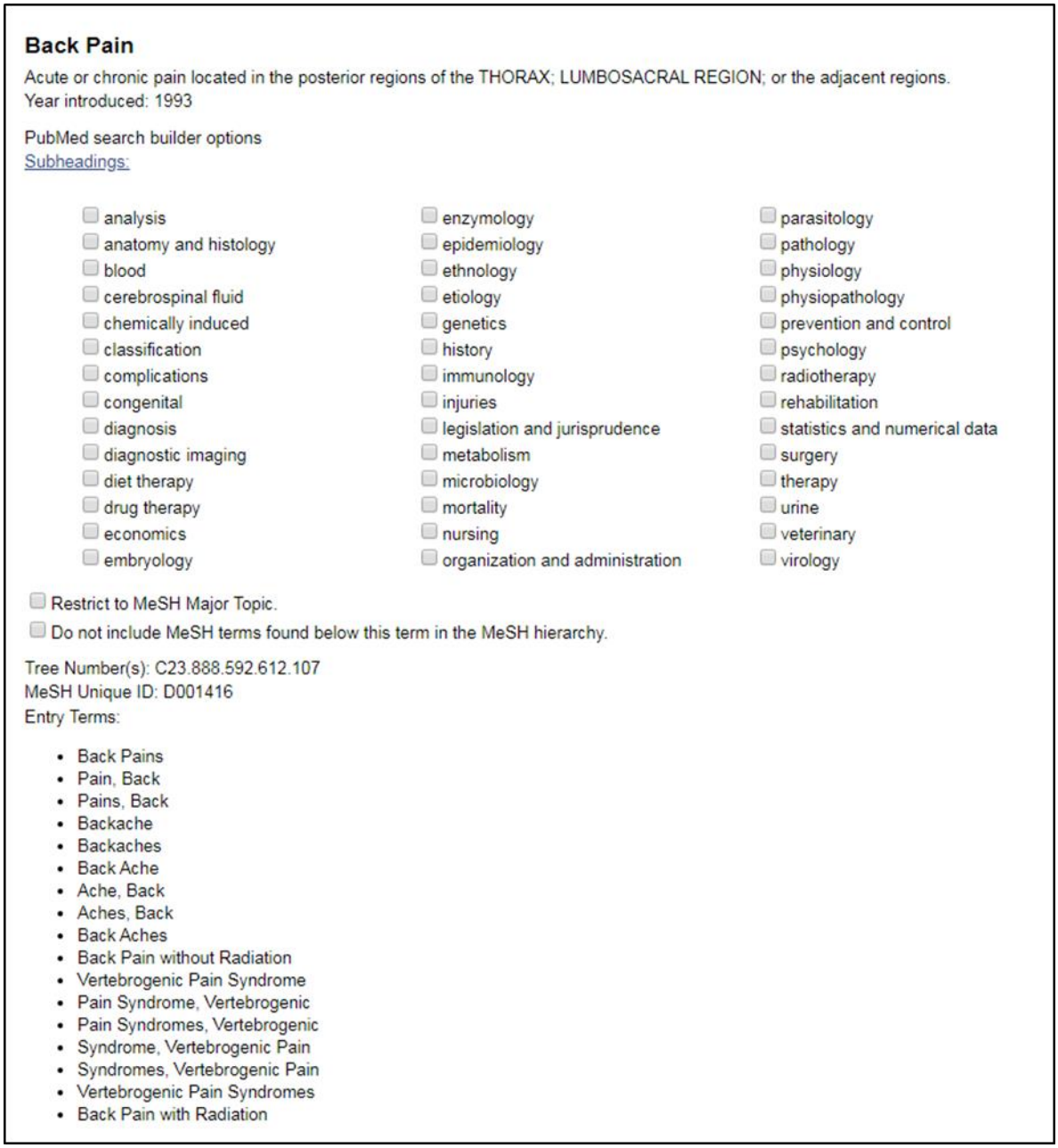
Abstract

Parkinson's disease (PD) is a progressive neurological disorder characterized by a large number of motor and non-motor features. Fatigue is one of the most common and most disabling symptoms among patients with PD, and it has a significant impact on their quality of life. Although fatigue has been recognized for a long time, its pathophysiology remains poorly understood, and there is no evidence to support any therapeutic approach in PD patients. Expert consensus on case definition and diagnostic criteria for PD-related fatigue have been recently published, and although they still need to be adequately validated, they provide a great step forward in the study of fatigue. The goal of this article is to provide relevant information for the identification and management of patients with fatigue.

Keywords: Parkinson's disease; apathy; depression; excessive daytime sleepiness; fatigue.

Figure 33. Author´s keywords

Alternatively, you can use the Mesh database, which provides a list of synonyms for the selected term.



Back Pain

Acute or chronic pain located in the posterior regions of the THORAX; LUMBOSACRAL REGION; or the adjacent regions.
Year introduced: 1993

PubMed search builder options
Subheadings:

analysis	enzymology	parasitology
anatomy and histology	epidemiology	pathology
blood	ethnology	physiology
cerebrospinal fluid	etiology	physiopathology
chemically induced	genetics	prevention and control
classification	history	psychology
complications	immunology	radiotherapy
congenital	injuries	rehabilitation
diagnosis	legislation and jurisprudence	statistics and numerical data
diagnostic imaging	metabolism	surgery
diet therapy	microbiology	therapy
drug therapy	mortality	urine
economics	nursing	veterinary
embryology	organization and administration	virology

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

Tree Number(s): C23.888.592.612.107
MeSH Unique ID: D001416
Entry Terms:

- Back Pains
- Pain, Back
- Pains, Back
- Backache
- Backaches
- Back Ache
- Ache, Back
- Aches, Back
- Back Aches
- Back Pain without Radiation
- Vertebrogenic Pain Syndrome
- Pain Syndrome, Vertebrogenic
- Pain Syndromes, Vertebrogenic
- Syndrome, Vertebrogenic Pain
- Syndromes, Vertebrogenic Pain
- Vertebrogenic Pain Syndromes
- Back Pain with Radiation

Figure 34. Synonyms for the *MeSH* term Back pain (*PubMed*)

Third, various medical dictionaries can be used.

A fourth option is use of existing search strategies, such as systematic reviews and treatment guidelines. For example, a systematic review on the impact of lifestyles on ovarian and breast cancer in women with the BRCA1 / 2 gene mutation was published in 2020 (33).

Ovid MEDLINE(R) ALL (Ovid MEDLINE and In-Process & Other Non-Indexed Citations, 1946 to Present). Searched on October 3, 2019.

1. BRCA1 Protein/
2. BRCA2 Protein/
3. Genes, BRCA1/
4. Genes, BRCA2/
5. (BRCA* or "breast cancer type 1" or "breast cancer type 2" or "breast Cancer 1" or "breast cancer 2").ti,ab,kf.
6. or/1-5
7. exp Breast Neoplasms/
8. (breast adj4 (adenoma* or cancer* or carcinoma* or metasta* or neoplas* or sarcoma* or tumo?r)).ti,ab,kf.
9. exp Ovarian Neoplasms/
10. ((ovarian or ovary or ovaries) adj4 (cancer* or carcinoma* or metasta* or neoplasm* or sarcoma* or tumor* or tumour*)).ti,ab,kf.
11. or/7-10
12. 6 AND 11
13. exp Energy Metabolism/
14. ("energy balance" or "energy imbalance" or "energy expenditure" or "energy intake" or metabolic or metabolism)
15. exp Exercise/
16. exp Exercise Therapy/
17. exp Physical Endurance/
18. Physical Exertion/
19. exp Physical Fitness/
20. Sedentary Lifestyle/
21. exp Sports/
22. Walking/
23. (aerobic* or endurance or exercis* or fitness* or "physical activit*" or "physical exertion" or sedentary or inactiv* or walking).ti,ab,kf.
24. Health Behavior/
25. Healthy Lifestyle/
26. exp Life Style/
27. ("health behavior*" or "health risk behavior*" or lifestyle* or "life style*").ti,ab,kf.
28. exp "Diet, food, and nutrition"/
29. exp "Energy Intake"/
30. Feeding Behavior/
31. Food Preferences/
32. exp "Healthy Diet"/

Figure 35. Example of a search strategy for a systematic review

Video

Identifying synonyms and MeSH terms in PubMed

https://www.youtube.com/watch?v=xR_pWVoVM-M

Task 1. Group Work. Finding Synonyms

Find synonyms for the term manual therapy

Possible answers:

manipulation therapy, manipulation therapies
manipulative therapy, manipulative therapies
reflexology
bodywork, bodyworks
rolfing
craniosacral massage
manual therapy, manual therapies
zone therapy, zone therapies
massage therapy, massage therapies

Task 2. Group work. Finding synonyms

Find synonyms for the term cough remedy

Possible answers:

cough drug, cough drugs
cough suppressants, cough suppressants
cough medication, cough medications
antitussive, antitussives
antitussive agent, antitussive agents
antitussive drug, antitussive drugs
cough syrup, cough syrups
cough mixture, cough mixtures
cough drop, cough drops
generic names: rextromethorphan, acetylcysteine, bromhexine
brand names: Mucovit, Brontex, Flavamed

Building up a Search Strategy

After selecting all search terms, you can start thinking about building up a search strategy. Databases offer several tools for searching and for combining search terms. Bear in mind that the way these tools work will be different according to the database or the interface used to access a database. Therefore, you should consult the help menu or the user manual of the databases before searching.

Boolean operators

Boolean operators are words that are used to combine individual search terms. There are three Boolean operators: AND, OR and NOT.

OR can be used to combine synonyms within search concepts, which makes your search broader. It will find any record that contains one or more or all of the terms that you have selected.

otitis OR ear infection OR ear inflammation retrieves the records that have at least one of these terms.

AND is used to join all individual concepts in order that each record will have at least one term from every concept. Use of AND narrows the search down by excluding the records that do not contain all required concepts.

otitis AND children retrieves records that contain both terms.

NOT is used to exclude one of the terms from the search strategy. It can make our results more precise, but you need to be careful when using it, because NOT excludes also records that have both our terms in it, so you are at a risk of losing important records.

children NOT infants retrieves the records that contain the word "children", but does not retrieve records containing the word "infants"

Nesting

When you want to combine terms within a concept and thereafter different concepts with each other you can also use a nesting approach. Nesting uses parentheses and Boolean operators. The logic is the same as in mathematics, the database will first search for the terms in parentheses and then will perform another search.

(pneumonia OR lung inflammation OR pneumonitis) AND hospital stay

In our example, the database searches first for records that contain at least one of the synonyms for pneumonia and thereafter searches for records that mention also hospital stay.

Truncation

Most databases allow to use truncation, which means that you can include a term with different endings. The root of the word must be typed into the search box after which the symbol for truncation, usually the asterisk, should be added to the root. The database will search for all possible endings. It is important not to render the root of the word too short, as in this case the terms that are not relevant for your search may be not retrieved.

Child* retrieves	child
	children
	childhood
	childbirth
	childless
	childproof
	etc.

In OVID Medline you can add a number to the asterisk, denoting the maximum number of letters that the database can add to the root of the word.

Child*3 retrieves	child
	children

Wildcards

Wildcards can be used in searches for terms with different spelling variants or for irregular plurals. As symbols for wildcards are different in various databases, you should make sure that you use a correct symbol when employing a wildcard in your search.

Optional wildcard allows a character to be present or absent. It is useful for searching for US and UK spelling variations. The OVID platform uses the question mark to represent an optional wildcard.

tumo?r retrieves both tumor and tumour
p?ediatric retrieves both pediatric and paediatric

Compulsory wildcard means that a character must be present, but it can vary. It is helpful for both US and UK spelling and can also be used for irregular plurals. The OVID platform uses the hash symbol to represent a compulsory wildcard.

randomi#ed retrieves both randomized and randomised
wom#n retrieves both woman and women

Search phrases

Some databases allow to search for phrases, and for this you need to use quotation marks. In this way it is possible to make your searches more precise. When we search for the term "bed rest" without quotation marks, the database will add the Boolean operator AND in between these words. Then your search retrieves the records that mention both words, but these words may not be connected with each other. With quotation marks your search will retrieve the records that contain the exact phrase "bed rest" in it. In case the exact phrase is not found, the database will ignore the quotation marks and will add AND in between the words.

Proximity operators

Proximity operators determine how close the selected terms must be located in the records retrieved by databases. This helps make searches more precise. You must check the database´s help menu for he correct way to use them.

In OVID Medline you can use ADJn, where n-1 represents the maximum allowed number of words between your two search terms in any order.

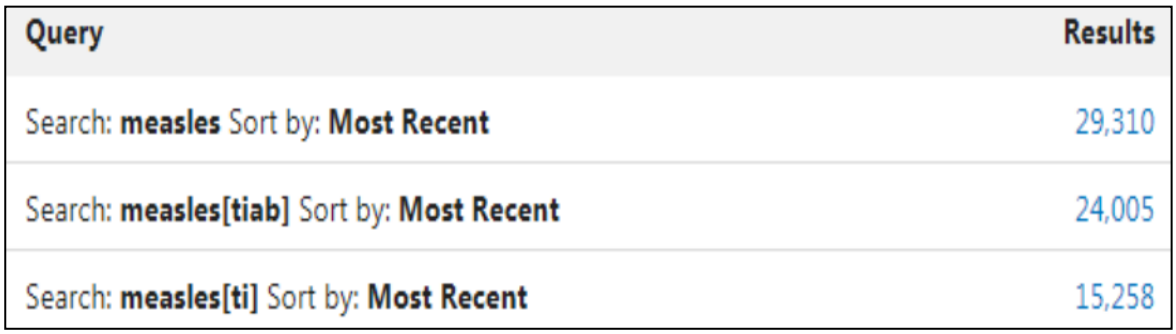
speech ADJ3 therapy will retrieve records with a maximum of 2 words between these terms in any order. It may be "speech therapy" or "therapy of speech" or "speech and language therapy".

When you do not add a number to the proximity operator then OVID Medline will search for the two words in this particular order.

blood ADJ pressure will only retrieve "blood pressure"

Search fields

You can increase the precision of your search by using search fields. Which field to choose may depend on your topic. When you have a narrow question or when you are interested in a rare disease then you could use a wider search field, for example, the text word. If you have a more general subject or a widely published topic so that the search would retrieve too many results, or if you find results that are not relevant, it might be reasonable to perform the search from narrower fields. All search fields with explanations and field codes can be found in the databases´ help menus.



Query	Results
Search: **measles** Sort by: **Most Recent**	29,310
Search: **measles[tiab]** Sort by: **Most Recent**	24,005
Search: **measles[ti]** Sort by: **Most Recent**	15,258

Figure 36. Model searches in *Pubmed*.

Measles without any search field retrieved 29 310 records. When the title and/or abstract field [tiab] was used, 24 005 records were retrieved. An even narrower search, using only the title field [ti], retrieved only 15 258 results.

Limits

Databases also provide several limits and filtering options, but you need to be careful when using these, because you may miss relevant records. If you decide to use any of them, you must be able to justify your decision. What are the most common limits?

Language. It may be tempting to use the English language as the only restriction, but if you limit your search to English records only, your results may be biased. The problem is that trials with positive results are more likely to be published in English-language journals and trials with negative results are largely published in national journals. But this does not mean that the latter studies are of lower quality. Most articles have an English abstract anyway, and you can obtain necessary information from that abstract and then you can decide whether or not to include the article in your research.

Publication date is also often used. But again, you may lose important articles. You may use date restriction when there is a definite time period within which relevant studies might be found.

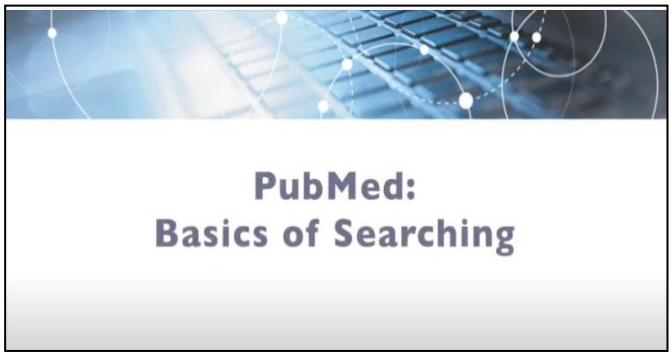
Publication format. While it is acceptable in some cases to limit your search to study designs that are high in the evidence pyramid (like meta-analysis, systematic reviews, randomized controlled trials), you must remember that important information (such as errors or possible fraudulent data) may be published first in letters and commentaries.

Age groups and sex. If you are interested in a specific age group or if it is important to distinguish between men and women, then it is advisable to include this in your PICO question and not to use the limit.

Use of limits must be well considered in order to avoid missing relevant papers, which will affect also the quality of your research.

Videos

Boolean operators, nesting, truncation and phrase search in PubMed



https://www.youtube.com/watch?v=qBV9HsPKXi0

Filters and search field tags in PubMed

https://www.youtube.com/watch?v=E101qvK8ZJY

Example. Keyword Search in PubMed (*https://pubmed.ncbi.nlm.nih.gov/*)

Search for patient information leaflets about infants with ear inflammation.

Proceeding from the question, we have two groups of search terms - ear inflammation and infants. To save time while searching, you can draw up lists of search terms in advance.

Let us start the search with the term “ear inflammation”. We enter the first search term “ear inflammation” in the search box and use truncation to find its plural form as well.

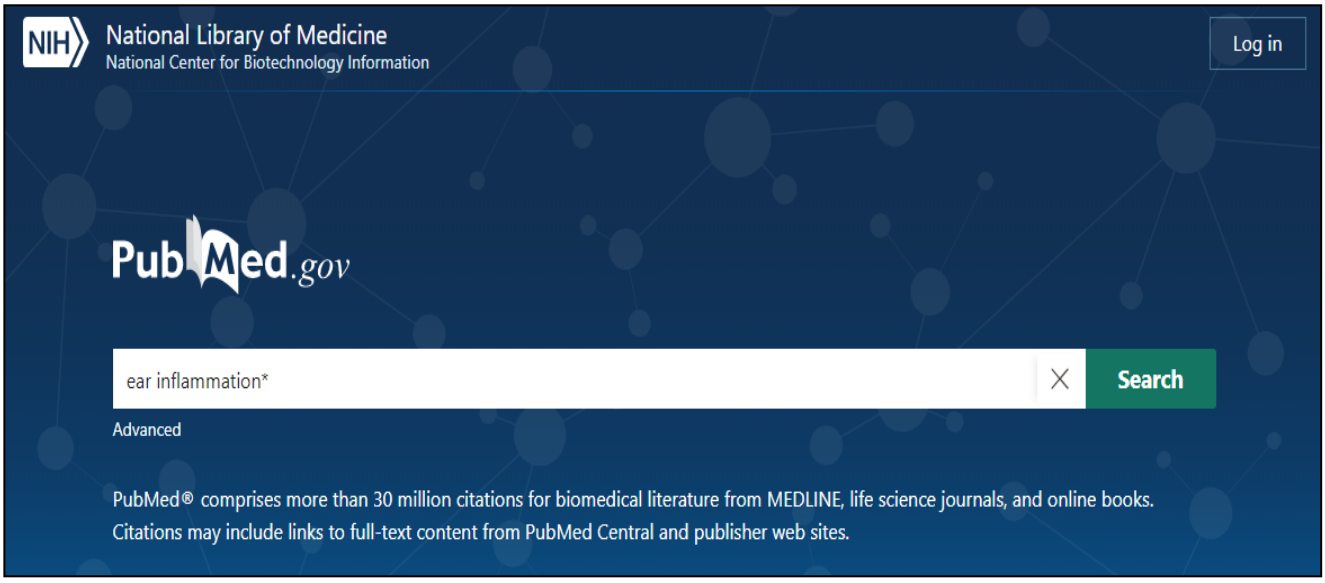


Figure 37. Keyword search in *PubMed*

We get the results of our first search and enter the synonym “ear infection” in the search box and use again truncation.

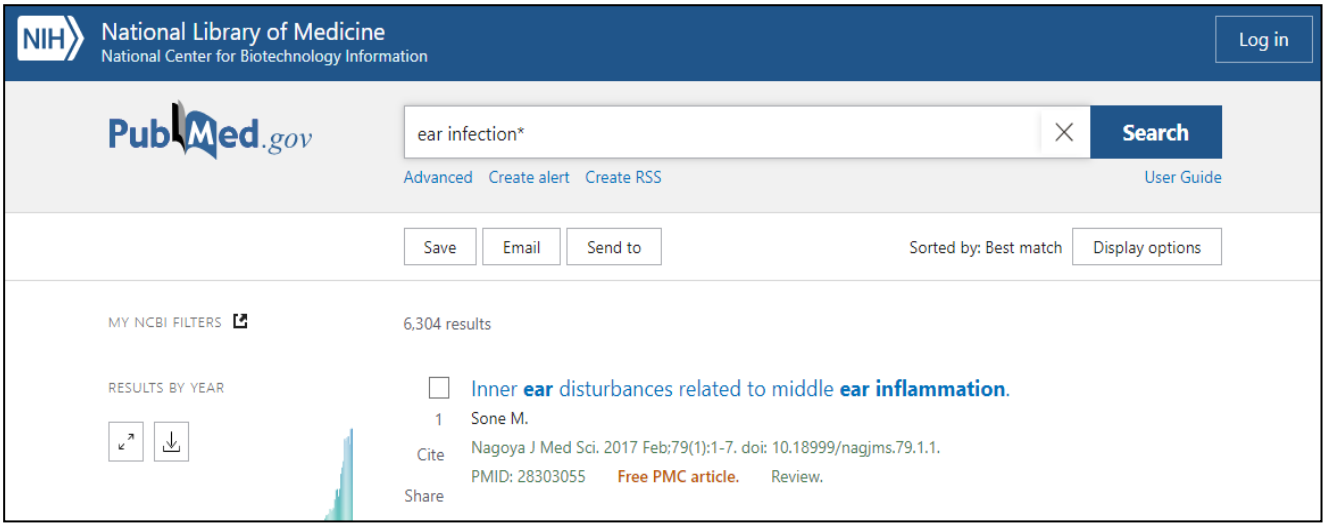


Figure 38. Keyword search in *PubMed*

We can also use the terms “otitis” and “otitides” and employ truncation to search for both terms at the same time.

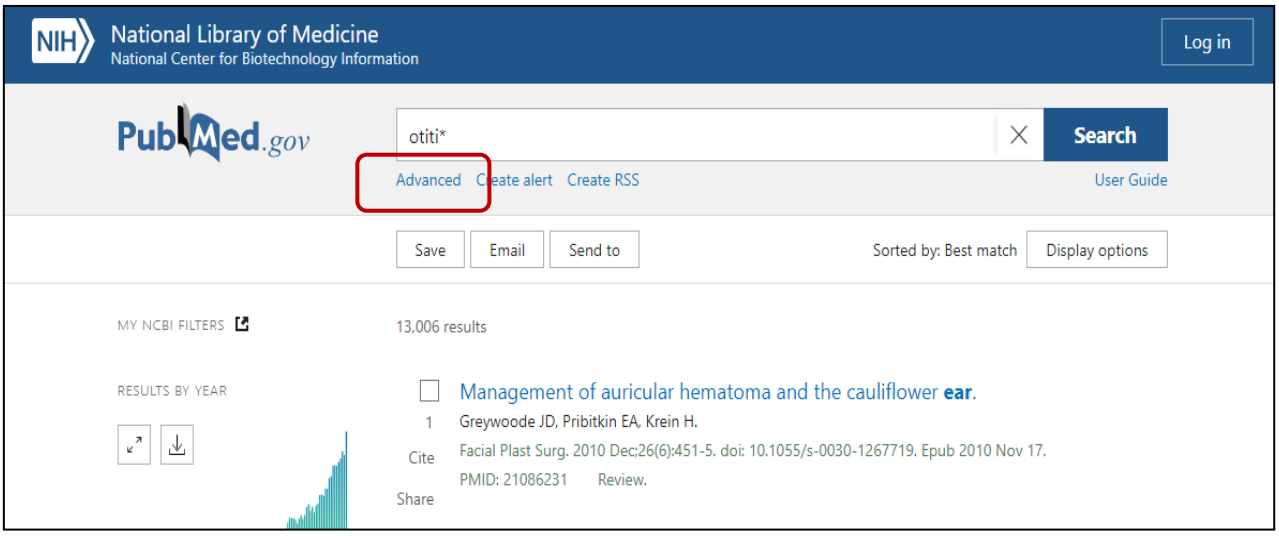


Figure 39. Keyword search in *PubMed*

Now we have searched for the terms related to ear inflammation and we need to combine them. For this, we need to pass on to search history, in PubMed you can find it under the Advanced link.

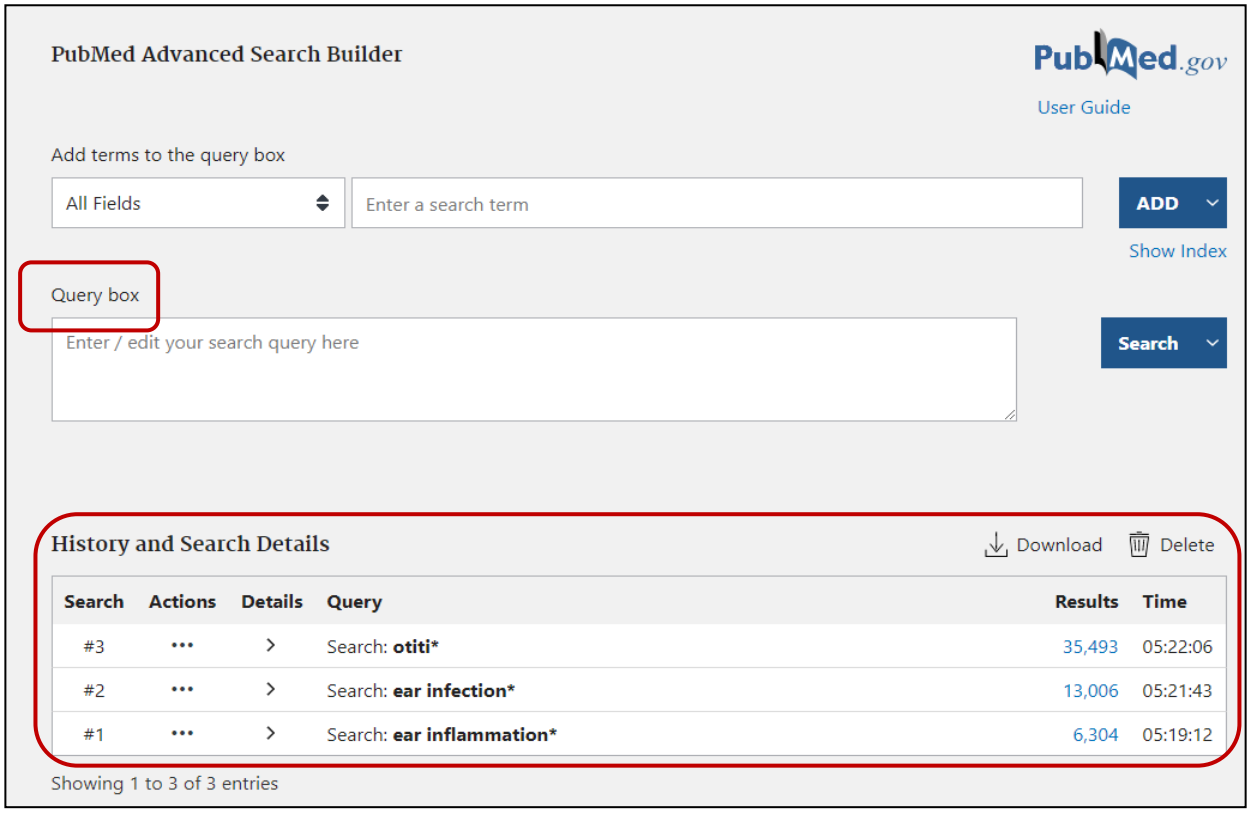


Figure 40. Keyword search in *PubMed*

The next step is to combine synonyms. To do this, move the terms to the Query box and right-click on the dots in the Actions column in front of the term and select Add query from the drop-down menu.

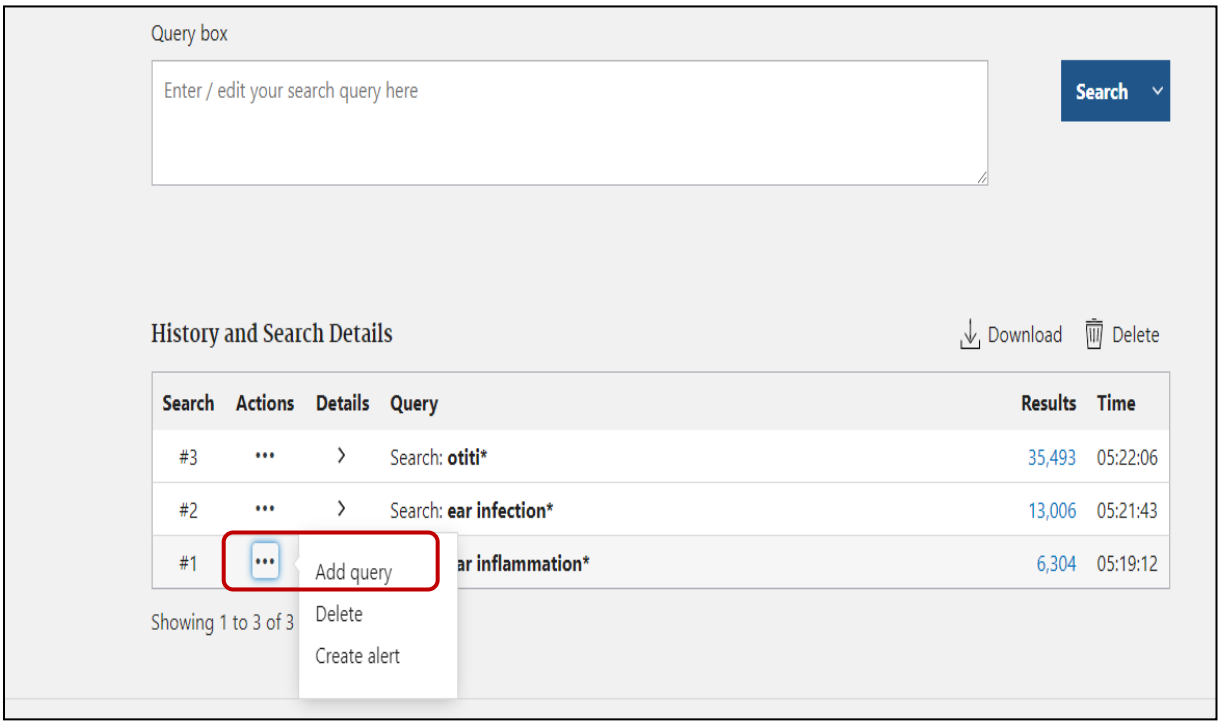


Figure 41. Keyword search in *PubMed*

When we start choosing the next term, we also have to choose the appropriate Boolean operator. The OR operator must be used to combine synonyms.

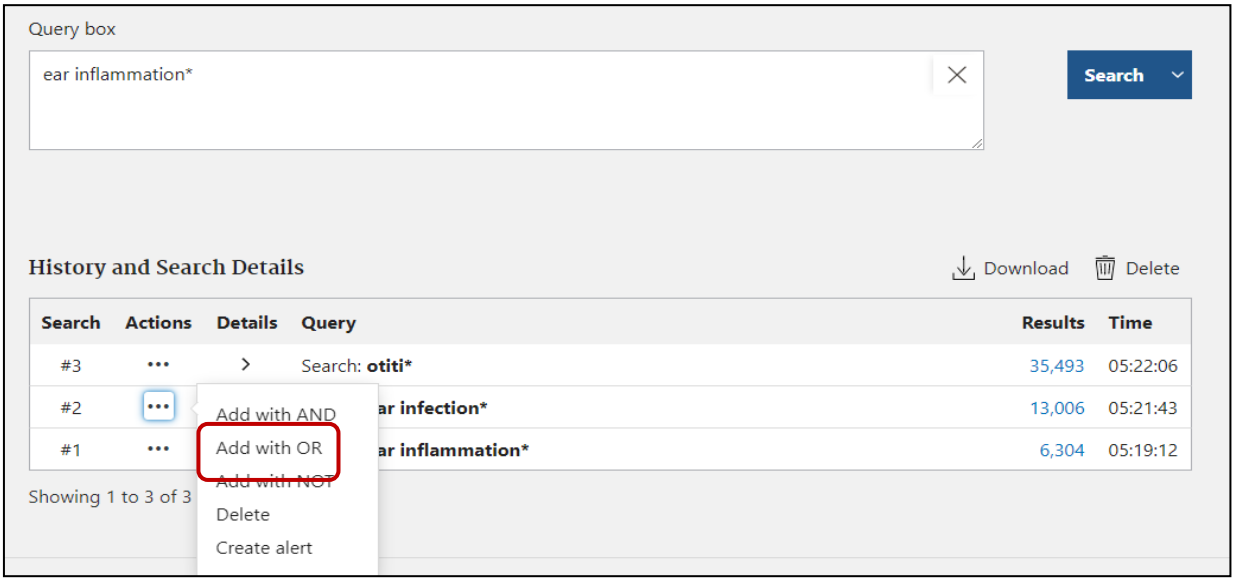


Figure 42. Keyword search in *PubMed*

When all terms are in the Query box, you must click on Search.

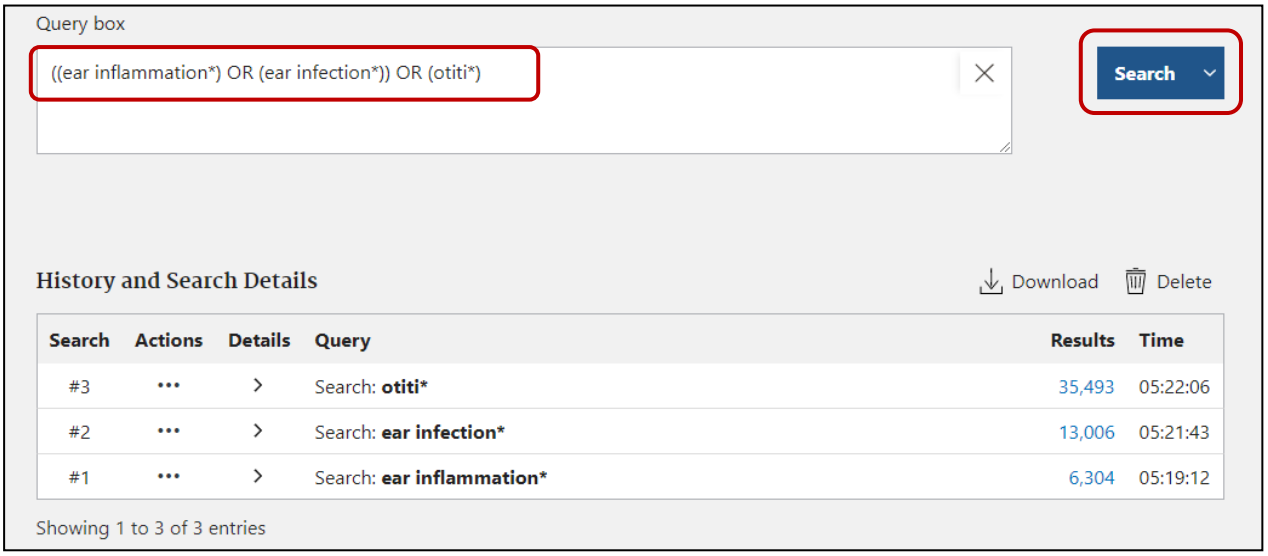


Figure 43. Keyword search in *PubMed*

And we get the results related to our first group of terms. We can start searching for the other term – "infants".

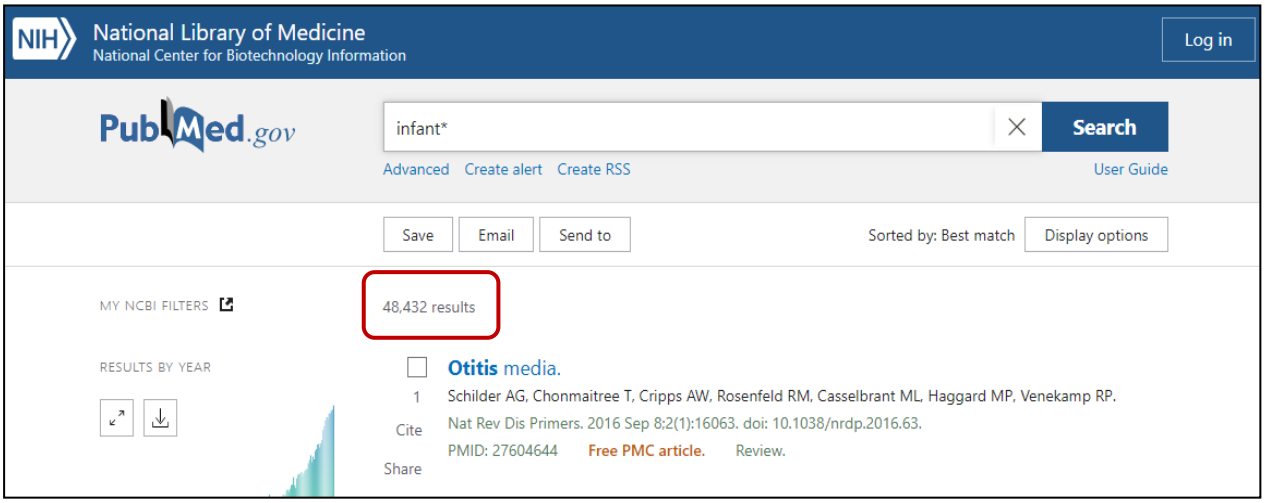


Figure 44. Keyword search in *PubMed*

As a synonym for the word "infant", we can also use the term "baby". PubMed requires that the word stem be at least four characters long, so truncation cannot be used here, we have to search separately for the singular and plural forms.

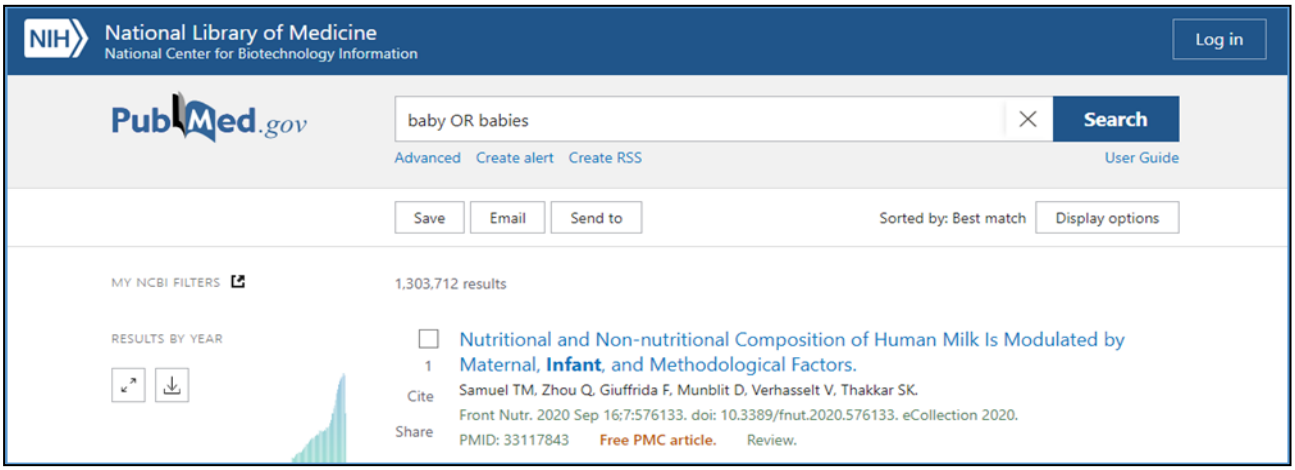


Figure 45. Keyword search in *PubMed*

To combine the synonyms, click again on the link Advanced.

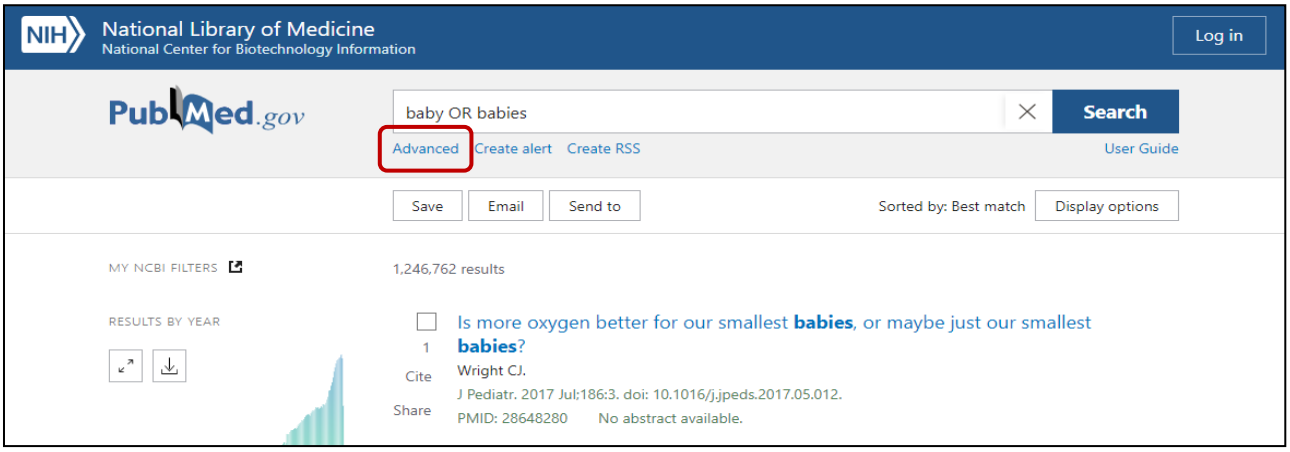


Figure 46. Keyword search in *PubMed*

Now you need to move the keywords in the query box by right-clicking on the dots in front of the term and clicking on the word Search to perform the search.

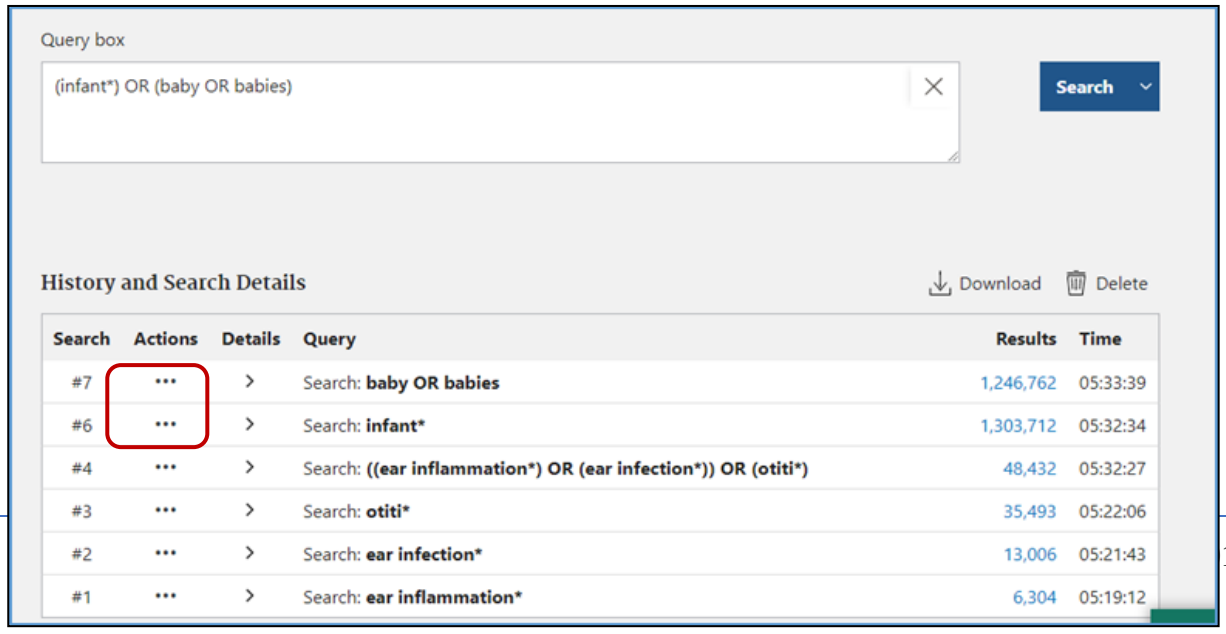


Figure 47. Keyword search in *PubMed*

We get the results of the second group of terms; the last step of the search is to combine these two groups of terms. To do this, we go back to our search history by clicking the Advanced link.

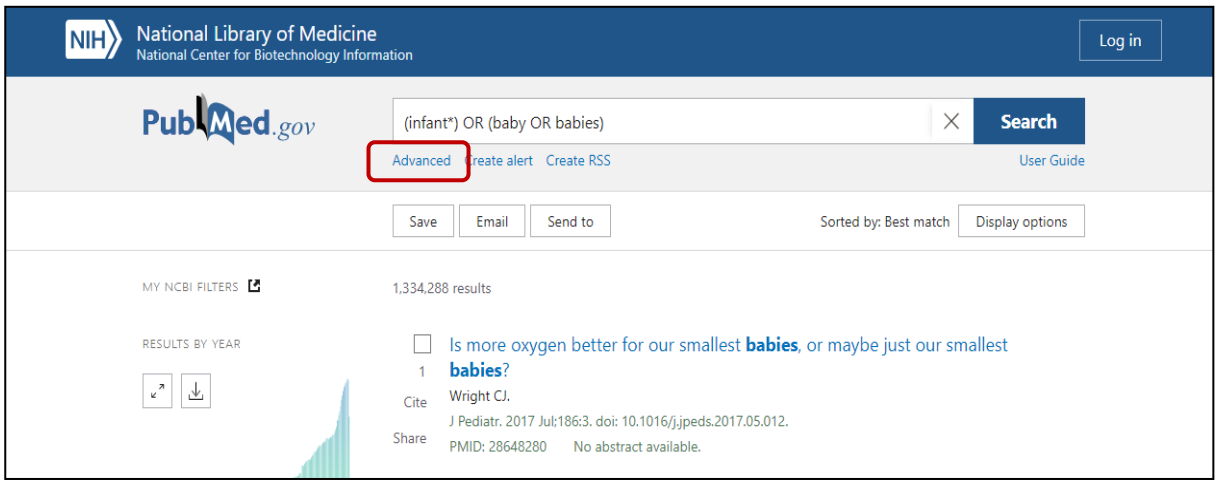


Figure 48. Keyword search in *PubMed*

Be sure to use the Boolean operator AND to combine the groups of terms.

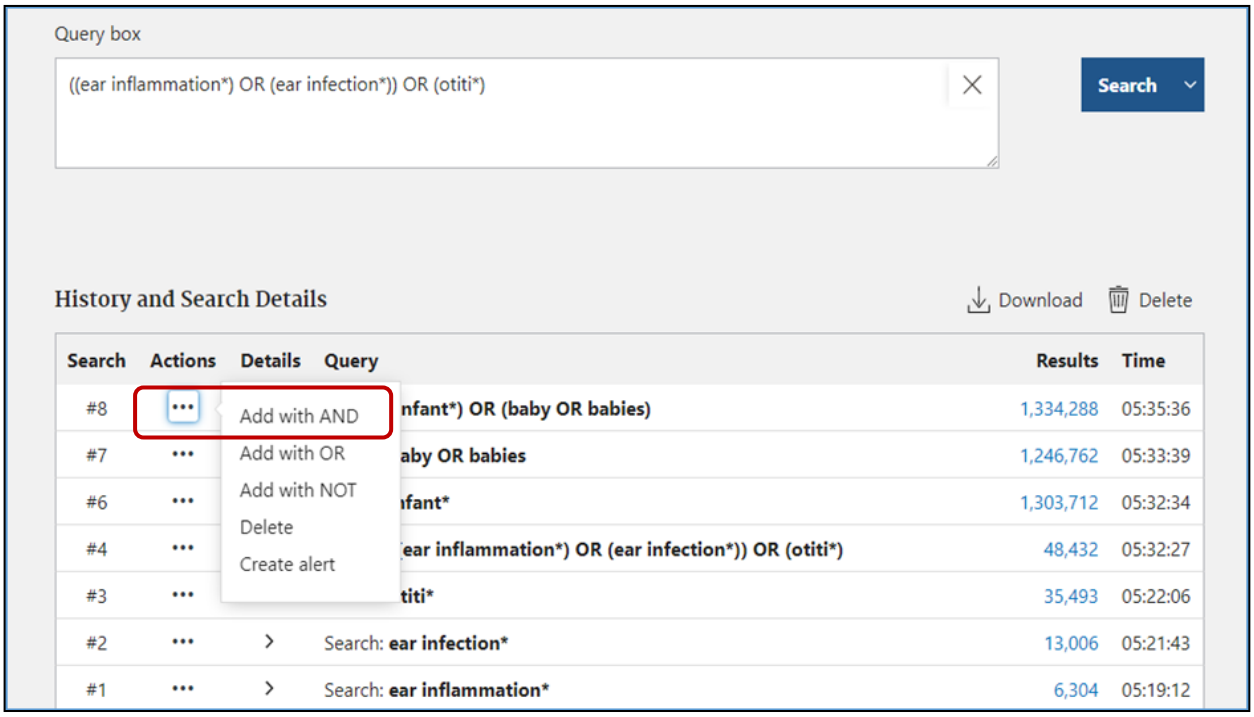


Figure 49. Keyword search in *PubMed*

And we get results of our combined search.

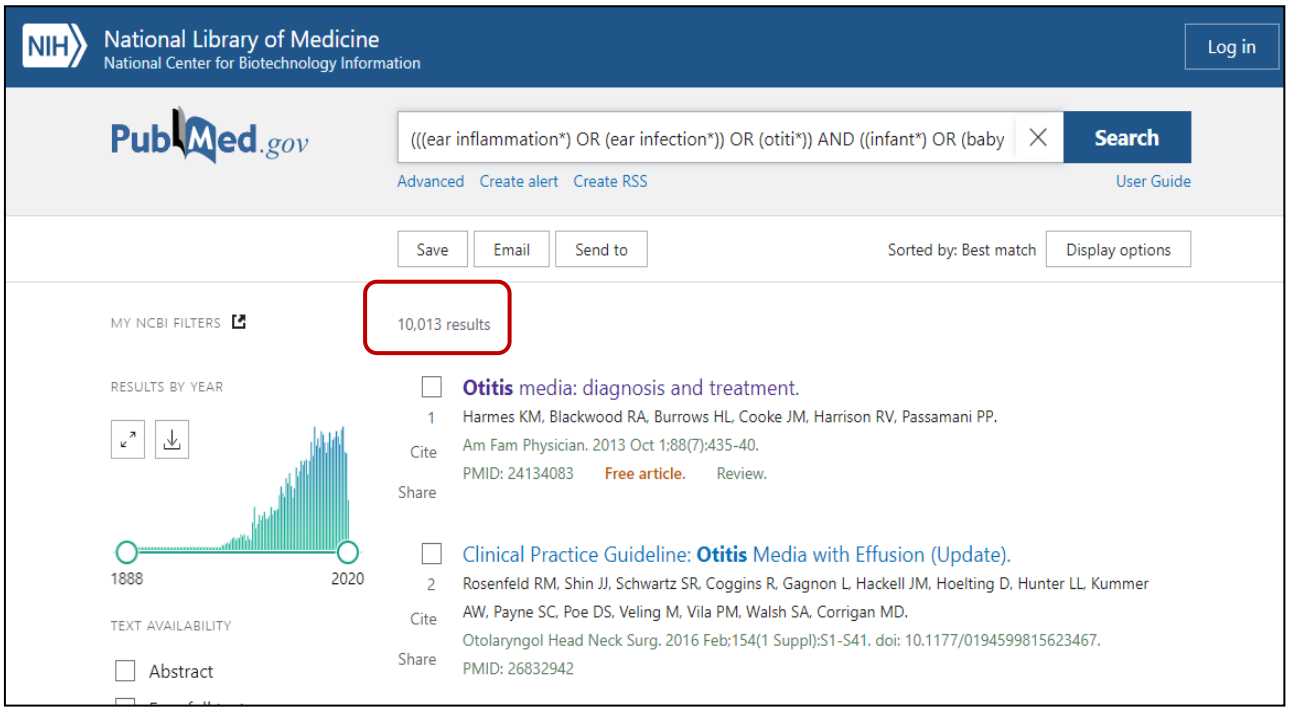
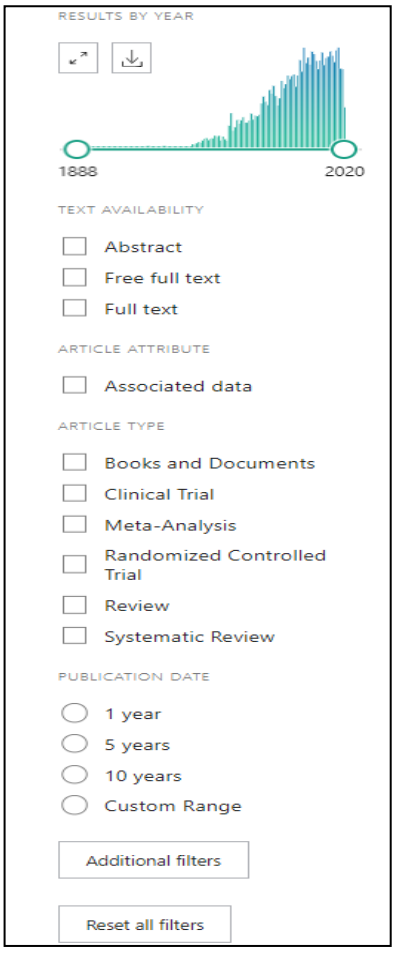


Figure 50. Keyword search in *PubMed*

Now we need to filter out the patient information leaflets.



You can find limits in the left-hand column. You can select a time limit by moving the mouse on the timeline.

You can choose a full-text limit, but be careful. The full text may not be available in PubMed, but it might be available in some other database. If you select this limit, the entry will be deleted from the list of the results and you do not know how to search for it elsewhere.

You can select records that include also trial data.

It is possible to sort the results by different article types.

It is also possible to select a time limit for a specific period of time, if you do not want to drag the mouse.

Under **Additional filters** you can find other limits that are not displayed by default, such as language, age group, and gender limits.

We are currently interested in the article type limit. The patient information leaflet is not currently displayed. To apply this limit, you must first click on the button Additional filters.

Figure 51. Keyword search in *PubMed*

We can see a list of all types of publications. We look up the patient information leaflet here, tick the box, and then click on Show.

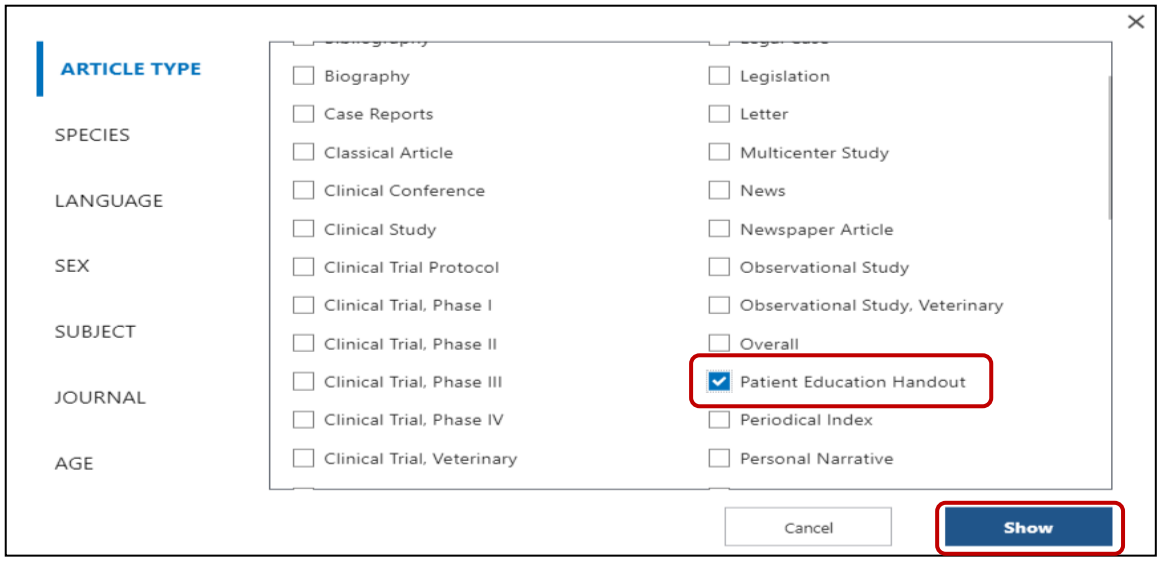


Figure 52. Keyword search in *PubMed*

We can see that the limit that we selected is now visible in the limits column, and we must click on the limit to apply it. And now only two patient handouts have remained in our huge list of the results.

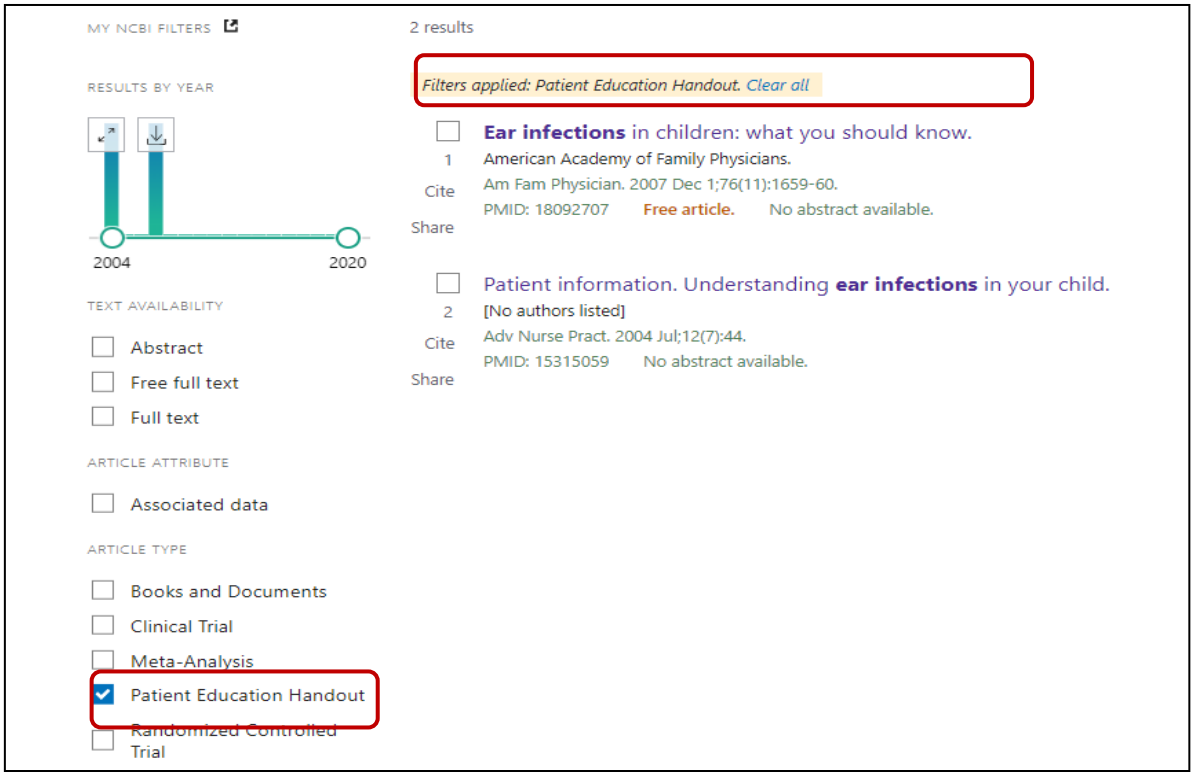


Figure 53. Keyword search in *PubMed*

By clicking on the title, we will see a more detailed record with a link to the full text.

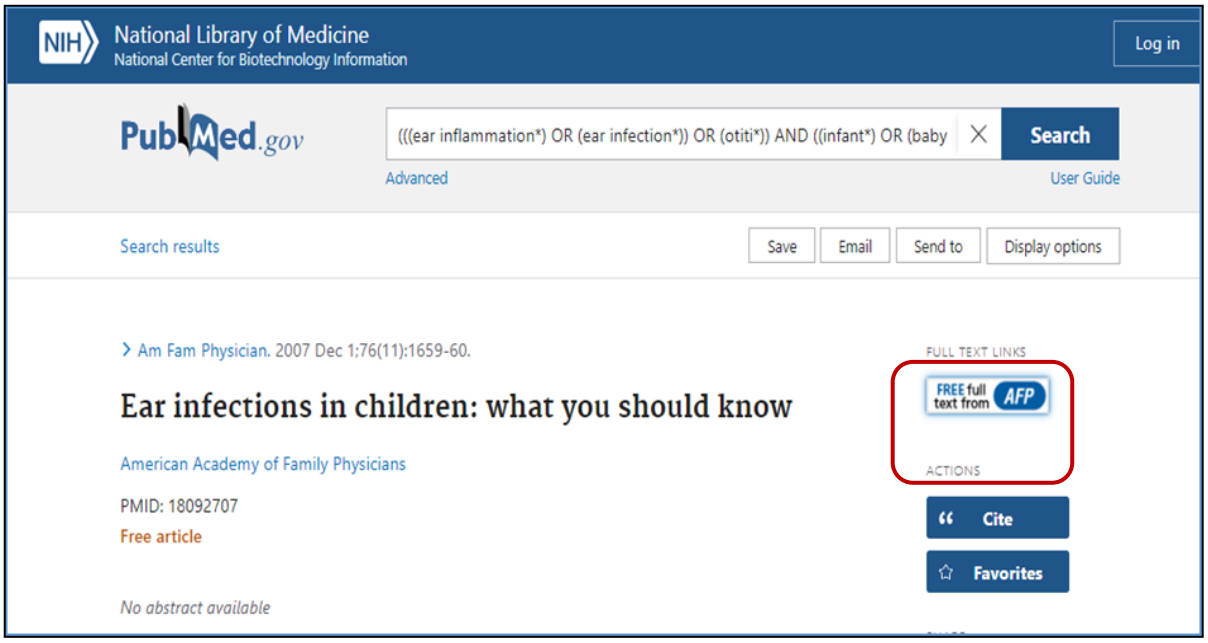


Figure 54. Keyword search in *PubMed*

And since this is a free-access handout, we can also read the full text.

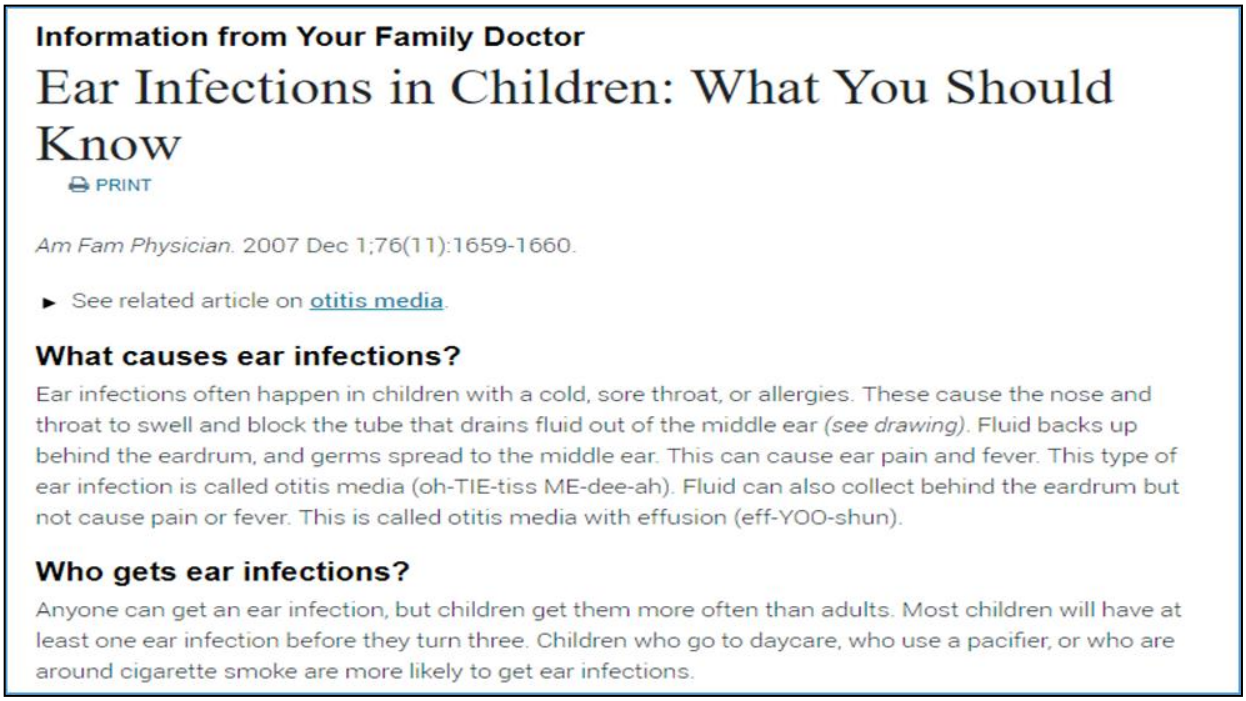


Figure 55. Keyword search in *PubMed*

If we want to send the list of results to an e-mail or save it as a file, we will find these options in the search results.

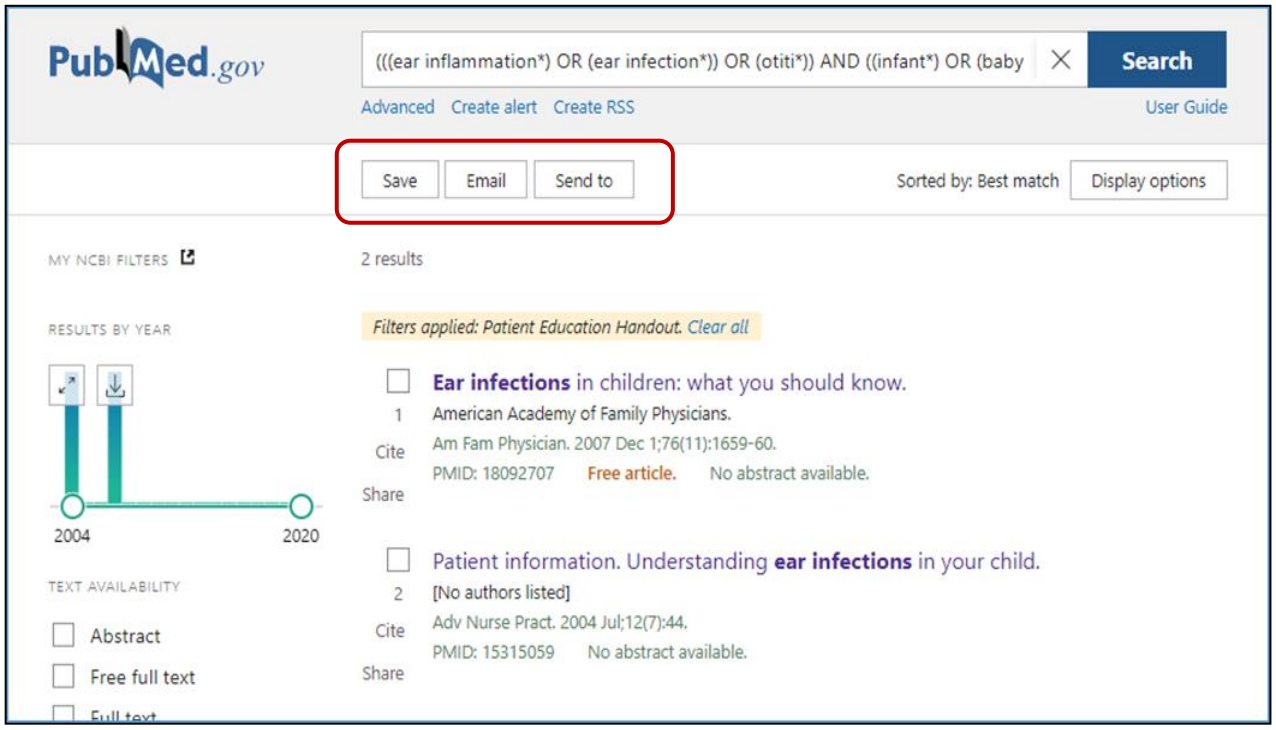
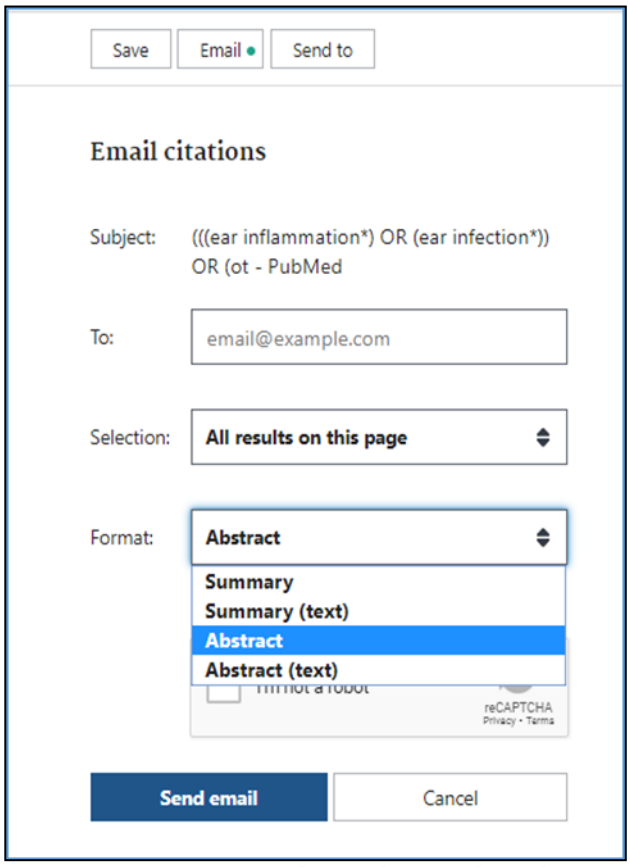


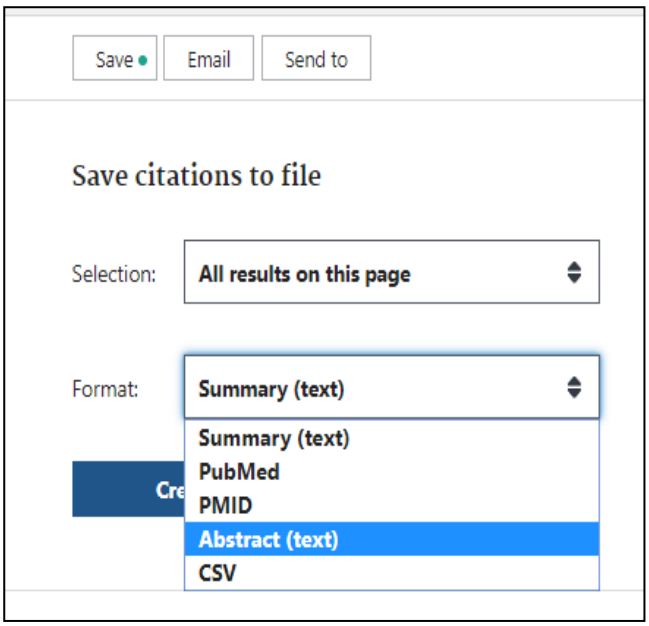
Figure 56. Keyword search in *PubMed*

If you send results to an e-mail, then the search strategy will be incorporated. But only the final strategy. It means that if you want to see all searches that you have made and how many results different synonyms have produced, you need to save the whole search history separately.

You can choose which results you want to send, and from under the format you can choose either only a short record or a record with an abstract. It would be better to choose the option Abstract, because sometimes titles do not provide much information about the content of the article.



FFigure 57. Keyword search in *PubMed*



When saving to a file, the search strategy cannot be saved with the results, so it should be saved separately and added to the results.

Here, too, it is good to choose the format Abstract.

Figure 58. Keyword search in *PubMed*

To download the full search strategy, click on the button Download above search history.

History and Search Details

Download Delete

Search	Actions	Details	Query	Results	Time
#10	•••	›	Search: **(((ear inflammation*) OR (ear infection*)) OR (otiti*)) AND ((infant*) OR (baby OR babies))** Filters: **Patient Education Handout**	2	06:14:38
#9	•••	›	Search: **(((ear inflammation*) OR (ear infection*)) OR (otiti*)) AND ((infant*) OR (baby OR babies))**	10,013	05:38:02
#8	•••	›	Search: **(infant*) OR (baby OR babies)**	1,334,288	05:35:36
#7	•••	›	Search: **baby OR babies**	1,246,762	05:33:39
#6	•••	›	Search: **infant***	1,303,712	05:32:34
#4	•••	›	Search: **((ear inflammation*) OR (ear infection*)) OR (otiti*)**	48,432	05:32:27
#3	•••	›	Search: **otiti***	35,493	05:22:06
#2	•••	›	Search: **ear infection***	13,006	05:21:43
#1	•••	›	Search: **ear inflammation***	6,304	05:19:12

Figure 59. Keyword search in *PubMed*

Example. Multiple Field Search in Pubmed (*https://pubmed.ncbi.nlm.nih.gov/*)

Search for articles on genome sequencing that are written by scientists of the University of Tartu, from 2010.

For multiple field search we must go to the page Advanced.

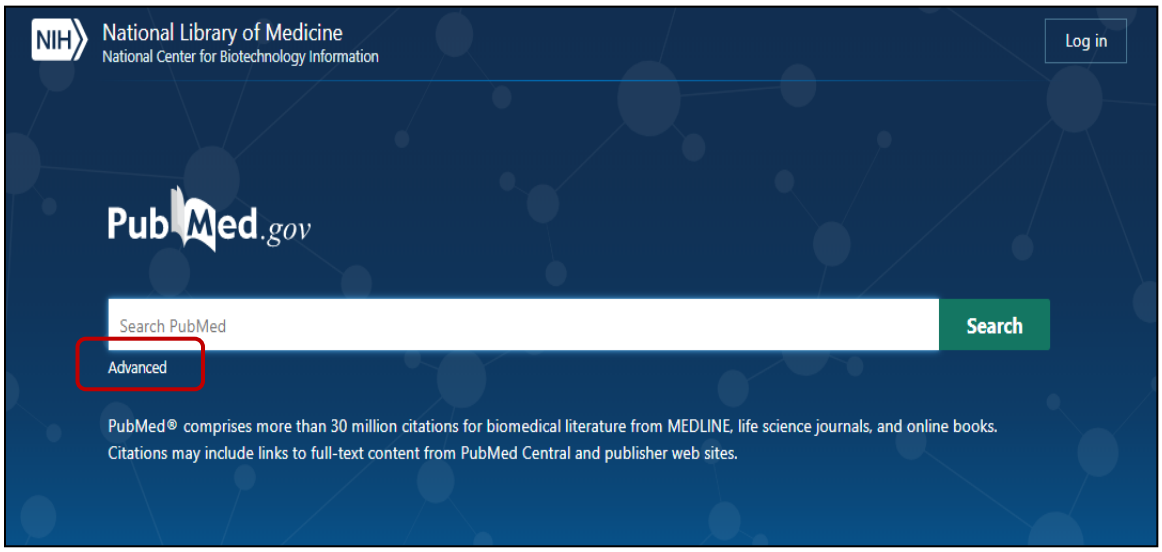


Figure 60. Multiple field search in *PubMed*

From top of University of Tartu we can select search fields and enter search terms. Choose first Affiliation and enter it in the search box. And click on the Add button to move the query down to the Query box.

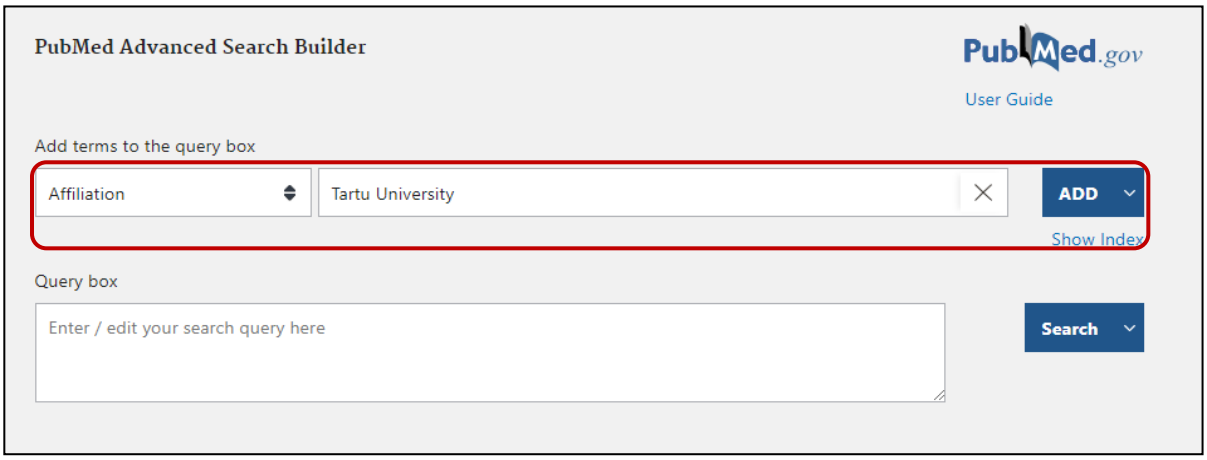


Figure 61. Multiple field search in *PubMed*

Then select the next search field Text Word, which means that the search term will be searched in all fields of the entry that contain the text (title, summary of content, author's keywords, etc.) and enter the term. To add to the query box, select the operator AND.

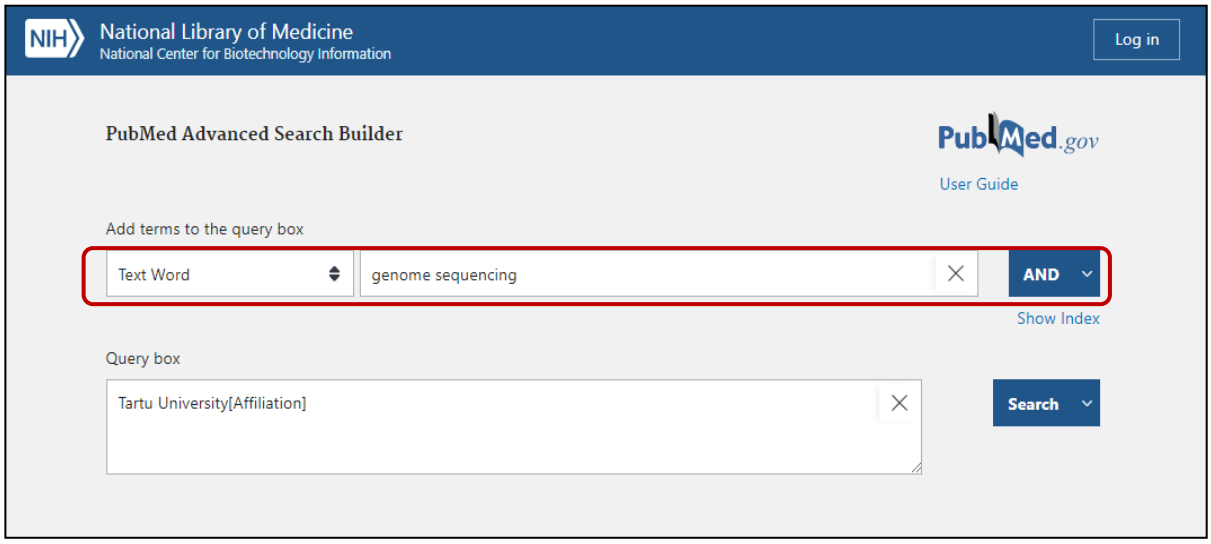


Figure 62. Multiple field search in *PubMed*

Then choose the date of publication. The correct Boolean operator is AND.

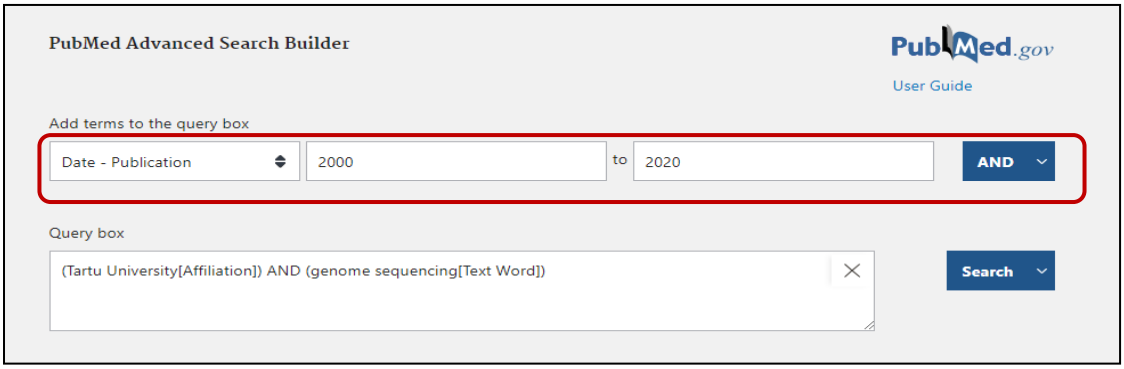


Figure 63. Multiple field search in *PubMed*

The final query looks like this:

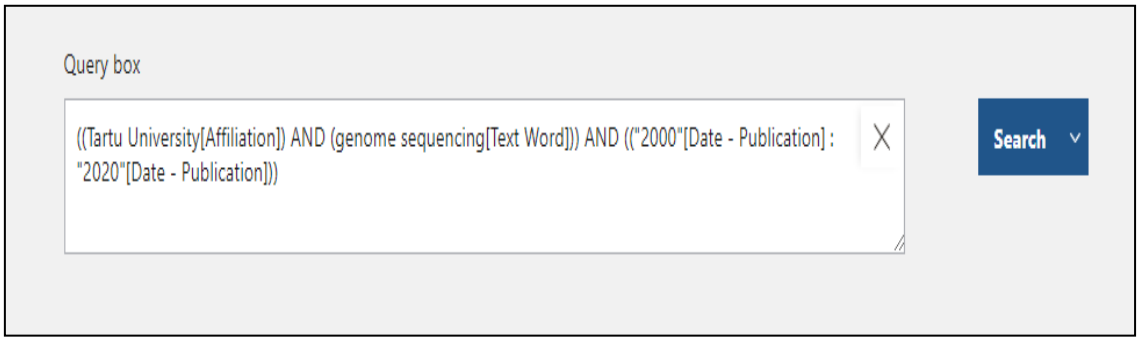


Figure 64. Multiple field search in *PubMed*

By clicking on the Search button, you will obtain your search results. Above the search results you will find options for sending an e-mail and for saving the file. And if you need to narrow your search, the column of limits is on the left. These work similarly to keyword search.

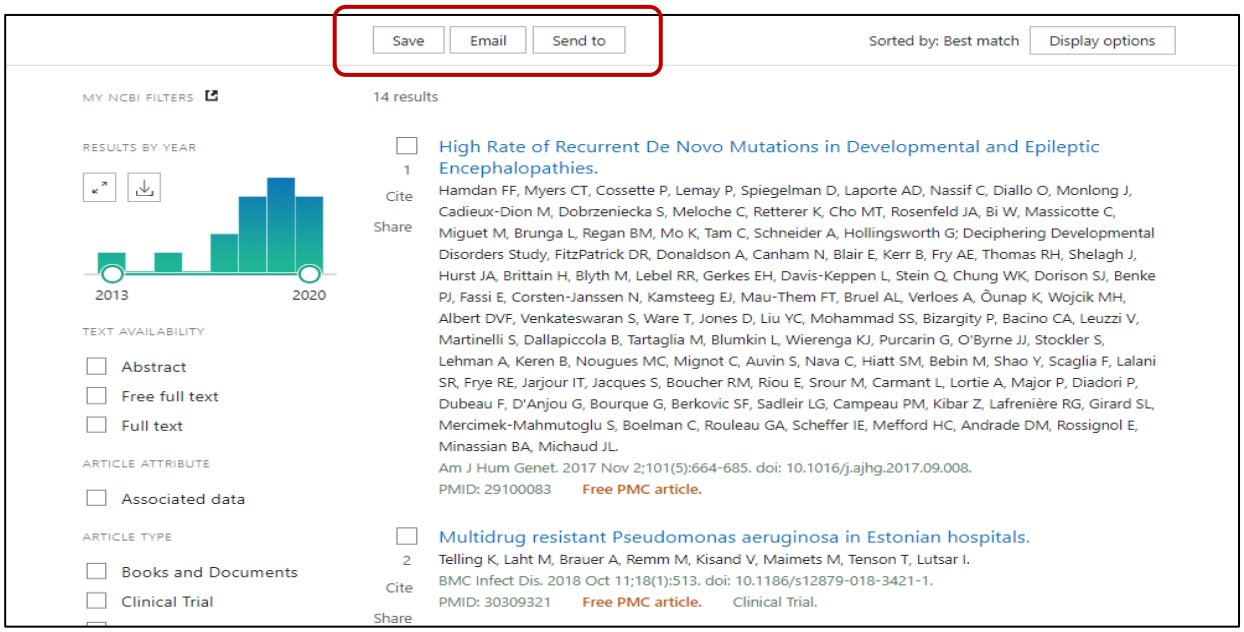


Figure 65. Multiple field search in *PubMed*

Task. Keyword Searches in PubMed (*https://pubmed.ncbi.nlm.nih.gov/*)

1. What is the effectiveness of pet therapy for children with spastic diplegia?
2. Is Vitamin B effective in preventing migraines in adults?
3. Which is more effective for treating acne during adolescence – phototherapy or antibiotics?

Final results

It takes much time and effort to obtain fully satisfactory search results; still, it should be noted that this pays off if we have built up a thorough a search strategy, considered the capabilities of different databases, checked completed searches, terms and combined searches, etc. And as has been once and again emphasized, everything starts from a properly structured question. The following is a brief description of some aspects of a search strategy.

Thus, we should consider the following:

- **Is the chosen strategy sensitive enough in the given case?** What does it mean? When building up a search, we can consider many different things, and the more options we include, the more sensitive is the search.
- **Is there a need to increase or decrease the sensitivity of the strategy?** Of course, this will only become clear when we take a closer look at the obtained results. If it seems that there are too few results, the sensitivity of the strategy needs to be increased, but if there are too many of them, the opposite needs to be done. What to do in such situations will be discussed below.
- **Does the chosen strategy help find all important references?** This is a question that is very difficult, if not impossible, to answer. Despite the fact that we have access to so many extensive and high-quality databases (e.g. Medline), it is far from certain that absolutely all articles published on the selected topic worldwide have been found. Evidently, not all needed

articles can be found. Yet even if we have skilfully built up our search strategy, it gives us hope that we have still found the lion's share of important information. At least the information that is available.

- **How many references were found altogether?** Is it possible to work on this project with such a number of references? In other words, what is the number of results that would satisfy us, i.e. the number that we can manage? This again leads to the issue of sensitivity of search.
- **Does this strategy need to be specified?** It means that if we take a closer look at the obtained results, then if the information that we see therein is what we were looking for, i.e. if it is the answer to the original question? However, if this is not the case, we should first consider whether the strategy could be changed and then what in it could be changed and how to do it.

So we can never be sure that a well-structured and well-executed search strategy will produce the right number of results - not too few or too many.

Here are some tips on what can be done if we are not satisfied with the number of results.

Too few results. But maybe very little has been written on this subject? Maybe it is a poorly studied problem and its coverage is probably limited? At this point, it is possible to do a simple search in PubMed and see how many results come up. If this number is small, then the coverage of this issue is probably limited. An example of a PubMed search for hordeolum:

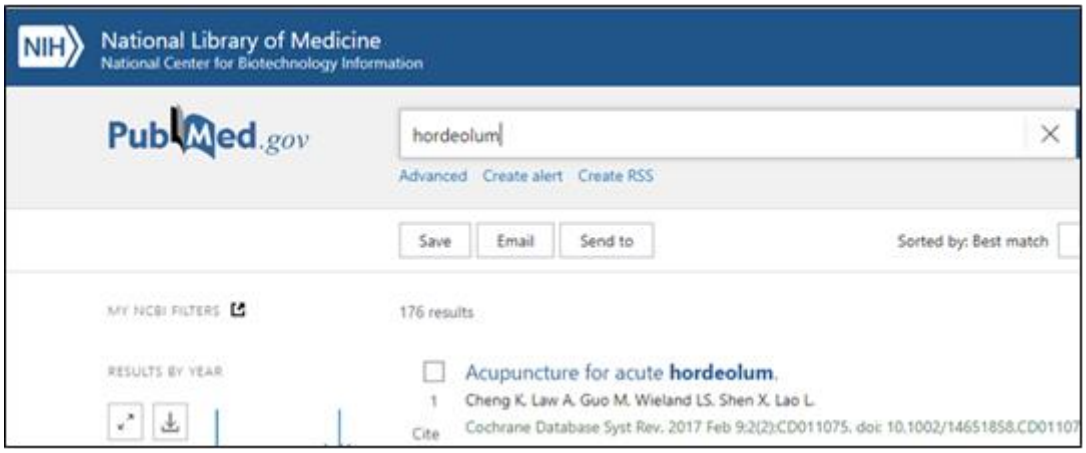


Figure 66. Keyword search in *PubMed*

We can see that a simple search retrieves only 176 results - so it is quite clear that there is no point in building up a very detailed strategy, as little has been written on the subject.

How to increase the number of search results? To increase the number of search results, we could consider the following activities:

- Remove one term from our search strategy. For example, when a search contains more than two blocks of terms, remove all but two.
- Reduce the sensitivity of our search strategy:

- Do not limit the articles found in a MeSH search to those in which the keyword that we are looking for is the main topic of the article, i.e. do not mark Restrict to MeSH Major Topic in a MeSH search.

- Do not include keywords below the search term (Do not include MeSH terms found below this term in the MeSH hierarchy).

- Do not limit MESH search to subtopics, i.e. include in the search all subtopics for the corresponding MeSH term. By default, PubMed will include all subtopics in search if unchecked.

- Increase the number of synonyms for search terms. Have we included all synonyms for the given concept in the title and abstract search? This might also increase the number of search results.

Too many results. First of all, we should roughly determine what is the allowed maximum number of (desired) results.

Here are some ways to narrow down your search strategy:

- add a new term to the strategy, for example, if the strategy used consists of two concept blocks, add a third concept block (remember the PICO-question)
- apply proximity search, but be careful, as many important references may remain unfound in this case
- specify the use of synonyms in title-abstract search, remove less relevant synonyms
- use subheadings in your MeSH search
- limit your MeSH search to articles in which the search term stands for the main topic (Restrict to MeSH Major Topic)
- do not include topics below the search term in MeSH search
- set limits to reduce the number of search results. The more limits, the less results. NB! Do not forget to remove the limits that you have set, if you do not want to use them in upcoming searches
- sometimes a title search can help, but be very careful, as many important results may not be obtained in this case

If we are satisfied with final results, it is possible to export records from databases. Databases allow to store the records found, print them out, send them by e-mail, and export them to a suitable reference management system. In addition, you can copy a DOI number from the database, which is a unique article number and is not changed in different databases. You can always receive the letter of the desired article from http://dx.doi.org/ (34).

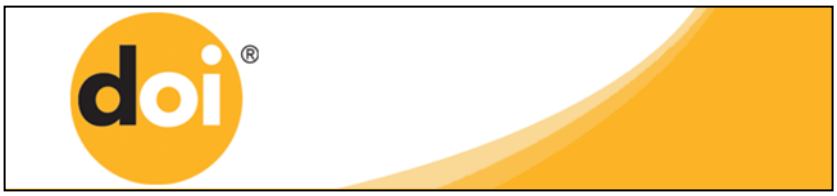


Figure 67. *DOI*. https://www.doi.org/img/banner-413.gif

In particular, two reference management systems are used - Zotero (https://www.zotero.org) and Mendeley (http://www.mendeley.com). They are freeware reference managers that allow you to collect, manage, and collaborate with colleagues around the world. Of course, there exist other reference managers, but they are mostly for pay. Also EndNote Basic with limited options can be used free of charge.

Figure 68. Reference management systems *Zotero* (https://www.bethlehem.edu/wp-content/uploads/2020/02/zotero-logo-600x400-1.png), *Mendeley* (https://upload.wikimedia.org/wikipedia/commons/8/81/Mendeley_Logo_Vertical.png) and *EndNote* (https://lib.czu.cz/cache/article-data/SIC/Web/Endnote.png)

Reference manager's options:

- creating a systematic library of references
- searching for information (including full texts) within the library
- adding a screenshot of the website, web address and article as a PDF attachment to the entry
- adding files from your computer to the manager, creating an entry based on them
- setting up groups to work together
- automatically generate links to Word and other word processing programs (35)

Appraisal of search results

Critical appraisal of research is a process in the course of which the value and credibility of research is carefully and systematically assessed in a specific context. The reliability of each source of information found must be checked – for this, specific rules have been developed.

When critically evaluating information sources, the following questions could be asked:

- Who is the author? Are the authors listed correctly within the reference? You can check this, for example, with either a Google or a Google Scholar search.
- Are the facts and figures presented in the work true?
- What do other authors write on the same topic?
- Is the provided information impartial and independent – is there a reference to other authors?
- Is the provided information biased - for example, is there any advertising? (36)

Self-Control Test. Final Results

1. What does sensitivity of search strategy mean? Choose the correct answer.

- The search strategy is designed to find as many leads as possible, while many of the links you find may be irrelevant

- The search strategy is structured in such a way that the references found in the answer correspond as exactly as possible to the question asked, while many important references may not be found.

2. How to increase the number of search results? Choose the correct answer.

- Add a term to your search strategy
- Remove a term from the search strategy

3. How to reduce the number of search results? Choose the correct answer.

- Add synonyms to the search strategy
- Add a new term to your search strategy

4. Does a search in the Medline database always return all articles in the world on the subject? Choose the correct answer.

- No
- Yes

5. Is it possible to search the Medline database only in the field of the article's abstract? Choose the correct answer.

- Yes
- No

6. What does DOI mean?

- In the classification system, DOI means the conditional convention assigned to a species
- DOI stands for a permanent identifier used to uniquely identify an object (which may itself be physical or digital) in a digital environment

7. What indicators testify to the quality and independence of a research in its critical appraisal? Choose two right answers.

- There are many references to the research funded by pharmaceutical firms or other companies
- A correct list of references, or bibliography is presented at the end of paper
- References to Wikipedia articles are important in the list of sources used
- All authors of the work are listed with relevant details about them

Answers

1. The search strategy is designed to find as many leads as possible, while many of the links you find may be irrelevant
2. Remove a term from the search strategy
3. Add a new term to your search strategy
4. No
5. No

6. DOI stands for a permanent identifier used to uniquely identify an object (which may itself be physical or digital) in a digital environment
7. A correct list of references, or bibliography is presented at the end of paper

All authors of the work are listed with relevant details about them

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CHAPTER III. SPECIAL MEDICAL AND HEALTH INFORMATION RESOURCES

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Riga Stradins University

Industry Terms ans Diovisions

Dictionaries

Medical terminology dictionary - freely available internet resources where you can find medical definitions, explanations of terms, information about medicines and diagnoses; it is possible to search by name, subject or by branches of medicine. Some resources from the internet are offered:

The Free Dictionary by Farlex - https://www.thefreedictionary.com/

A very informative and simple source of information. It offers a General Dictionary, Medical Dictionary, Graphic Thesaurus, Encyclopedia and English spelling and pronunciation, and it provides definitions with references. Translations to other popular languages are provided. Medical Dictionary provides information for medical professionals on particular diseases, medications, diagnostic methods and manipulations.

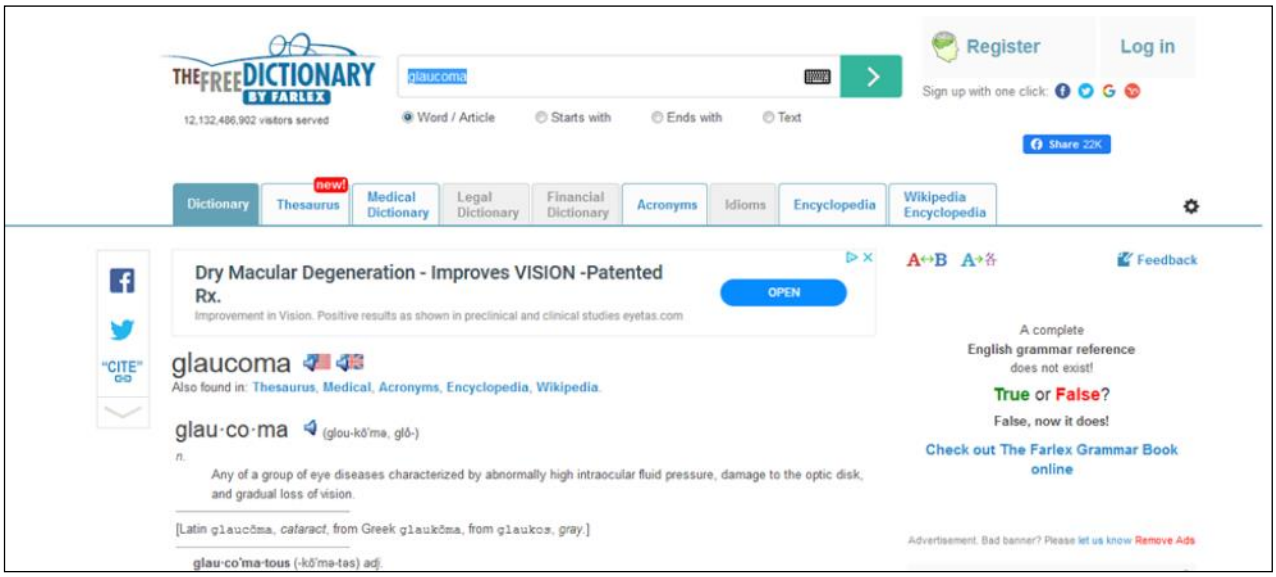

Figure 1. The Free Dictionary by Farlex https://www.thefreedictionary.com

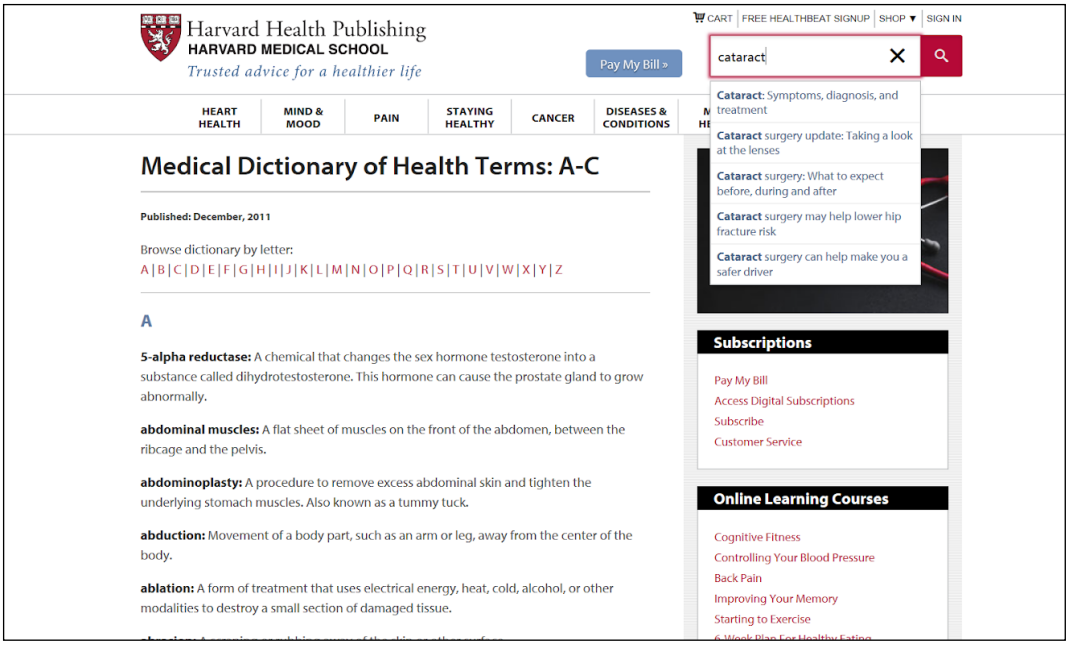

Figure 2. Harvard Medical Dictionary of Health https://www.health.harvard.edu/a-through-c

Medical Dictionary Online powered by MegaLexica! - https://www.online-medical-dictionary.org/

Global RPH - The clinician`s Ultimate Reference - https://globalrph.com/medical-terms-introduction/

Rīga Stradiņš University Library offers a whole range of popular dictionaries and encyclopaedia on its website, including medical ones, using references to e-addresses: https://www.rsu.lv/biblioteka/resursi/vardnicas

WebMD Medical Dictionary - https://dictionary.webmd.com/default.htm

Cambridge Dictionary - https://dictionary.cambridge.org/dictionary/

Medical Dictionary - https://medical-dictionary.com/

Academic terms database AkadTerm [Akadēmiskā terminu datubāze AkadTerm]

The Academic Terms Database *AkadTerm* contains terminology in English and Latvian with explanations in Latvian. Corresponding Latvian terms have been found for the English terms that are not given in other dictionaries. Further you can find part of the current terms of this dictionary, along with a brief, indicative outline of the meaning. http://termini.lza.lv/term.php

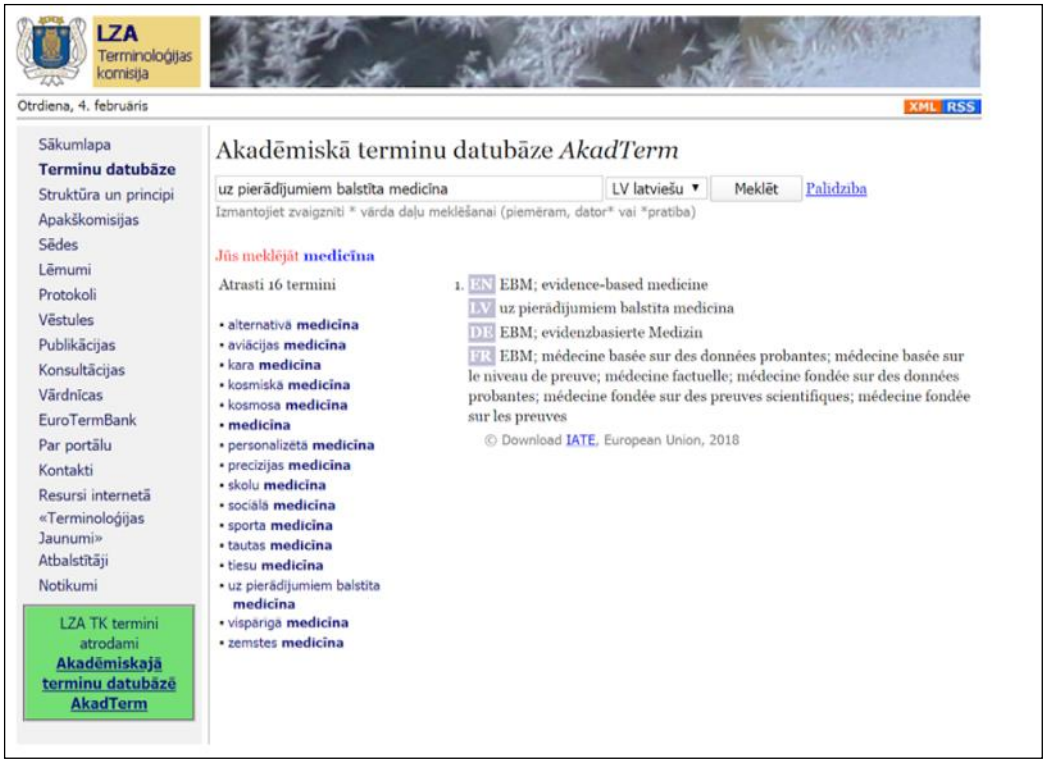

Figure 3. Academic terms database *AkadTerm* http://termini.lza.lv/term.php

Latvian National Terminology Portal

The Terminology Commission of the Latvian Academy of Sciences has been developing a unified sectoral terminology system in the national language that complies with international standards existing in the European Union countries. The Terminology Commission determines the use of terms in special educational literature and technical and record-keeping documentation, as well as approves new terms and their definitions. Approved sectoral terminology is also collected. https://termini.gov.lv/

Figure 4. Latvian National Terminology portal https://termini.gov.lv

Glossary of term and foreign words Letonika

Reference resources of the database letonika.lv are collected in the section "Encyclopaedia". Results from the "Explanatory dictionary of foreign words" and interpretations from translation/terminology dictionaries are also included in the search.

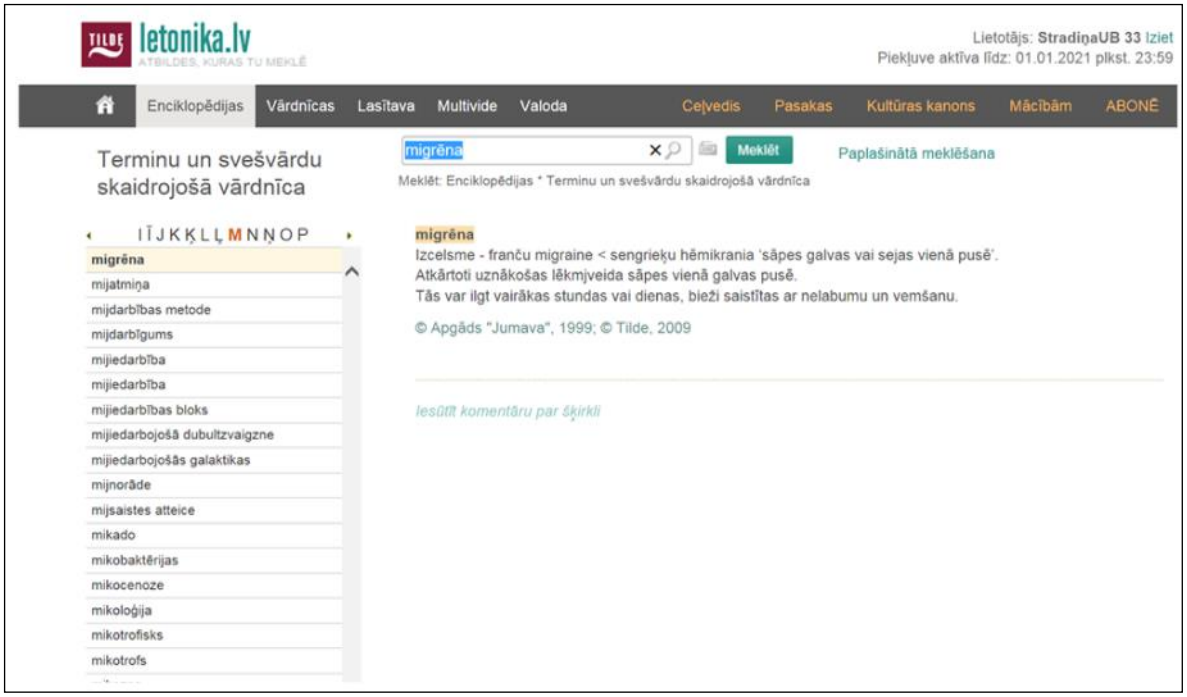

Figure 5. *Letonika* www.letonika.lv

The largest open lexical database of Latvian

A dictionary that covers all the words of a language; a very large, extensive dictionary. An extensive dictionary of synonyms, antonyms and other semantically related words. http://tezaurs.lv/

Figure 6. *Tezaurs* http://tezaurs.lv

Medical Subject Headings

The Medical Subject Headings (MeSH) thesaurus is a controlled and hierarchically-organized vocabulary produced by the National Library of Medicine. It is used for indexing, cataloguing, and searching of biomedical and health-related information. MeSH includes the subject headings appearing in MEDLINE/PubMed, the NLM Catalogue, and other NLM databases.

Introduction to the Medical Subject Headings (MeSH) thesaurus, including its use and structure, as well as recent updates and availability of data is provided. The MeSH record view in the Details, Qualifiers, and MeSH Tree Structure tabs should satisfy all your basic needs if you are using MeSH to search and retrieve citations.

Navigating the MeSH hierarchy - clicking on "Tree View" will allow you to browse the MeSH hierarchy from the broadest to the narrowest MeSH headings. You can also jump to the MeSH tree by clicking the Tree Number from inside a record in the Detail tab, or by clicking on the record's MeSH Tree Structure tab.

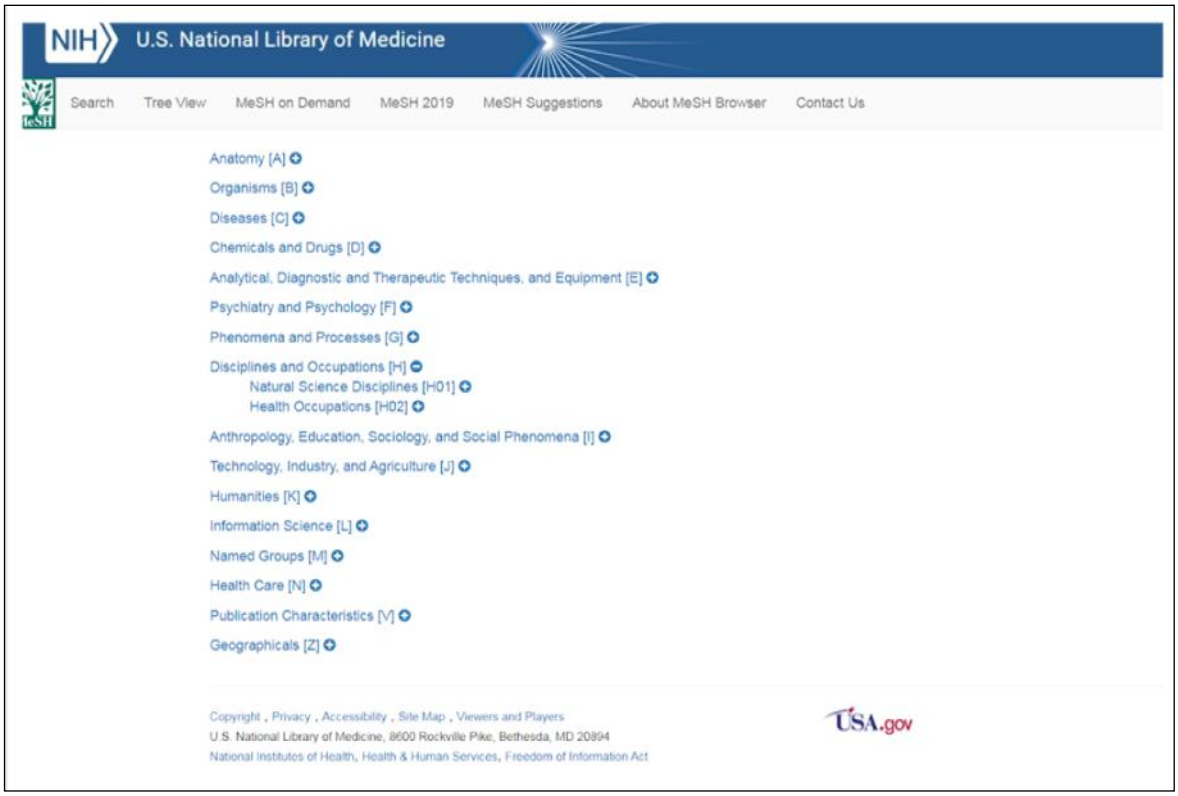

Figure 7. *MeSH tree* https://meshb.nlm.nih.gov/treeView

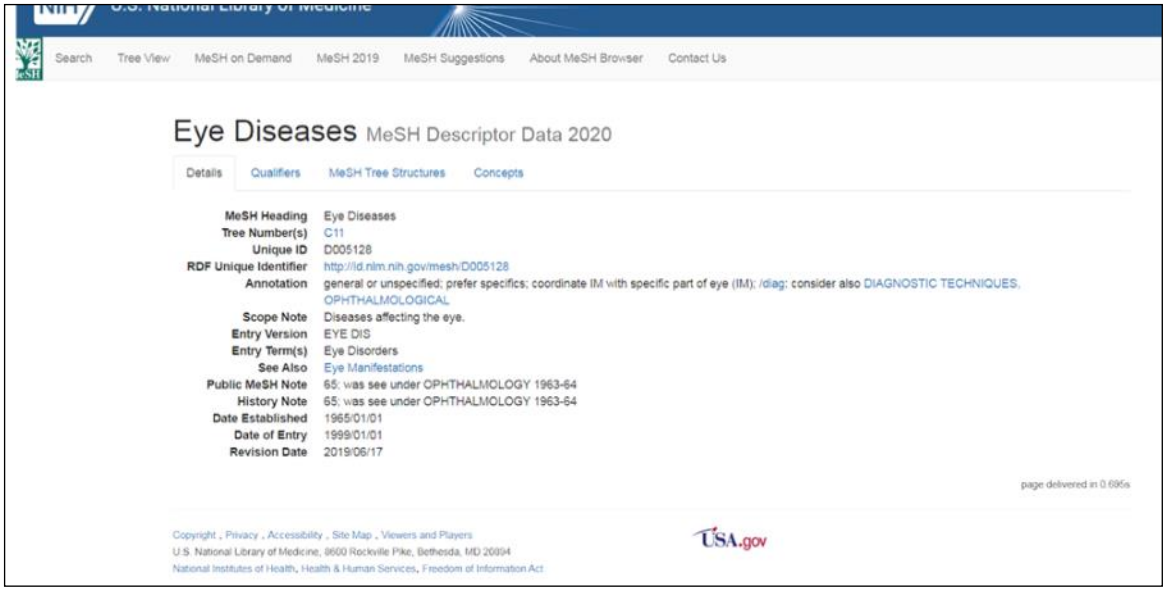

Figure 8. *MeSH* Detail tab

Universal Decimal Classification (UDC)

The UDC Consortium (UDCC) is a non-profit association of publishers established to maintain, develop and distribute the UDC for the benefit of its users. Apart from its strategic, managerial and promotional responsibilities, the UDCC also appoints an editorial team and advisory board to oversee the content of the scheme and contribute to its regular revision in order to reflect new knowledge. http://www.udcc.org/index.php/site/page?view=about_udcc

The Universal Decimal Classification (UDC) is the world's foremost multilingual classification scheme for all fields of knowledge and a sophisticated indexing and retrieval tool. It is a highly flexible classification system for all kinds of information in any medium.

The UDC is one of the most widely used classification schemes for all fields of knowledge. It is used in libraries, bibliographic, documentation and information services in over 130 countries around the world and is published in over 40 languages (also in Latvian).

The UDC Summary (UDCS) provides a selection of around 2,600 classes from the whole scheme which comprises more than 70,000 entries.

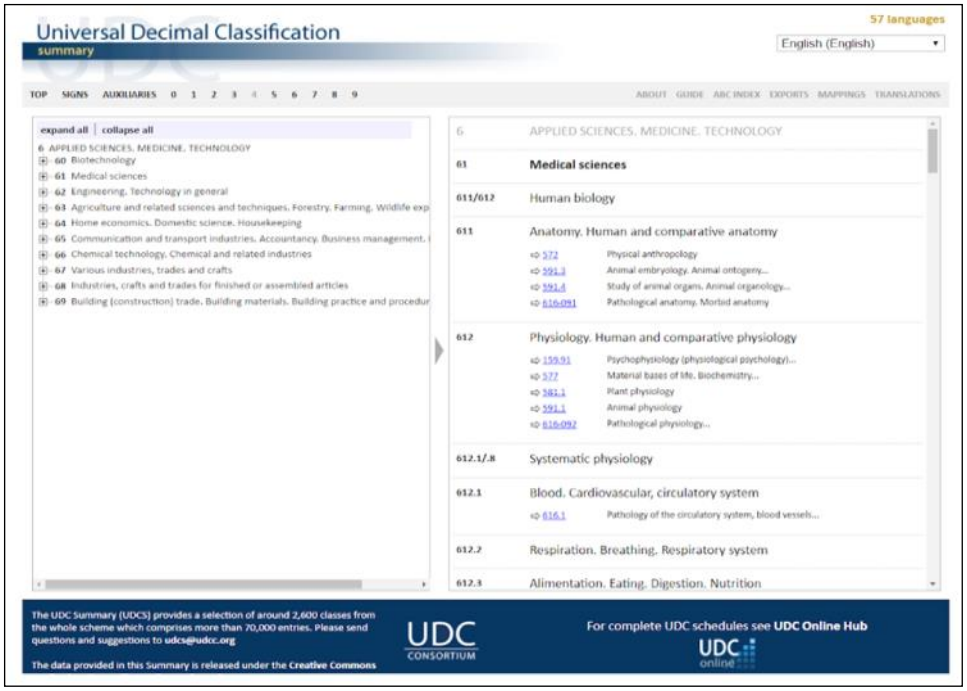

Figure 9. Universal Decimal Classification, http://www.udcsummary.info/php/index.php?id=37275&lang=en&pr=Y

UDC Handbook

The National Library of Latvia has prepared a new edition for librarians - "Universal Decimal Classification" (PDF). The manual is intended as a practical assistant for the use of Universal Decimal Classification (UDC) in the classification process.

The UDC is a well-structured and information-rich system of organising knowledge, which is used in many libraries in the world. The full edition in Latvian is available only in electronic format as a separate database of Latvian Scientific Libraries. The handbook contains summaries of the UDC main tables and determinative tables that facilitate finding the required notation in the UDC database.

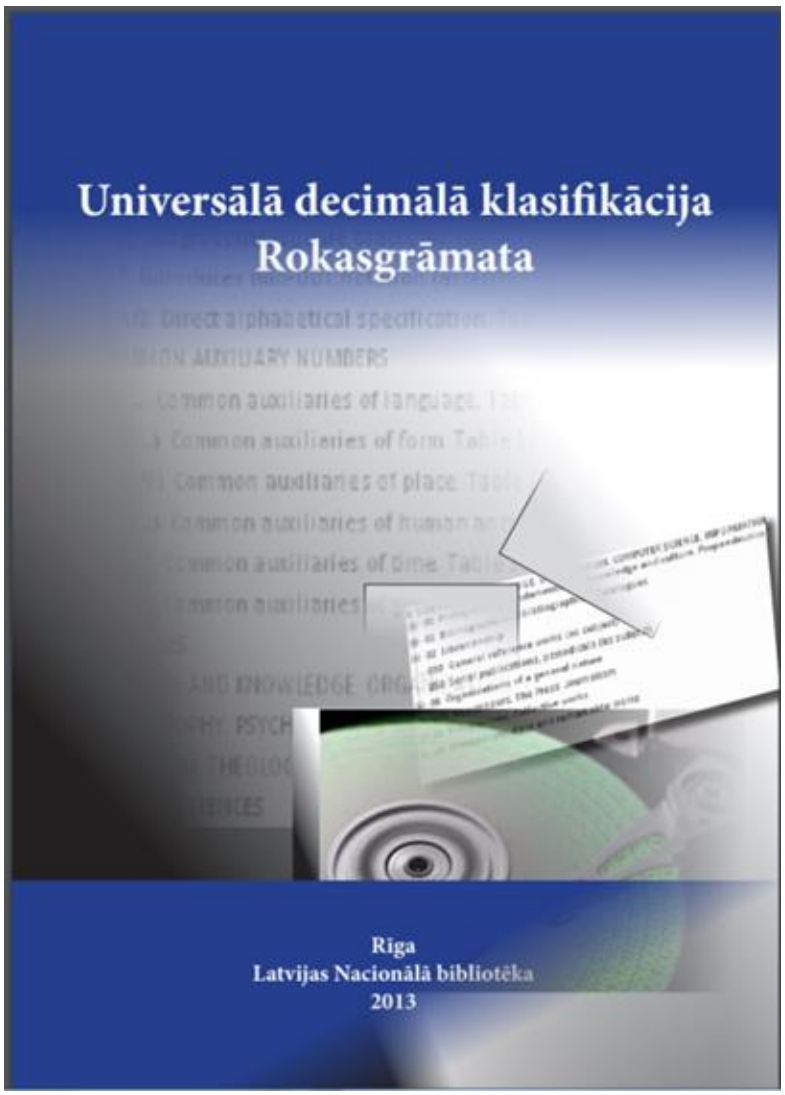

Figure 10. Universal Decimal Classification https://dom.lndb.lv/data/obj/file/163014.pdf

Medical Specialties

Specialty - the field of activity corresponding to the profession, in which the relevant person has obtained a professional qualification. A narrower area of the specialty forms a subspecialty or professional specialisation, and an area common to two or more specialties - an additional specialty. "Law on Regulated Professions and Recognition of Professional Qualifications". http://likumi.lv/doc.php?id=26021

The European Union of Medical Specialists (Union Européenne des Médecins Spécialistes – UEMS) is a non-governmental organisation representing national associations of medical specialists in the European Union and in associated countries. https://www.uems.eu/about-us/medical-specialties

The UEMS represents more than 50 medical disciplines through various bodies and structures. The most important ones are the 43 Specialist Sections, which represent independently recognised specialties. They have created a European Board as a subgroup, in conjunction with the relevant European Society, with a view to defining European standards for medical education and training.

They also contribute to the work of Multidisciplinary Joint Committees (MJC) which address fields of a multidisciplinary nature.

The UEMS Specialist Sections and Boards

- Allergology
- Anaesthesiology
- Cardiology
- Cardiothoracic Surgery
- Child and Adolescent Psychiatry
- Clinical Neurophysiology
- Dermatology and Venereology
- Emergency Medicine
- Endocrinology
- Gastroenterology
- Geriatrics
- Gynaecology and Obstetrics
- Infectious Diseases
- Internal Medicine
- Laboratory Medicine / Medical Biopathology
- Medical Genetics
- Medical Microbiology
- Medical Oncology
- Nephrology
- Neurology
- Neurosurgery
- Nuclear Medicine
- Occupational Medicine
- Ophthalmology
- Oro-Maxillo-Facial Surgery
- Orthopaedics & Traumatology
- Otorhinolaryngology
- Paediatric Surgery
- Paediatrics
- Pathology
- Pharmacology
- Physical and Rehabilitation Medicine
- Plastic, Reconstructive and Aesthetic Surgery
- Pneumology
- Psychiatry
- Public Health Medicine
- Radiology
- Radiation Oncology and Radiotherapy
- Rheumatology
- Surgery
- Thoracic Surgery
- Urology
- Vascular Surgery

Careers in Medicine® is a program of the Association of American Medical Colleges

Begin your specialty exploration by reading the profiles of more than 120 specialties and subspecialties. For each, you will find descriptions of the work the physicians do, salary, training requirements, match, salary and workforce information, and links to relevant organisations and publications.

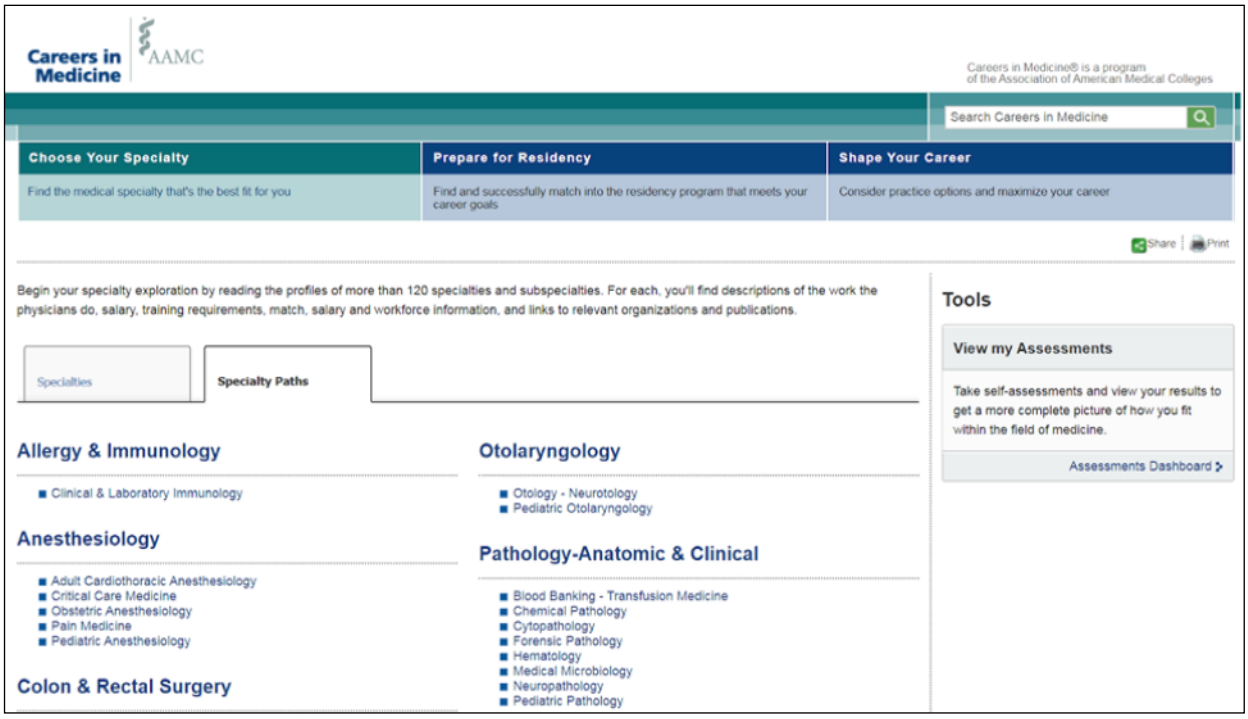

Figure 11. *Careers in Medicine*® https://www.aamc.org/cim/specialty/exploreoptions/list/

The American Board of Medical Specialties (ABMS) works in collaboration with 24 specialty Member Boards to maintain the standards for physician certification. Their focus is on improving the quality of health care to patients, families, and communities by supporting the continuous professional development of physician specialists. They achieve their mission as an organisation by helping physicians achieve their potential as providers of quality health care.

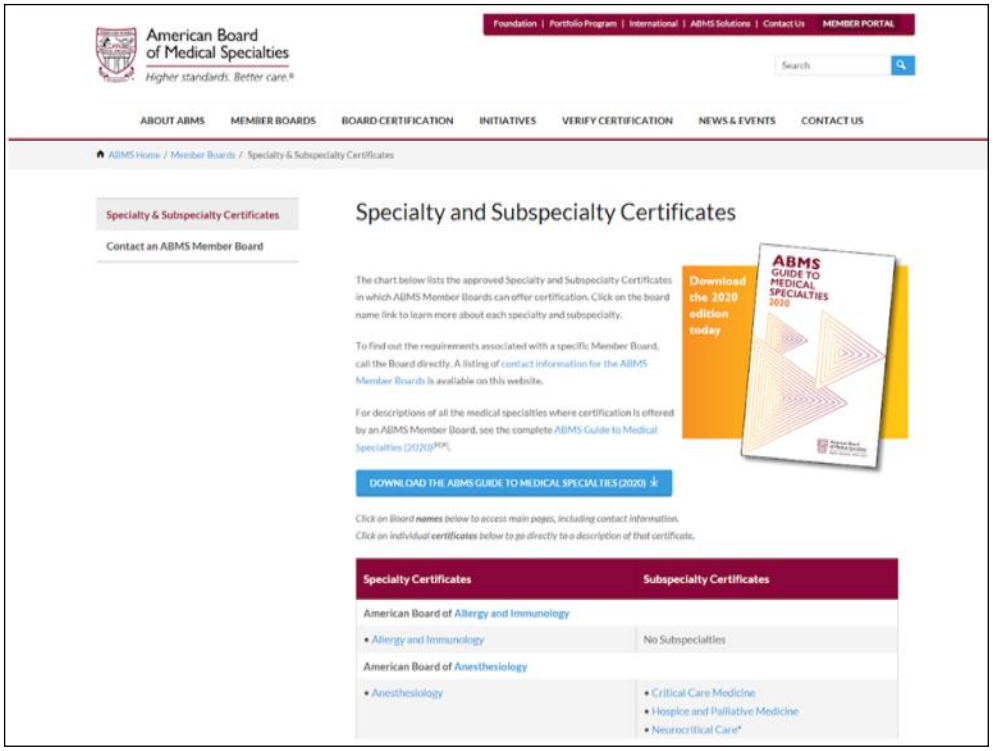

Figure 12. *ABMS* https://www.abms.org/member-boards/specialty-subspecialty-certificates/

Database of regulated professions (LV)

A regulated profession — a professional activity regulated in the Republic of Latvia or a set of regulated professional activities in the professions specified by law, for the commencement and pursuit of which a requirement for an appropriate professional qualification has been specified in the relevant national legislation. http://www.aic.lv/regdip/

"Law on Regulated Professions and Recognition of Professional Qualifications". http://likumi.lv/doc.php?id=26021

Visas profesijas | Veselības aprūpe

Profesijas/Specialitātes, kurām ir pieejama Eiropas profesionālā karte

Profesijas/Specialitātes, kurām nepieciešama dokumentu pārbaude, pirmoreiz uzsākot īslaicīgus pakalpojumus

Profesiju/Specialitāšu saraksts, kurām nepieciešama apmācība ar īpašu struktūru, kā minēts Direktīvas 2005/36/EK 11. panta c) punkta ii) apakšpunktā

Meklēt nosaukumā: Meklēt

Nosaukums	Tips	Karte	Dok	Apm
Veselības aprūpe				
Audiologopēds (klīniskais logopēds)	Profesija	☐	☑	☐
Ārsta palīgs	Profesija	☐	☑	☐
Ambulatorā dienesta ārsta palīgs	Specialitāte	☐	☑	☐
Neatliekamās palīdzības ārsta palīgs	Specialitāte	☐	☑	☐
Ārsts	Profesija	☐	☑	☐
Anesteziologs, reanimatologs	Specialitāte	☐	☐	☐
Arodveselības un arodslimību ārsts	Specialitāte	☐	☐	☐
Asinsvadu ķirurgs	Specialitāte	☐	☐	☐
Ģenētiķis	Specialitāte	☐	☐	☐
Ģimenes (vispārējās prakses) ārsts	Specialitāte	☐	☐	☐
Ķirurgs	Specialitāte	☐	☐	☐
Bērnu ķirurgs	Specialitāte	☐	☐	☐
Dermatologs, venerologs	Specialitāte	☐	☐	☐
Fizikālās un rehabilitācijas medicīnas ārsts	Specialitāte	☐	☐	☐
Kurortologs (balneologs)	Apakšspecialitāte	☐	☐	☐
Geriatrs	Specialitāte	☐	☐	☐
Ginekologs, dzemdību speciālists	Specialitāte	☐	☐	☐
Onkoloģijas ginekologs	Apakšspecialitāte	☐	☐	☐
Hematologs	Specialitāte	☐	☐	☐
Infektologs	Specialitāte	☐	☐	☐
Internists	Specialitāte	☐	☐	☐
Endokrinologs	Apakšspecialitāte	☐	☐	☐
Gastroenterologs	Apakšspecialitāte	☐	☐	☐

Figure 13. *Database of regulated professions* http://www.aic.lv/regdip/

Latvian Qualifications database [LV]

The database includes nationally recognised qualifications that can be obtained in accredited educational institutions. Education qualifications have been compiled using data and information from the laws governing education in Latvia, Cabinet of Ministers Regulations and other regulatory enactments. Professional Standard includes the classification of professions, which are used to define knowledge, skills and competencies inherent to the qualification to be obtained in professional education.

https://www.latvijaskvalifikacijas.lv/meklet-kvalifikaciju/

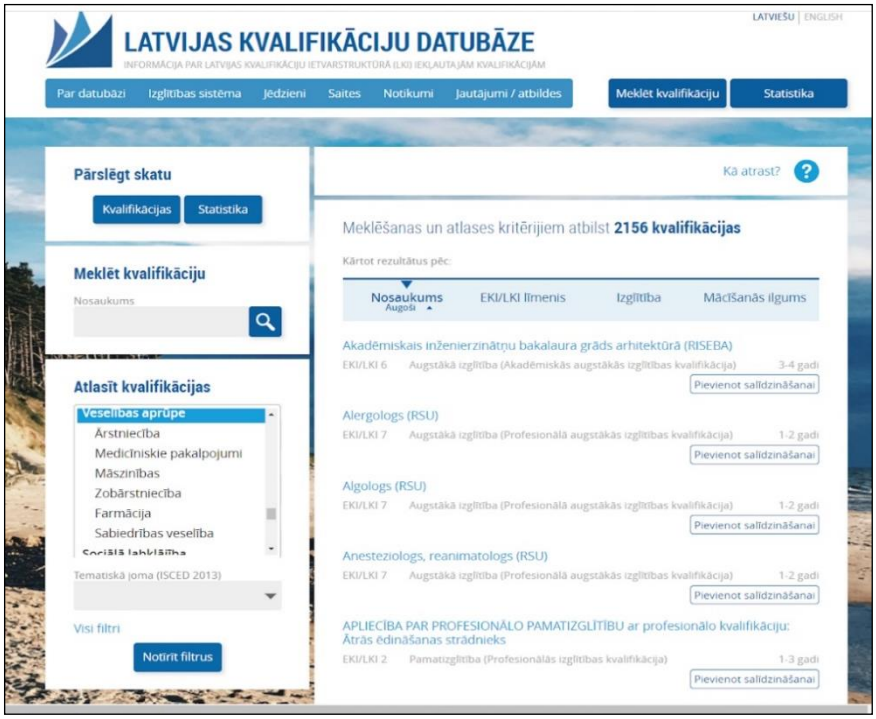

Figure 14. Latvian qualifications database

https://www.latvijaskvalifikacijas.lv/en/?doing_wp_cron=1633933233.20326805114746093750

0

Checklist

1. Where can you find information about the particular disease?
2. Where can you find the category of a particular disease or the sector to which it belongs?
3. Where can you find the explanation of a medical term?
4. Where can you find a description of a medical profession?
5. Where can you find information about the qualifications of health professionals in Latvia?

There is no single recipe for searching for specific information, there are always options! When searching for the information, we usually start with general search engines and dictionaries, and, if specific information is needed, we use medical resource search engines, catalogues, guides and specific websites of an organisation or association.

Possible answers:

1. Dictionaries, medical dictionaries, encyclopaedia, Medical Subject Headings Thesaurus, such as: HTTPs; https://thefreedictionary.com; https://dictionary.cambridge.org/dictionary/; https://meshb.nlm.nih.gov/
2. Medical Subject Headings Thesaurus, for example: https://meshb.nlm.nih.gov/
3. Glossaries of terms, Medical Subject Headings Thesaurus, such as: https://tezaurs.lv/ ; https://termini.lv ; https://dictionary.cambridge.org/dictionary/ ; https://meshb.nlm.nih.gov/
4. Medical Subject Headings Thesaurus, websites of associations of medical professionals:
5. https://meshb.nlm.nih.gov/; https://www.uems.eu/about-us/medical-specialties;
6. Database of the regulated professions, Latvian Qualifications Database: http://www.aic.lv/regdip/; https://www.latvijaskvalifikacijas.lv/meklet-kvalifikaciju/

Latvia

Healthcare professionals will find professional information resources in different types of libraries; however, emphasis should be placed on three national libraries: Rīga Stradiņš University Library, the National Library of Latvia and the University of Latvia Library.

Rīga Stradiņš University (https://www.rsu.lv/) implements study programmes in both health care and social sciences. Specialists in the field of health care are trained by the Faculty of Pharmacy, the Faculty of Medicine, the Faculty of Rehabilitation, the Faculty of Public Health and Social Welfare, the Faculty of Dentistry, the Faculty of Residency, the Department of Doctoral Studies, the International Student Department and RSU Liepāja Branch. First level professional higher education programmes, vocational education and vocational secondary education programmes can be undertaken at RSU Red Cross Medical College.

Links to E-resources arranged according to their subject-matter are available on the website of Rīga Stradiņš University (https://www.rsu.lv/) under the section *Library* both on the home page and under the section *Resources* (see the Figure).

Figure 15. *Rīga Stradiņš University* https://www.rsu.lv/

The section *Resources according to the subject-matter* is regularly supplemented and updated.

The section *Medicine and Health Care* includes and covers a wide range of open access resources in various medical and healthcare sectors with a brief description of the resource. It provides links to international medical associations, databases and portals and laboratories. There are links indicating where to search for information regarding congresses and conferences, links to medical resource search engine and catalogue websites, and statistical resources. The section includes also medical technology and equipment websites, evidence-based medical resources, guidelines, and patent information.

Both healthcare professionals and other interested parties will find useful Latvian resources under the section *Medicine in Latvia*, where links to societies, organisations and associations are available (see international medical associations under the section *International Medical Associations*). There you can find links to portals; electronic publications; educational and research institutions; agencies; pharmacies; medical centres; hospitals; inpatient and outpatient service providers; pharmaceutical

wholesalers and manufacturers; dental clinics and medical and laboratory equipment and instruments. There is also a section *For Patients*.

As useful resources are available in a variety of languages, the section *Dictionaries* will help you both in translating terminology and finding explanations. Open access e-books and e-journals in various disciplines can be read under the sections *Open Access E-Books* and *Open Access e-Journals*.

The *Information Literacy Guide in Health Sciences* published under the section *Library* of Rīga Stradiņš University website will also be a useful and structured assistant, which will help to avoid confusion and to navigate the Internet resources related to health sciences.

One of the departments of Rīga Stradiņš University Library is the World Health Organisation (WHO) Depository Library in Latvia. You can find information related to the WHO current activities, read and download WHO publications and WHO e-books free-of-charge (arranged by sector) via link: https://www.rsu.lv/biblioteka/pvo-depozitarija-biblioteka-latvija. The WHO newsletter archives from 2010 to the latest issue, links to WHO databases: WHO digital database IRIS, WHO Health Observatory database, WHO European Health Information Database and WHO Mortality Database are also available there. There is also information on WHO global health days.

The website of Rīga Stradiņš University Library was viewed on 14 October 2020.

The Dspace platform of Rīga Stradiņš University (https://dspace.rsu.lv/jspui/) includes information resources related to Rīga Stradiņš University in digital format, such as conference proceedings, student final papers, etc. The resource is being updated, a full version is not available for all the content. Dspace platform was viewed on 29.10.2020.

The University of Latvia (https://www.lu.lv/) The University of Latvia, Faculty of Medicine offers studies for Bachelor's and Master's degrees, as well as doctoral and residency studies. See the Faculty website for more information http://www.mf.lu.lv (viewed on 29.09.2020.)

The website of the Library of the University of Latvia (http://www.biblioteka.lu.lv/) provides links to e-resources and databases, arranged both in alphabetical order and by sectors. Not all of the resources listed are open access resources, and they are predominantly international resources.

Researchers will find the University of Latvia e-resource repository (https://dspace.lu.lv/) useful, which includes publications of the University of Latvia staff, students' final theses and other information resources related to the University of Latvia.

Resource viewed on 29.10.2020.

National Library of Latvia / https://www.lnb.lv/

On the home page of the National Library of Latvia, under the section “Resources”, you will find a link to the National Encyclopaedia (https://enciklopedija.lv/), which is a popular scientific and comprehensive information resource. The content of the National Encyclopaedia is regularly updated. The search is provided by entering a keyword in the search box, and links to the latest entries and other resources of the National Encyclopaedia are given on the home page.

The “Resources” section also includes the “Sector Guide”, which provides links to Latvian and international e-resources in Medicine and Psychology; the "Statistics" section will also be useful for

everyone. The Sector Guide singles out "International Organisations" in different sectors, including in Health and Humanitarian Aid.

The Ministry of Health of the Republic of Latvia (http://www.vm.gov.lv/): information about the Ministry of Health, which is the leading public administration institution in the health sector, current events in the sector, the section *Your Health*, which provides information on a variety of community and health-related topics, such as information on healthy eating, patient rights and responsibilities, medication, mental health, etc., and the section *Your Health* provides links to other sources of information that help you find the necessary information about the relevant heading. *Resource was viewed on 28.01.2020.*

On the website of the Ministry of Health of the Republic of Latvia, the contact details, link to the home page and information regarding the institution are given under the section *Ministry and Subordinate Institutions.* The following institutions are subordinate to the Ministry of Health of the Republic of Latvia: (The website of the Ministry of Health of the Republic of Latvia was viewed on 22.09.2020 and 10.11.2020):

- National Health Service;
- Centre for Disease Prevention and Control;
- Health Inspectorate;
- Emergency Medical Service;
- State Agency of Medicines;
- National Blood Donor Centre;
- State Centre for Forensic Medical Examination;
- Anti-Doping Bureau of Latvia;
- Pauls Stradiņš Museum for History of Medicine;
- Rīga Stradiņš University

Question. What is the leading authority in the health sector of the country? Who is developing a national health policy? (Answer: Ministry of Health of the Republic of Latvia; see the answer to the first question in the text of the training material or find the answers to both questions on the website of the Ministry of Health http://www.vm.gov.lv/ under the section "*Sector*": http://www.vm.gov.lv/lv/nozare/

Lithuania

The Ministry of Health of the Republic of Lithuania is the main institution at the national level, responsible for general supervision of the entire health system. The National Health Insurance Fund, under the Ministry of Health, is responsible for financing of healthcare services.

60 councils of municipalities are responsible for primary health and secondary healthcare. Tertiary care level is mostly concentrated in university hospitals and responsibility falls to the governmental level. A patient usually enters the health system through their GP or directly through a specialist doctor if urgent care is needed; for non-urgent care and with no GP referral a user fee is paid.

When specialised care is needed, a patient can choose a service provider and a consultant.

Inpatient and outpatient rehabilitation facilities are available to improve a patient's recovery.

Resource viewed on 06.10.2020

Figure 16. *The Ministry of Health of the Republic of Lithuania* http://sam.lrv.lt/en/

Ministry of Health provides Health Care Services: National Contact Point for Cross-border Healthcare, European Health Insurance Card: Travel light, National Health Insurance Fund under the Ministry of Health. Health statistics.

Institutions subordinate to the Ministry of Health are:

- State Health Care Accreditation Agency: http://www.vaspvt.gov.lt/en
- National Health Insurance Fund: http://www.vlk.lt/sites/en/
- Institute of Hygiene: http://www.hi.lt/en/

State Health Care Accreditation Agency

Lietuvos Valstybinė akreditavimo sveikatos priežiūros veiklai tamyba

http://www.vaspvt.gov.lt/lv

www.vaspvt.gov.lt

Figure 17. *State Health Care Accreditation Agency* www.vaspvt.gov.lt

State Health Care Accreditation Agency under the Ministry of Health issues **licenses** for public health care activities according to the Law on Public Health Care of the Republic of Lithuania.

Main activities:

- Healthcare organisations
- Healthcare specialists
- Medical devices in accordance with the EU regulations
- Regulation and management of medical devices (national level)
- Health technology assessment
- Supervision of healthcare quality
- Supervision of patients' rights

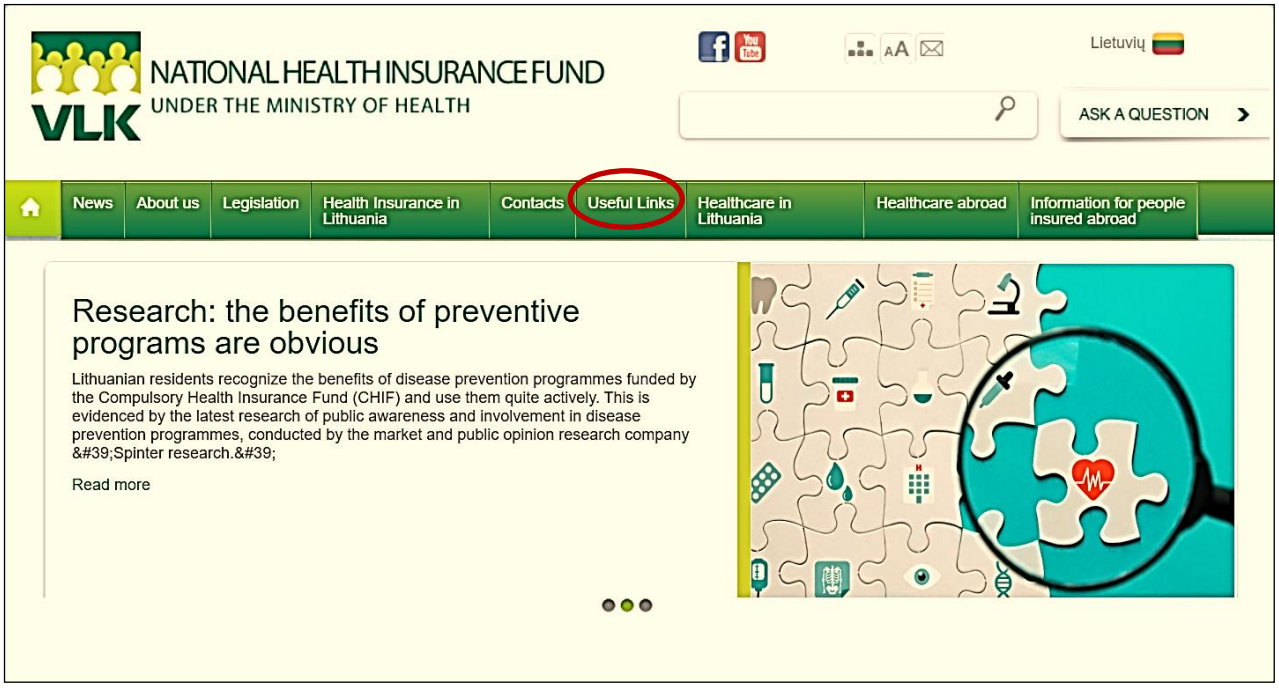

Figure 18. *The National Health Insurance Fund* www.vlk.lt

The National Health Insurance Fund (www.vlk.lt) , under the Ministry of Health, is responsible for **financing** of healthcare services.

https://healthmanagement.org/c/hospital/issuearticle/the-healthcare-system-in-lithuania

Institute of Hygiene (http://www.hi.lt/en/) is a budgetary institution under the Ministry of Health, which implements the state policy in **monitoring** health of the Lithuanian population and healthcare provided, carries out research on public health inequalities and performs public health technology assessment, takes care of patient safety and occupational health care.

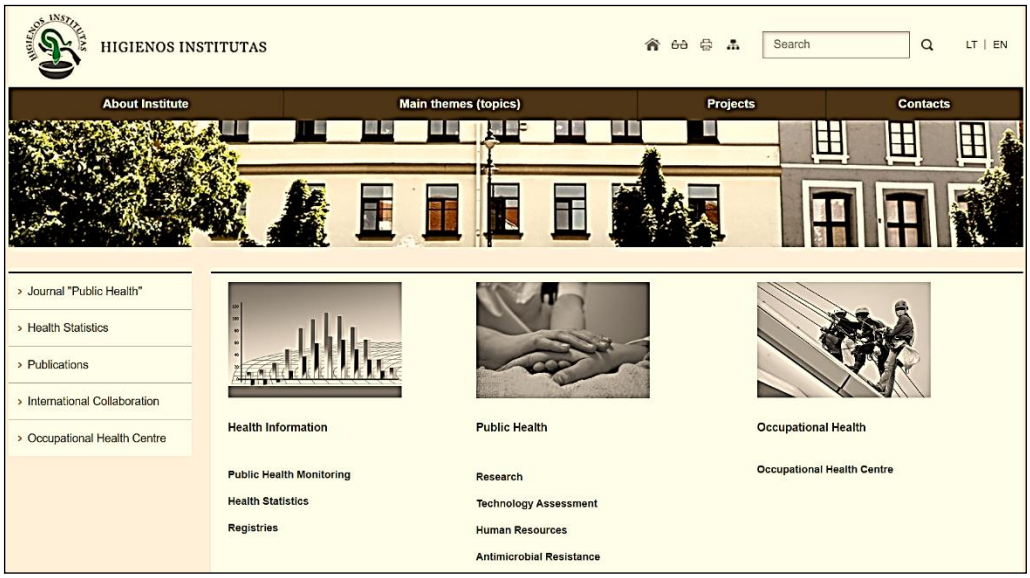

Figure 19. *Institute of Hygiene* http://www.hi.lt/en/

Main areas of activity (subject matters):

Health Statistics

- Public Health Monitoring
- Health Statistics
- Mortality in Lithuania
- Occupational Diseases in Lithuania
- Blood Donors

Public Health

- Public Health Technology Assessment
- Public Health Research
- Public Health Human Resources
- Antimicrobial Resistance and Antimicrobial Consumption
- Healthcare-associated Infections
- Adverse Events
- The Register of Public Health Specialist
- Lifestyle Surveillance

Occupational Health

- Occupational Health Centre

The journal "Public Health" (http://www.hi.lt/journal-public-health.html) was **established by the Institute of Hygiene of** Lithuania in 1996. It is a **unique scientific journal** in the country, specialised purely in the public health. It is intended for researchers, public health managers and administrators, experts working in the field of epidemiology, biostatistics, occupational health, health promotion, environmental health as well as other readers interested in health status of population and factors affecting it. The journal is published quarterly. Electronic version of each issue is placed on the website.

The Institute of Hygiene also creates a **Lithuanian Health Statistics portal** (http://www.hi.lt/health-statistics.html) :

- Monitoring of Lithuanian population health, health care activities and resources.
- Lithuanian Health Indicators Presentation System

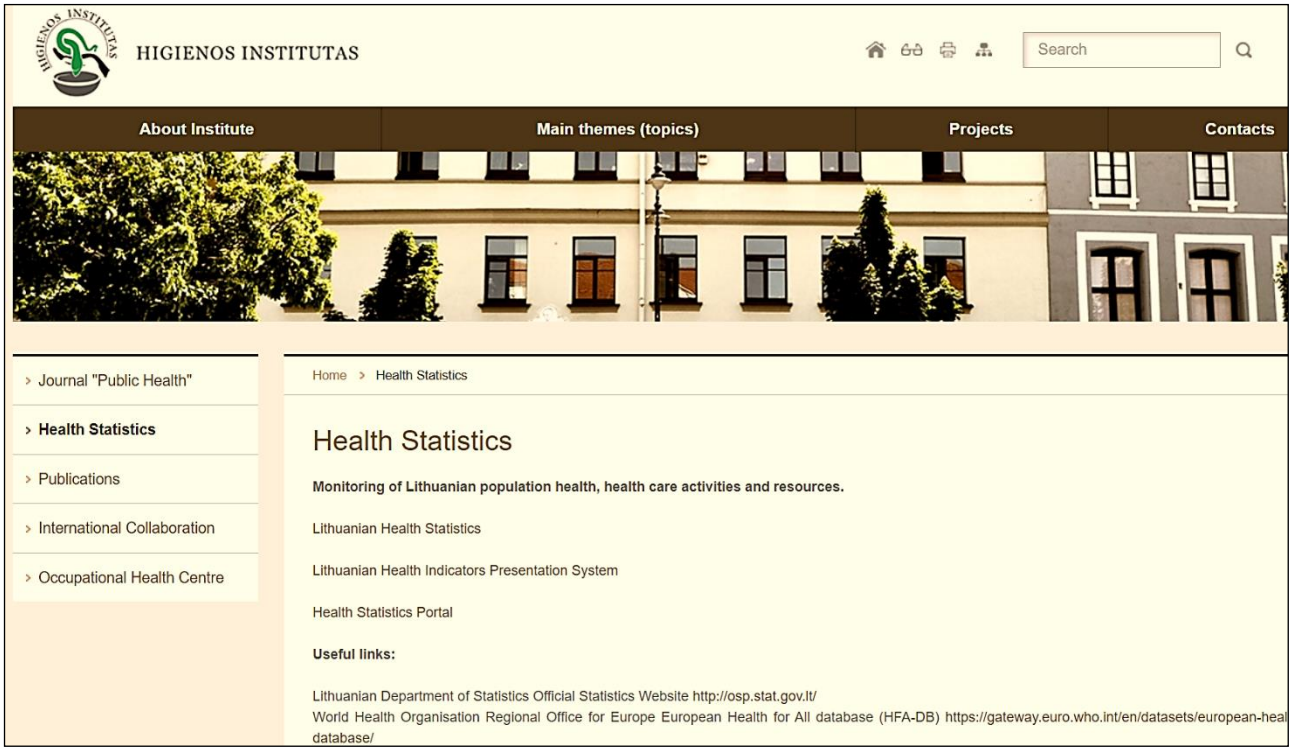

Figure 19. *The Institute of Hygiene* https://stat.hi.lt/user-report-view.aspx?group_id=29

The Health Statistics Portal of the Institute of Hygiene provides information on health statistics in Lithuania. The portal is aimed at monitoring and **analysing trends** in prevalence, incidence, hospital discharge and mortality indicators.

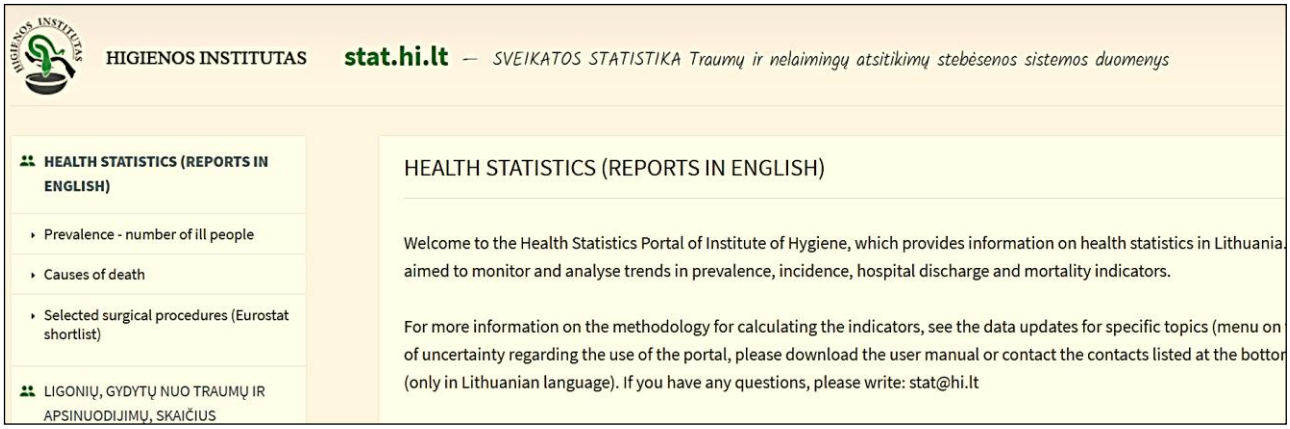

Figure 20. *The Institute of Hygiene*

Official Statistics Website

On the statistics portal of the Institute of Hygiene, a link to the official statistics website of the Lithuanian Department of Statistics is available.

https://osp.stat.gov.lt/pradinis

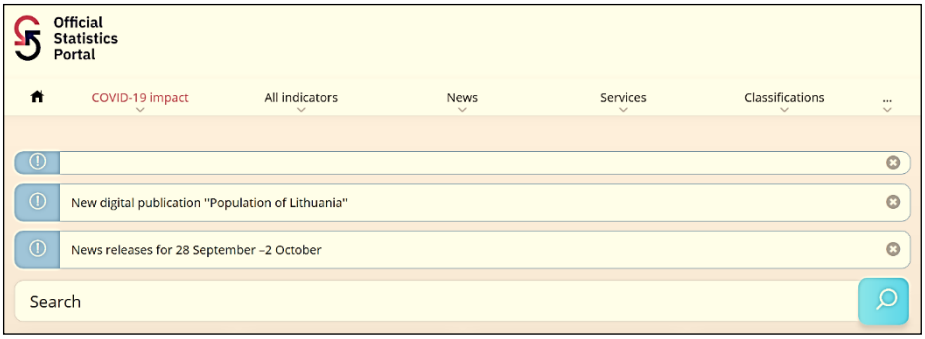

Figure 21. *Official statistics portal* http://osp.stat.gov.lt/

Search possibilities:

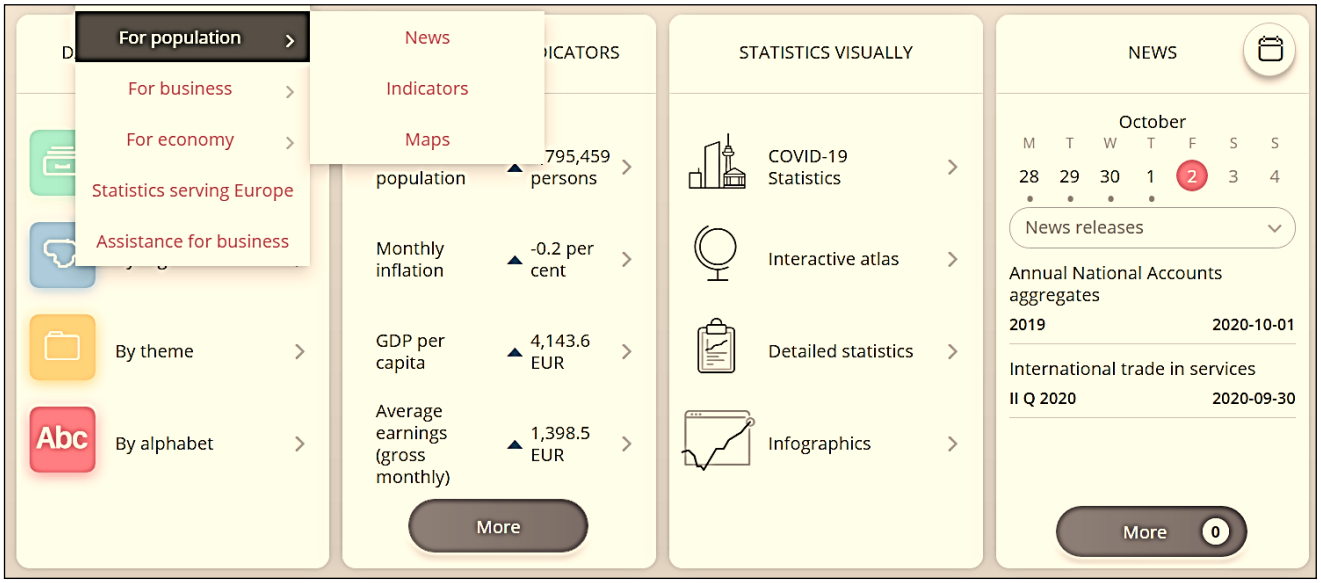

Figure 22. *Official statistics portal*

The Institute of Hygiene has created the **Health Information Centre** http://www.hi.lt/health-information-centre.html). The Health Information Centre develops the assessment of monitoring of Lithuanian residents' health and the factors affecting it, as well as manages and creates public **health registers** and **information systems.**

Main topics of the Information Centre:

- Public Health Monitoring
- Health Statistics
- Mortality in Lithuania
- Occupational Diseases in Lithuania
- Blood Donors

Public Health Technology Centre

http://www.hi.lt/public-health-technology-centre.html

Public Health Technology Centre carries out research on public health inconsistencies and develops **the assessment of** public healthcare **technologies**, while also preparing and testing innovative interventions in the public healthcare practice.

Main topics of the Centre:

- Public Health Technology Assessment
- Public Health Research
- Public Health Human Resources
- Antimicrobial Resistance and Antimicrobial Consumption
- Healthcare-associated Infections

The Occupational Health Centre (OHC) (http://www.hi.lt/occupational-health-centre.html) is a part of the Institute of Hygiene. The Occupational Health Centre **develops research on the effects of the working environment on health** as well as carries out the assessment of occupational healthcare technologies, while also preparing and testing innovative interventions in the occupational healthcare practice. Occupational Health Centre (OHC) is responsible for research, training, expertise, consultation and information in the field of occupational health in Lithuania.

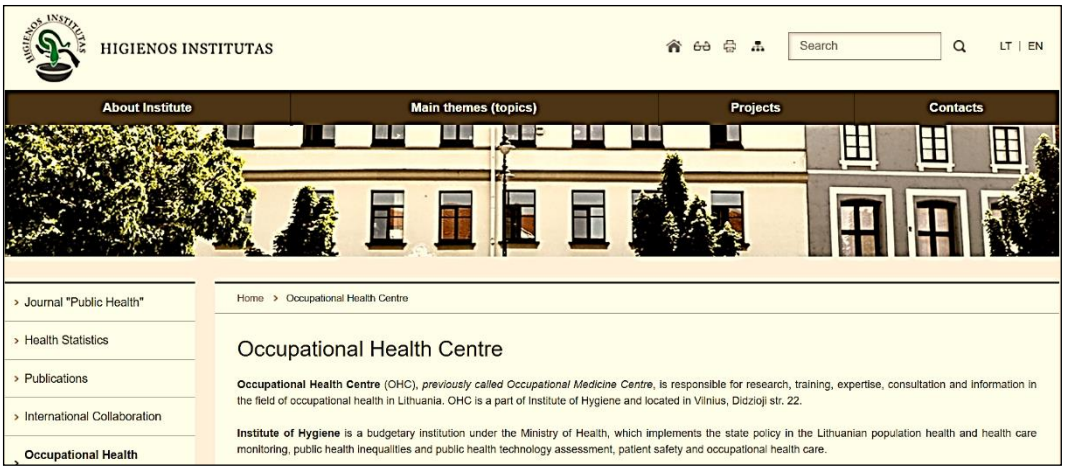

Figure 23. *The Occupational Health Centre (OHC)*

Publications

Publications on the following topics are available on the website of the Institute of Hygiene (http://www.hi.lt/publications-2.html):

- Health Statistics of Lithuania
- Medical Data of Births
- Causes of Death
- Health in the Baltic Countries
- Various Publications
- Publications in Lithuanian

Publications provided by the Occupational Health Centre: http://www.hi.lt/publications-4.html

- Scientific articles

- Scientific studies
- Methodical and practical publications

Figure 24. *The National Contact Point (NCP) for Cross-border Healthcare*

The National Contact Point (NCP) for Cross-border Healthcare (http://lncp.lt/en/), maintaining active cooperation with public organisations, providers of healthcare services and health insurers, guarantees the successful enforcement of the patients' rights to cross-border healthcare services.

The functions of the National Contact Point for Cross-border Healthcare in the Republic of Lithuania are assigned to:

- The State Health Care Accreditation Agency under the Ministry of Health (www.vaspvt.gov.lt);
- The National Health Insurance Fund under the Ministry of Health (www.vlk.lt).

The National Contact Point for Cross-border Healthcare shall provide the information concerning:

- availability, quality and safety of healthcare services;
- health insurance cover;
- prices of health care services;
- prices of medicines;
- possibilities for reimbursement of the prices of healthcare services or medicines,
- providers of healthcare services,
- pharmacies authorised to perform pharmaceutical activities;
- the right of the specific provider of healthcare services to provide services or any restrictions on its practice,
- standards of healthcare services,
- patients' rights, complaints procedures and mechanisms for seeking remedies,
- legal and administrative options available to settle disputes, including in the event of harm arising from cross-border healthcare,
- particulars of contact points of other Member States of the European Union,
- other matters related to the safety of the patients' rights.

Vilnius University Library. Faculty of Medicine.

https://biblioteka.vu.lt/en/

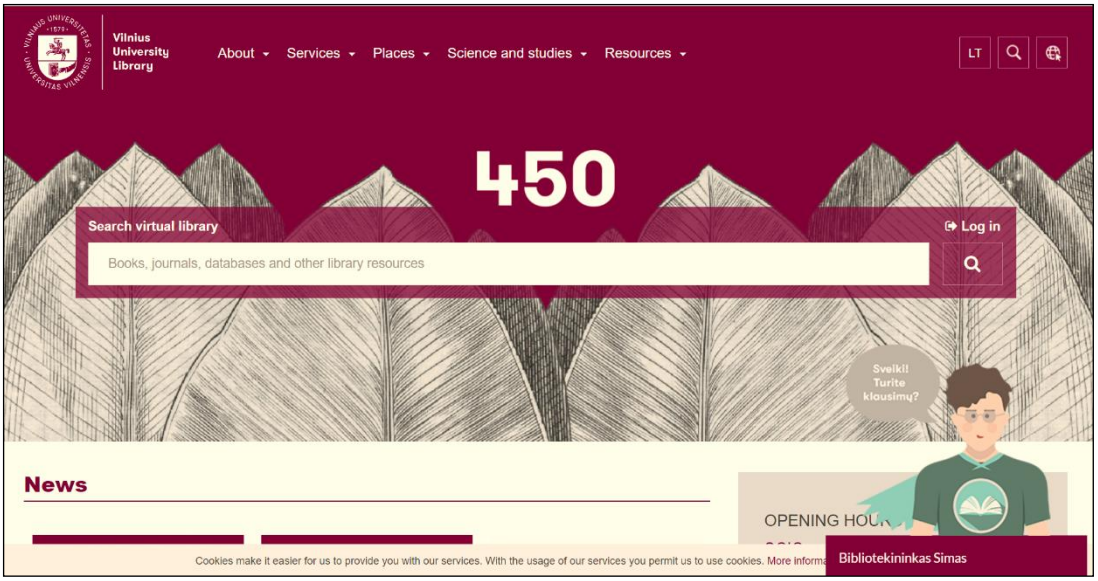

Figure 25. *Vilnius University Library*

Lithuanian University of Health Sciences (LSMU)

Institution - Lithuanian University of Health Sciences, Kaunas

https://lsmuni.lt/en/about-university/university-today/

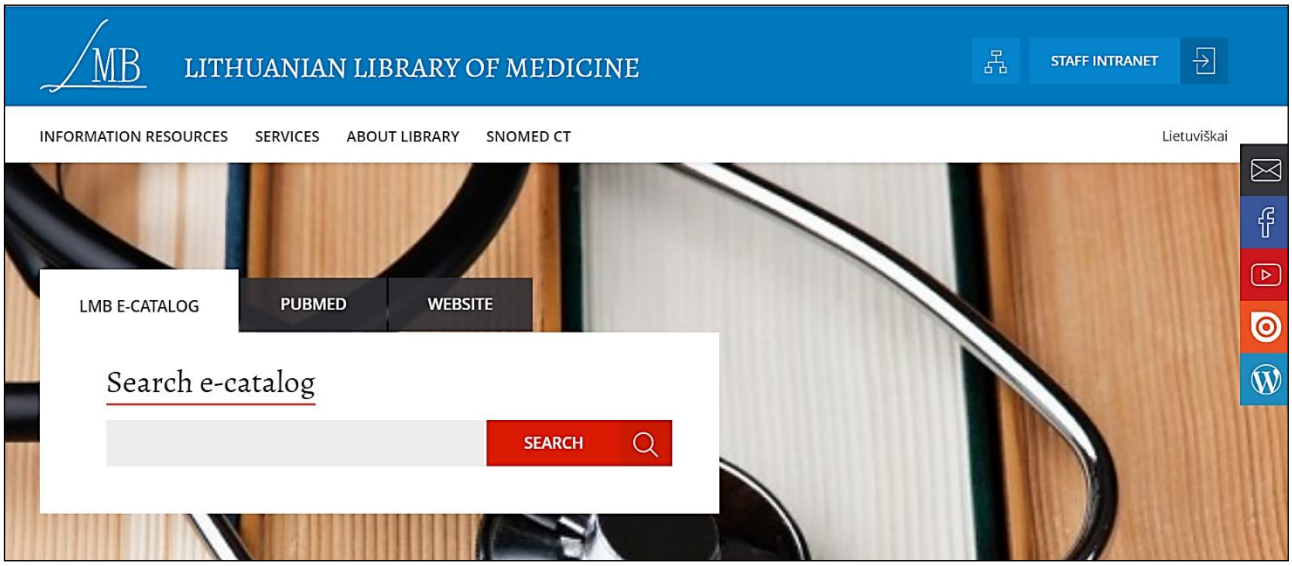

Figure 26. *The Lithuanian Library of Medicine*

The Lithuanian Library of Medicine (http://www.lmb.lt/en/), founded in 1944, is the largest book stock of medical and related sciences (biology, psychology).

http://www.lmb.lt/en/history/

https://lsmuni.lt/en/

Lithuanian University of Health Sciences, Kaunas. Library.

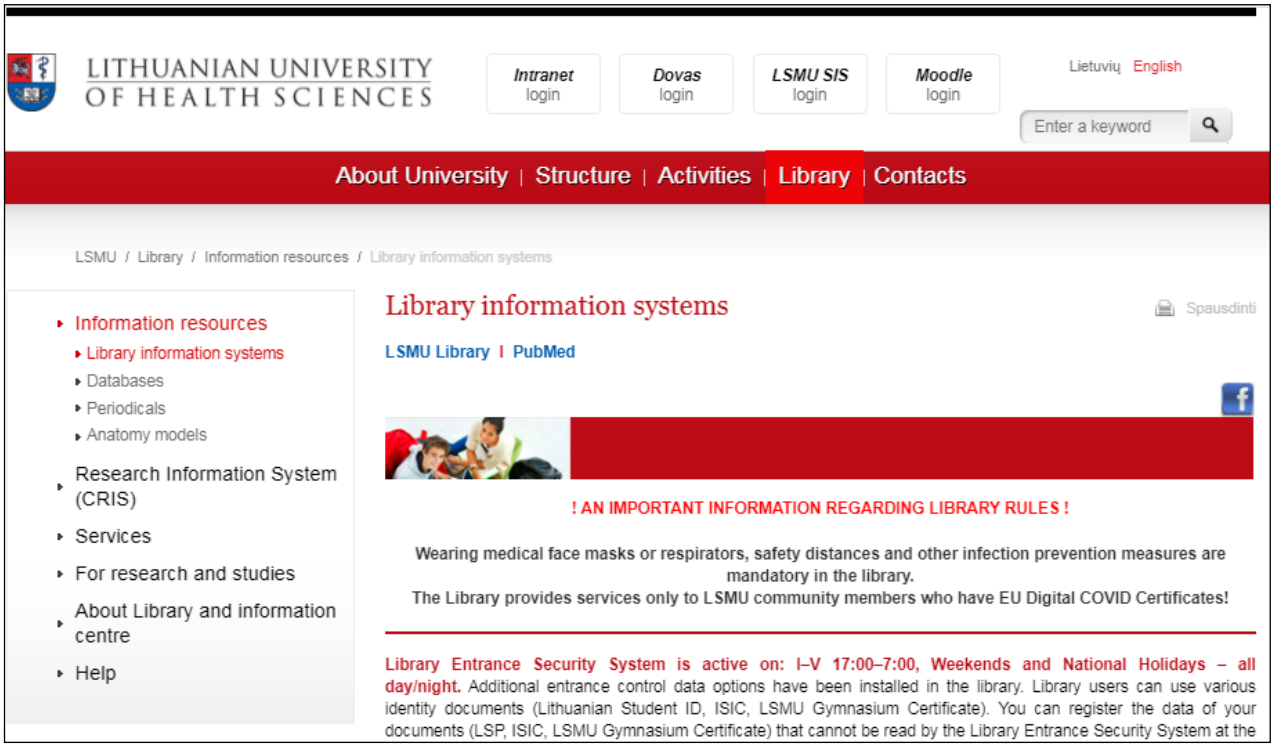

Figure 26. *Lithuanian University of Health Sciences*

Firure 27. *The Medicines Control Agency* (SMCA) https://www.vvkt.lt/About-us

https://www.vvkt.lt/index.php?3327723903

The State Medicines Control Agency (SMCA) is a governmental body of the Republic of Lithuania with headquarters in Vilnius

1. Its main responsibility is the protection of public health through the evaluation and supervision of medicines for human use, including:

- the scientific evaluation of marketing authorisation applications and marketing authorisation (medicines derived from biotechnology and other high-technology processes, medicines containing new active substance intended for the treatment of HIV/AIDS, cancer, diabetes or neurodegenerative diseases, and orphan medicines cannot be approved nationally);
- the supervision of manufacturing authorisation holders, wholesale distribution authorisation holders, and pharmacies in Lithuania (inspections, laboratory testing, and licensing);
- the supervision of clinical trials and legal turnover of narcotic and psychotropic medicines.

2. The safety of medicines is monitored constantly by the SMCA through a pharmaco vigilance network. The SMCA takes appropriate actions, if adverse drug reaction reports suggest changes to the benefit-risk balance of a medicine.
3. The SMCA is headed by the Director and has about 127 staff members.
4. The Agency brings its own scientific resources together with those of Kaunas Medical University and Vilnius University in a network of over 50 national experts.
5. The SMCA is involved in working groups of the Ministry of Health of Lithuania as well as in scientific and regulatory bodies of the European Union including Committees and working parties of the European Medicines Agency (EMEA), the European Commission, and the European Council.

Figure 28. *LPSA* https://lpsa.lt/en/main-page/

Estonia

The Ministry of Social Affairs (https://www.sm.ee/en) works in several fields (regarding to its competence), but when we talk about Health, the areas of activity are (can be found under the section *Activities*, *Objectives*):

- Health care (as said in the Ministry's home page "The role of the Ministry of Social Affairs is to plan the healthcare policy and organise its implementation"). Under the *Health care*

section there are links to sub-sections: *Primary Health Care; Specialised Medical Care; Nursing, Midwifery; Health Professionals; Ambulance, Quality of Health Services and Medicinal Products/Devices* with descriptions and useful links.

- Public health. The Ministry is responsible for the development and management of public health policy. Under this section, links to organisations related to public health in Estonia are included: National Institute for Health Development (https://www.tai.ee/en/); Estonian Health Insurance Fund (https://haigekassa.ee/en); State Agency of Medicines (https://www.ravimiamet.ee/en); the Health Board (https://www.terviseamet.ee/en/health-board) and also links to strategic documents. Under the *Public health* section there are links to sub-sections: *Health Promotion; Infectious Diseases and Environmental Health* with descriptions and useful links.
- E-Health. Information about E-health system, where medical organisations enter health data about a person. This section also includes useful links and strategic documents. There is an important link to the Patient portal https://www.digilugu.ee/login, where after authorisation a person can see their health data, book doctor's appointments, see prescribed medicines etc. ***Question:*** *What else patient can do on the Patient portal?*

  Also, on the Ministry's homepage under the section *Ministry, Contacts* is a sub-section *Administrative Field Institutions* with direct links to the Ministry's administrative institutions.

University of Tartu (https://www.ut.ee/en) provides higher education in four faculties. Under the section *About us* is a subsection *Contacts* with links to these faculties.

Medicine and related sciences are taught in the Faculty of Medicine and the Faculty of Science and Technology.

The Faculty of Medicine (https://meditsiiniteadused.ut.ee/en) consists of six institutes:

- Institute of Biomedicine and Translational Medicine (https://www.biomeditsiin.ut.ee/en)
- Institute of Pharmacy (https://www.farmaatsia.ut.ee/en)
- Institute of Dentistry (https://hambaarstiteadus.ut.ee/et) EST
- Institute of Clinical Medicine (https://kliinilinemeditsiin.ut.ee/en)
- Institute of Family Medicine and Public Health (https://tervis.ut.ee/en)
- Institute of Sport Sciences and Physiotherapy (https://www.kk.ut.ee/et)

The home page of the Faculty of Science and Technology: https://reaalteadused.ut.ee/en

One of the institutes of the Faculty of Science and Technology related to medicine is Institute of Molecular and Cell Biology (https://www.tymri.ut.ee/en), which implements higher education programmes in the field of molecular and cell biology.

University of Tartu Library: (https://utlib.ut.ee/en) the subject libraries related to the field of medicine are Biomedicum Library; Centre of Medical Information at the University of Tartu Hospital Library; Institute of Pharmacy Library and Institute of Sport Sciences and Physiotherapy Library. On the homepage of the University of Tartu Library are included short descriptions of each library, their opening hours and contact information.

When we speak about the University of Tartu, we need to mention another institute – **the Institute of Genomics** (https://genomics.ut.ee/en) which is a structural unit of the University of Tartu.

Viewed/Last seen 08.12.2020.

Tartu University Hospital (https://www.kliinikum.ee/en/)

Tartu University Hospital is the biggest hospital in Estonia and the only academic hospital in Estonia.

There is a section *For the Patient* on the homepage containing topical and useful information for patients. The section *Clinics and Services* leads to the list of Tartu University Hospital clinics and gives a direct link to the homepage of each clinic. There is also the sub-section *Services* with information about several structural units. One of these units is the Centre of Medical Information (https://www.kliinikum.ee/infokeskus/en/). The homepage of the Centre of Medical Information starts with topical information, there is a list of paid databases, and also open access databases are listed. Under the section *Library* there are collections of links of free electronic medical books and journals. Also, the links to free access guidelines in several medical fields are available on the website, links and materials related to patient information and links to the Estonian and foreign libraries, mostly related to medicine.

Question: *Using the mentioned resources, please find the "International Statistical Classification of Diseases and Related Health Problems 10th Revision".* Answer: RHK-10 link is on the page of the Medical Information Centre.

Viewed/Last seen 10.12.2020.

Tallinn University (https://www.tlu.ee/en) provides professional higher education studies in different study programmes, but health related sciences are taught in School of Natural Sciences and Health of Tallinn University.

The Academic Library of Tallinn University (http://www.tlulib.ee/index.php/en/) offers links to free e-resources (mostly in English). Links are available under the section *Subject Information* and the sub-section *School of Natural Sciences and Health* and *Useful links.* Links are mostly meant for professionals in the field. Viewed/Last seen 28.12.2020.

The Estonian Medical Association (https://arstideliit.ee/) is the association of Estonian physicians which promotes the development and prestige of medical profession, defends physicians' interests, promotes medical ethics and represents the standpoints of the medical community in shaping health care policy in Estonia.

https://arstideliit.ee/erialaseltsid – link to specialist societies.

https://arstideliit.ee/eesti-arstide-liit/liikmelisus-organisatsioonides – link to international societies.

The homepage of the Estonian Medical Association is only in Estonian.

Viewed/Last seen 11.01.2021.

ScienceDirect Database

The ScienceDirect database is the database of the Elsevier publishing house that contains information about several thousand magazines and books published by Elsevier. Both journals and books in this database cover a very wide range of information in various fields of science: health sciences, medicine, humanities and social sciences, natural sciences, and technical sciences. Libraries that have subscribed to this database have access to a large number of full-text journals and books. Bibliographic information and abstracts for all Elsevier publications are available in the ScienceDirect database.

More than 1.2 million articles in the ScienceDirect database have open access articles that are peer-reviewed and freely available for anyone to read, download, and reuse in accordance with the user license displayed on the article. For example, 459 journals of the Elsevier publishing house are available in open access in the ScienceDirect database in health sciences (see Figure 29).

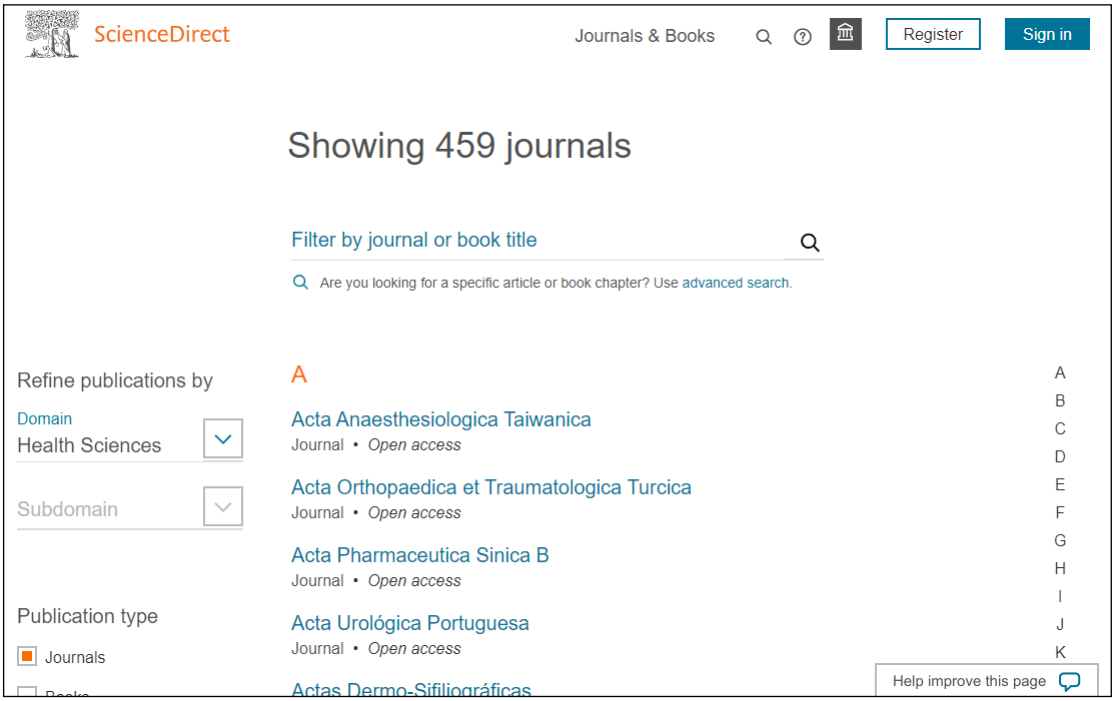

Figure 29. *ScienceDirect database*

The information from the ScienceDirect database can be offered for use to researchers who want to be informed about the latest developments in their field, to follow new discoveries and to use interdisciplinary research.

There are several types of search available in the ScienceDirect database: *basic search* and *advanced search*. If a user needs some information about a medical topic and the keywords or articles of a particular author are known, the keywords of the particular topic or the surname of the particular author may be entered in the basic search box on the home page of the ScienceDirect database (see Figure 30).

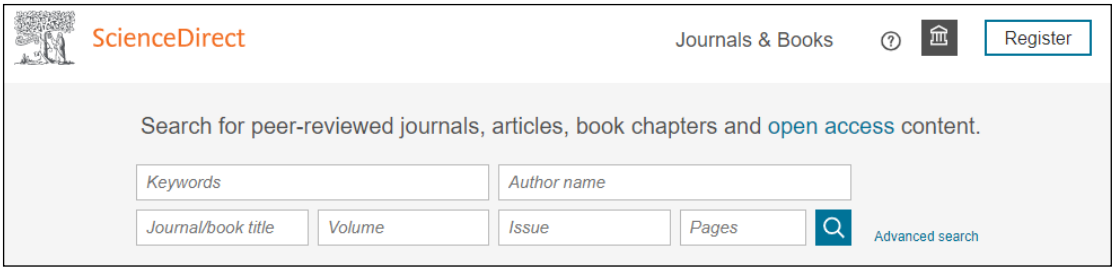

Figure 30. *ScienceDirect database: basic search*

The user can also search for the information by the title of a particular book or a journal, volume, issue and pages in the basic search box.

The *Advanced Search* form allows you to search for information by specifying one or more pieces of information at a time (such as searching by keywords, author, and date). You can create a search phrase using the Boolean Operators. No field available in the advanced search is mandatory to be filled in. At least one field is required to be filled in. A description and explanation of each field can be found in the link *Search tips*. To open additional search fields, click *Show all fields* (see Figure 31).

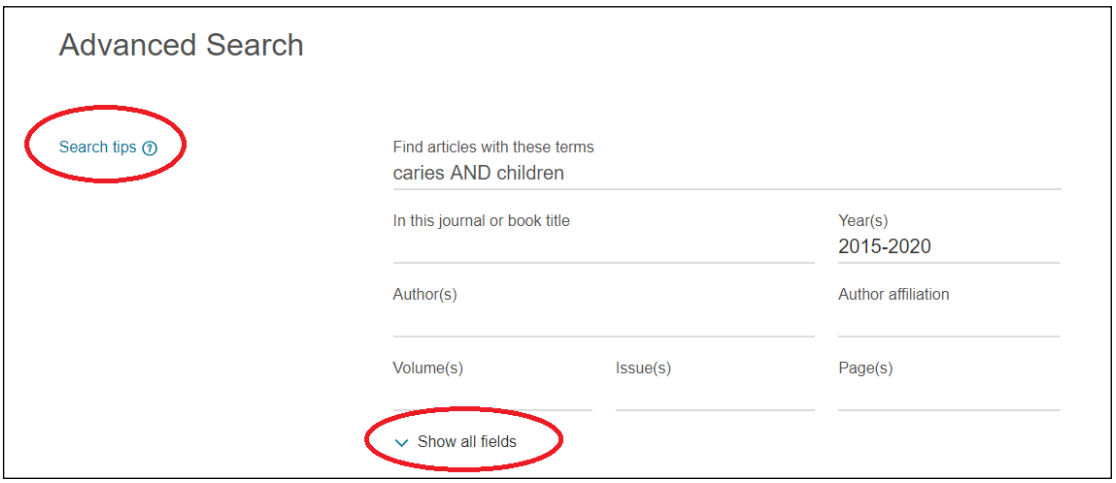

Figure 31. Advanced Search

The results found may be sorted by relevance or date. On the left side of the results list, you may mark which publications you want to look at by reducing the number of results, for example, by a certain year, by a specific type of publication (types of publications in the *ScienceDirect* database are named and described in the link below the question mark icon attached to the publication type section), by journal title, by the field of science or by the type of access. The types of access used in the *ScienceDirect* database are described next to the question *What different access levels are there for journals and books?* on the website of the *ScienceDirect Support Center* in the answers to various questions. (See Figure 32).

Document type	Access level
● *Open access*	Anyone can read and download the full content
● *Open archive*	Anyone can read and download the full content. Articles are made available after an embargo period.
● Full text access	The article/chapter is included in your institution's subscription to ScienceDirect. You can read and download the full content.
○ Abstract only	The full article/chapter is not part of your subscription. The content of the abstract can be read. The full article/chapter, if available, can be purchased through the shopping cart with a credit card or charged to your institution's account according to the terms of their contract.
○ No access	The article/chapter is not part of your subscription. A separate abstract is not available. The full article/chapter, if available, can be purchased through the shopping cart with a credit card or charged to your institution's account according to the terms of their contract.

Figure 32. The types of access

In the list of the results found, you can see bibliographic descriptions of publications, accompanied instructions for downloading the full text, exporting the abstracts, extracts (concise excerpts from the abstract), a bibliographic description. Bibliographic descriptions of the publications for which the full text is not available may be accompanied by references only to the abstract or export.

Tasks

Please find scientific articles on lung diseases in the journal "*The Lancet"* for the last 5 years in the *ScienceDirect* database.

Complete the task using basic search:

Step 1. Open the *ScienceDirect* database at http://www.sciencedirect.com/.

Step 2. In the basic search box that opens immediately, enter the search keywords "lung diseases" in the *Keywords* search field and the title of the journal *"The Lancet"* in the *Journal / Book title* field.

Step 3. When the list of the results opens, the last 5 years should be marked on the left side to narrow the search for the last 5 years.

Step 4. On the left side of the list of the results, the required type of publication (*Article type*) – *Research articles* should be marked.

Complete the task using advanced search:

Step 1. Open the *ScienceDirect* database at http://www.sciencedirect.com/.

Step 2. Choose *Advanced Search*.

Step 3. Enter the keywords "lung diseases", the title of the journal *"The Lancet"*, the required years in the appropriate search fields and mark the required type of publication at the bottom of the search box– *Research articles* (see Figure 33).

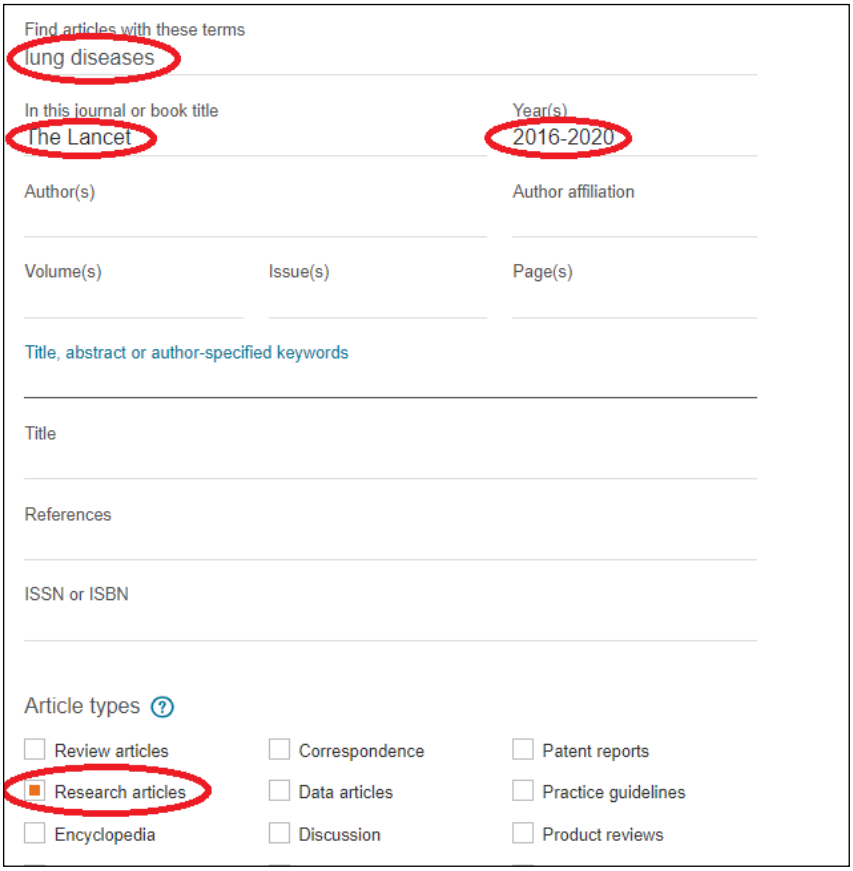

Figure 33. Advanced search

Please find the scientific articles by Andrejs Ērglis in the *International Journal of Cardiology* in the *ScienceDirect* database.

Complete the task using basic search:

Step 1. Open the *ScienceDirect* database at http://www.sciencedirect.com/.

Step 2. In the simple search box that opens immediately, enter the author you are looking for: Andrejs Ērglis (you can write using macrons) in the search field *Author name* and the title of the journal "*International Journal of Cardiology*" in the *Journal / Book title* field.

Step 3. On the left side of the list of the results, the required type of publication (*Article type*) – *Research articles* should be marked.

Complete the task using advanced search:

Step 1. Open the *ScienceDirect* database at http://www.sciencedirect.com/.

Step 2. Choose *Advanced Search*.

Step 3. The title of the journal *"International Journal of Cardiology*" and the name and surname of the searched author - *Andrejs Ērglis* are entered in the appropriate search fields and mark the required type of publication at the bottom of the search box – *Research articles.*

List of information sources:

ScienceDirect database http://www.sciencedirect.com/

ScienceDirect Support Center. How do I use the advanced search? https://service-elsevier-com.db.rsu.lv/app/answers/detail/a_id/25974/supporthub/sciencedirect/

ScienceDirect Support Center https://service.elsevier.com/app/home/supporthub/sciencedirect/

ScienceDirect Support Center. What different access levels are there for journals and books? https://service.elsevier.com/app/answers/detail/a_id/9621/supporthub/sciencedirect/kw/What+different+access+levels+are+there+for+journals+and+books/

EBSCO Database

EBSCO*host* is a powerful online reference system accessible via the Internet. It offers a variety of proprietary full text databases and popular databases from leading information providers.

The comprehensive databases range from general reference collections to specially designed, subject-specific databases for public, academic, medical, corporate and school libraries.

EBSCOhost – Tutorials https://connect.ebsco.com/s/article/Where-can-I-find-tutorials-on-EBSCO-interfaces?language=en_US

https://www.youtube.com/watch?v=LwdvCs9aFKQ

An electronic resource platform provides access to the databases and collections offered by Ebsco Information services. For example, Medline Complete, Medline, Academic Search Complete, Health Source: Nursing/Academic, Academic Search Ultimate, etc.

To start. Select and mark from the list of databases with which to start the search.

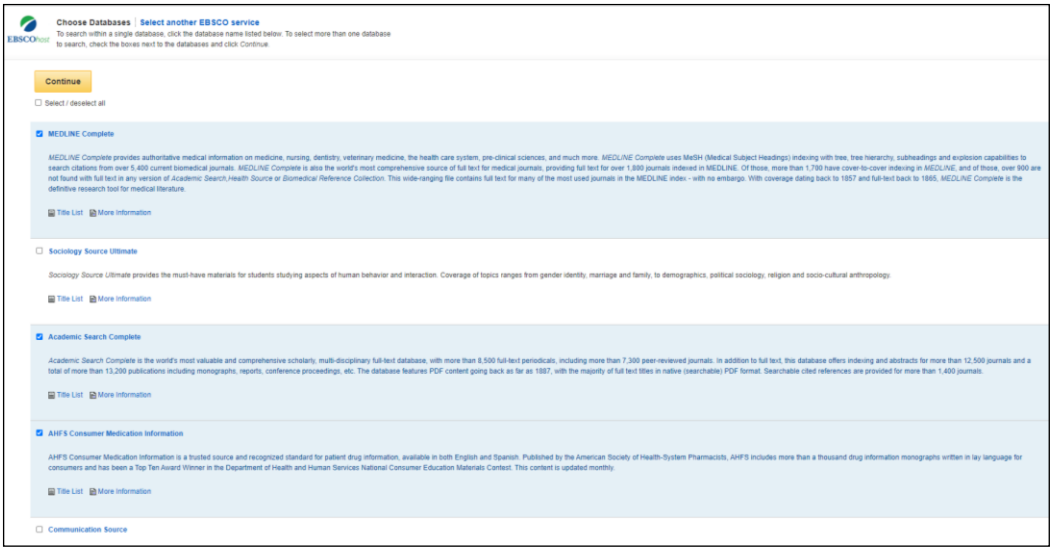

Figure 34**.** List of databases

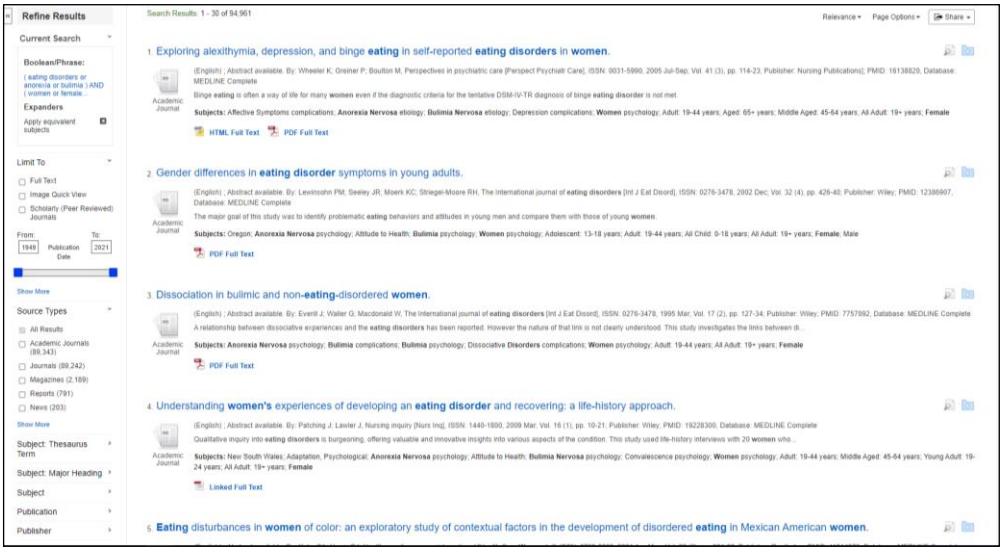

Figure 35. The Result List displays

Refine search

The Left Column displays the Current Search, Limiters, and Facets

Current Search - Click the toggle arrow to open the Current Search box. Current Search keeps track of your search terms, search options, and facets applied to your search.

Limit To– Apply limiters right from the Result List by clicking a hyperlinked limiter or checkbox. Refine your search even more by clicking the *Show More* link.

Facets – You can narrow by source type, subject, journal, author, and more. This feature, also known as "clustering," is helpful if you want to discover the major subject groups for your topic without having to browse multiple pages of results, or checking individual articles to see if they are relevant.

When the Detailed Record is displayed, it may also include a summary or an abstract. If activated by your library administrator, the full text of the article may appear below the Detailed Record. The *Image Quick View* feature provides the ability to view thumbnails of the images in an article right from the citation.

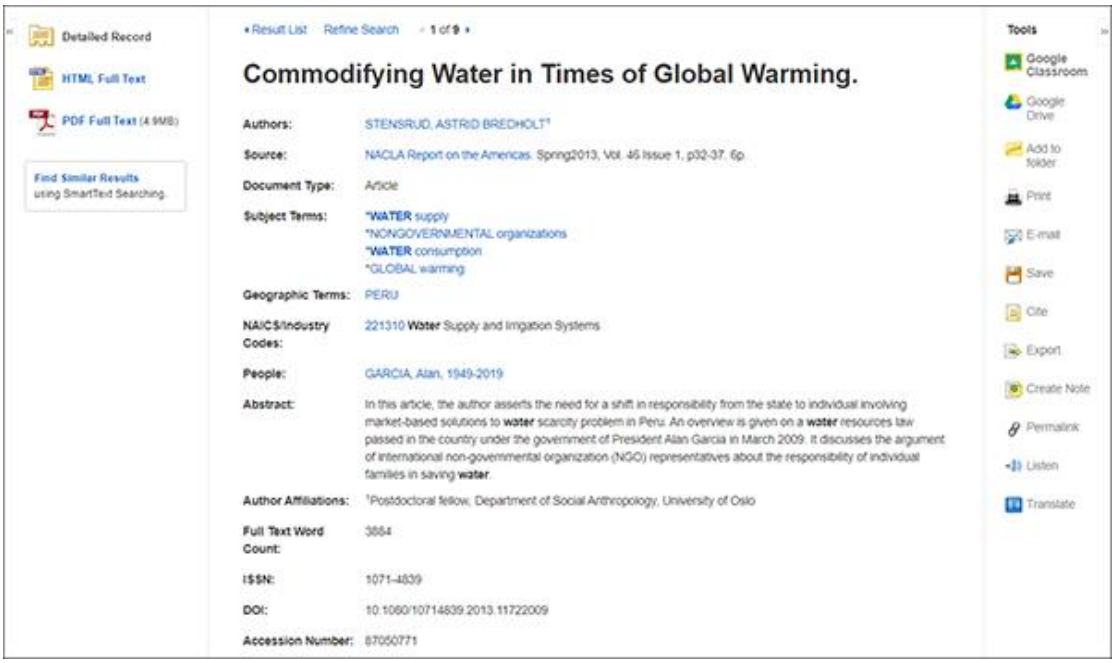

Figure 36. *Detailed Record*

- The author and subject terms of the record can appear as links that let you perform a search of that particular field.
- When available, a *Find Similar Results* link will display on the citation. Click the link to perform a SmartText search for related articles. SmartText Searching will run the search using the citation's abstract and a new Result List will display. If no abstract is available, SmartText Searching will run the search on the article title. If SmartText Searching is not available in the database being searched, Find Similar Results searches the article's subject headings or descriptors.
- The source may display a link or journal logo that leads to a detailed view of the source or publication. Clicking on the journal logo links you to a detailed description of the journal. Clicking *Back* returns you to the full record of the article.
- The source may also include a table of contents link that lets you perform a search on the same issue of the source or publication.

Tools Menu

When viewing an article, there are several tools available to you on the right-hand side of the screen.

- **Google Classroom** - Share the article to Google Classroom.
- **Google Drive** - Save the article to your Google Drive account.
- **Add to folder** - Add the article to the session folder or your personal My EBSCO*host* folder.
- **Print** - Print the article.

- **E-mail** - E-mail the article to yourself or multiple e-mail addresses.
- **Save** - Save the article to a destination on your computer.
- **Cite** - Retrieve citation information for the article in several different formats.
- **Export** - Export the article to your bibliographic management software.
- **Create Note** - Save a note on the article to your My EBSCO*host* folder.
- **Permalink** - Copy and paste a persistent link to the article.
- **Listen** - Hear the HTML Full Text of an article read to you using Text-to-Speech. (If enabled by your administrator.)
- **Translate** - Translate the HTML Full Text of the article to one of many available languages. (If enabled by your administrator.)

When you want to combine search terms, you will need to use the **Boolean operators**, or connectors. This is best done using the advanced search mode. There are three main Boolean operators: AND, OR, and NOT.

Use *AND* to retrieve articles that mention both terms somewhere in the article. The use of AND generally will retrieve **fewer but more focused results.**

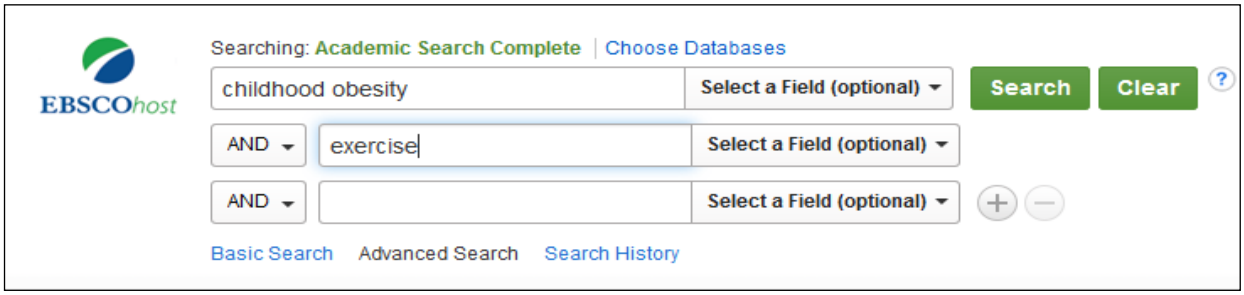

Figure 37. Example: Childhood obesity AND exercise

Use *OR* between two terms to retrieve articles that mention either term**.** The use of OR generally will retrieve a larger set of results**.** The OR operator is useful when searching with terms that are synonyms or convey the same concept.

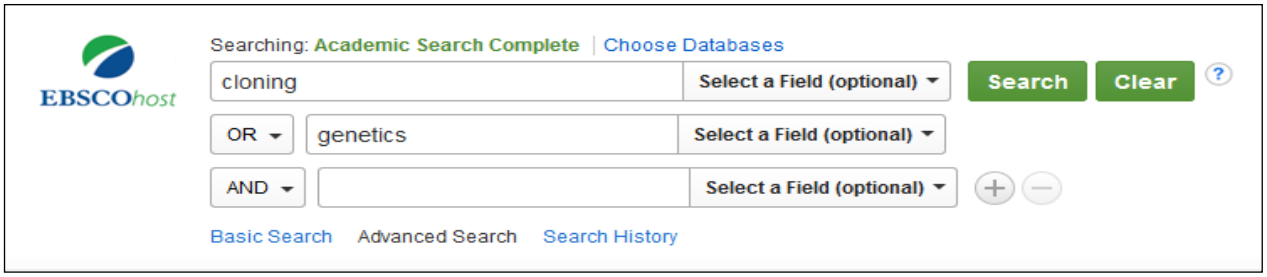

Figure 38. Example: Cloning OR genetics OR reproduction

Use *NOT* to exclude terms**.** The use of NOT allows you to remove search results containing a specific term. The use of NOT generally will retrieve fewer but more relevant results**.**

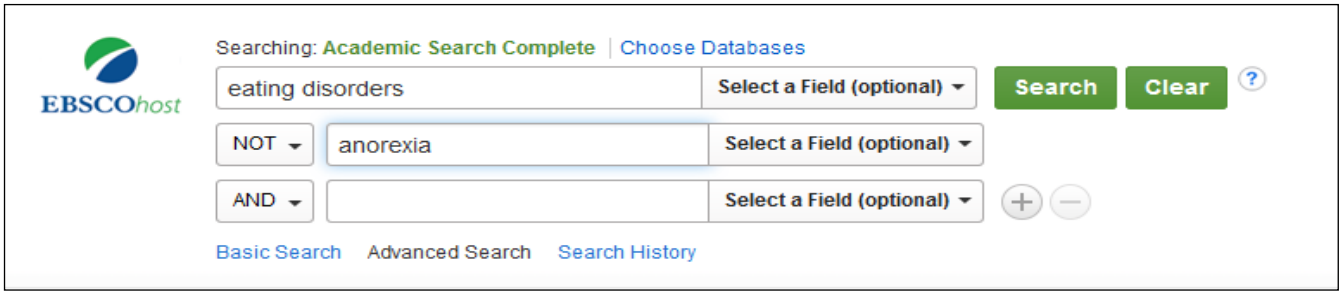

Figure 39. Example: Eating disorders NOT anorexia

A good technique for focusing a database search is to limit your search to a specific field. Do a field-specific search when you are looking for:

- articles in a particular journal
- items published in a particular year or years
- particular keywords in the title
- items written in English only

Example: Search for "Eating Disorders" as a keyword; search for "Gupta" in the Author field; search "Secondary Eating Disorder" in the Title field.

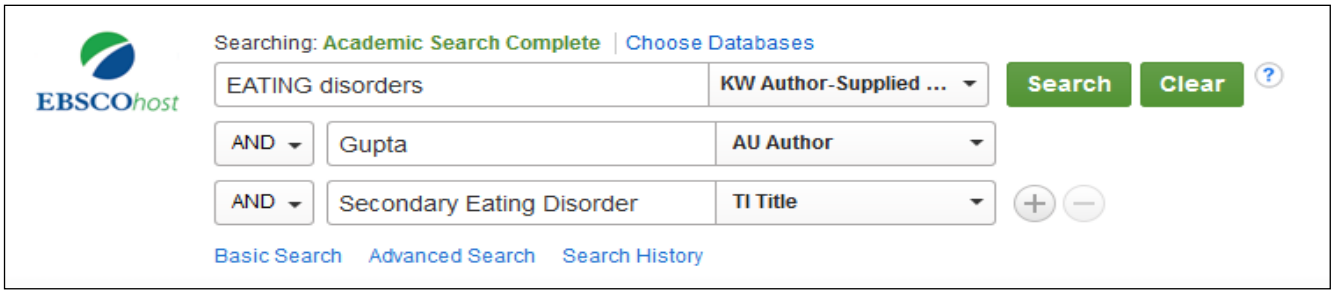

Figure 40. Example: Search for "Eating Disorders"

Unlike keyword searches**,** subject searches only return results that include your search term in the subject headings field.

Many databases use a controlled vocabulary, which is a list of standardized subject headings used to index content. You can usually find the database's-controlled vocabulary in a section called subject terms or the thesaurus. Use this tool to determine which word or phrase is the one used by the database for a specific concept. For example, since "adolescents" and "teenagers" mean roughly the same thing, a database may choose to index all articles on this topic under "teenagers." That way, a subject search for "teenagers" will also return articles about "adolescents."

Example (Figure 41):

In the database Academic Search Complete, we clicked "Subject Terms" in the blue menu bar. We then browsed for the term "adolescents." The search revealed that the preferred term in this database is "TEENAGERS."

- For best results, use the Advanced Search option in a database when you are doing a search that uses multiple concepts or terms.
- While MeSH subject headings can be helpful for focusing results, sometimes they are not assigned until weeks after an article is placed in the database. To find the most recent articles, you also may want to try using keyword searches (i.e., without requiring them to appear in the subject's field).
- The *SU Subjects* field in **MEDLINE with Full Text** includes both MeSH (National Library of Medicine medical subject headings) and "contributed indexing" keywords.
- Some limiters such as *source type*, which includes *Academic Journals*, are only available in the "*Refine results*" panel on the left side of the search results screens

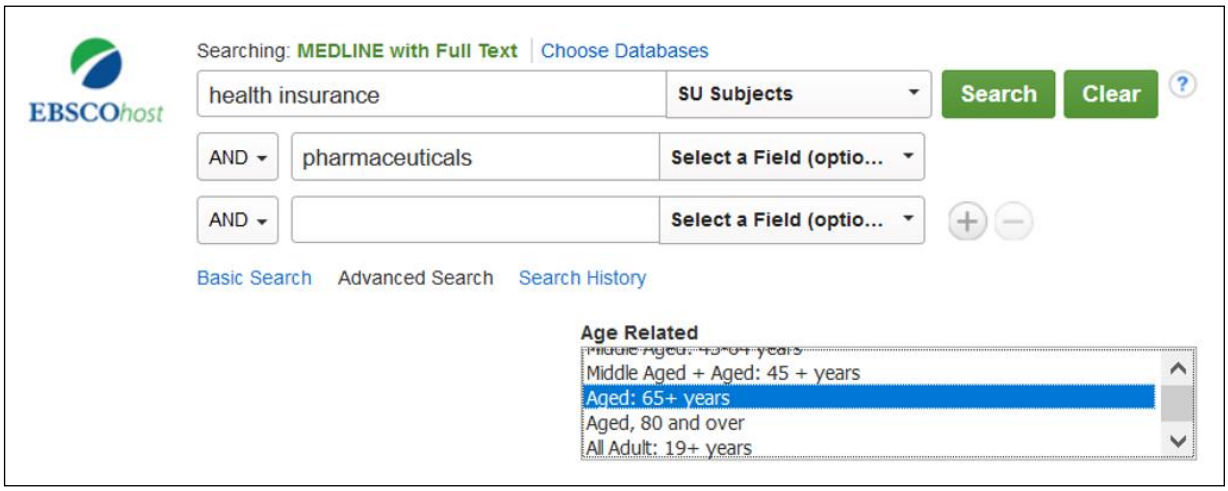

Figure 41. Example

To use Advanced Search with Guided-Style Find Fields:

1. Click the *Advanced Search* link below the *Find* field.
2. Enter your search terms in the first *Find* field on the Advanced Search screen.

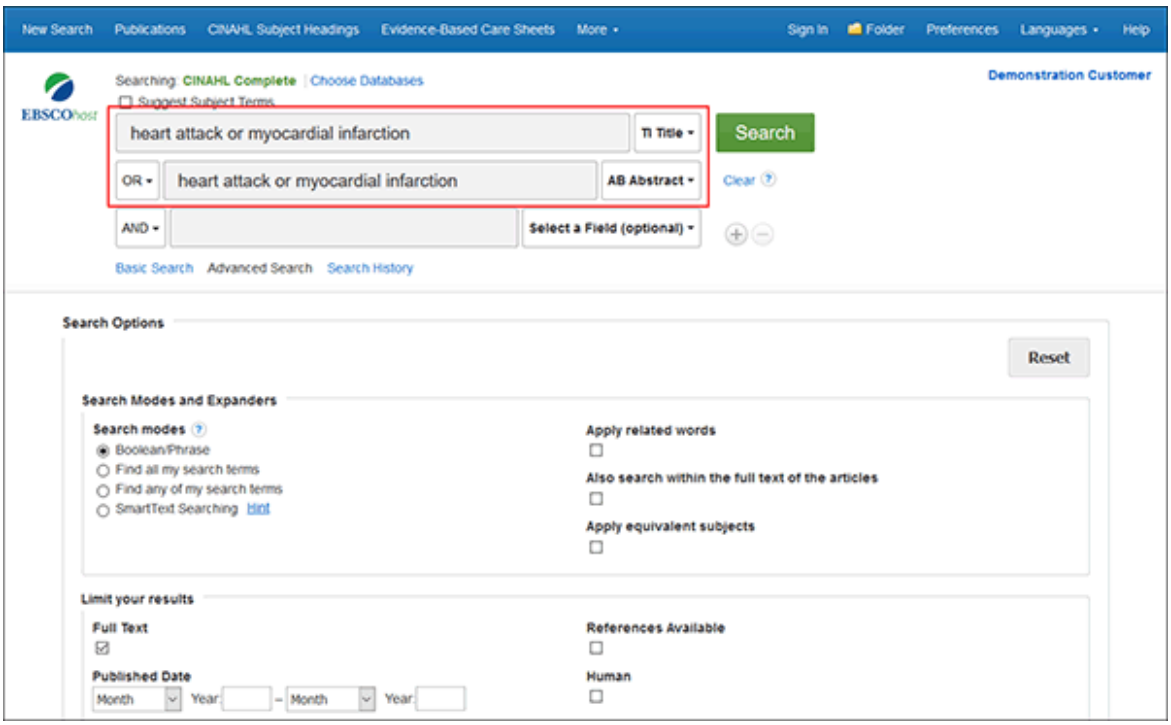

Figure 42. Advanced search

3. Choose a citation search field from the *Select a Field* drop-down list (for example, search in only the *Title* field of the citation).
4. Repeat steps 1 and 2 for the second set of *Find* fields.
5. Select a Boolean operator (AND, OR, NOT) to combine the two *Find* field entries.
6. You can enter another Boolean operator, keyword, and search field in the third set of fields.
7. If you need additional rows, click the *Plus button* ⊕. Up to 12 rows can be displayed. To delete a row, click the *Minus button* ⊖.
8. Select from the available Search Options:

    - *Search modes* - Use specific search modes, such as "Find all my search terms," or "SmartText Searching," or use search options that expand your search such as "Apply related words."
    - *Limit your results* - Apply limiters such as *Full Text* or *Publication type.*
    - *Special Limiters* - Apply limiters specific to a database. If you select a special limiter, it is applied only to the database under which it appears.

    https://connect.ebsco.com/s/article/Reading-an-Article-on-EBSCO-Interfaces?language=en_US

Task:

Topic. "Can playing the violin cause repetitive stress injury to wrists and arms?"
Sample.
Concept 1: violin
Concept 2: repetitive stress injury
Concept 3: wrist
Concept 4: arms
Search strategy.

Violin AND repetitive stress injury AND (wrists OR harm OR arms)

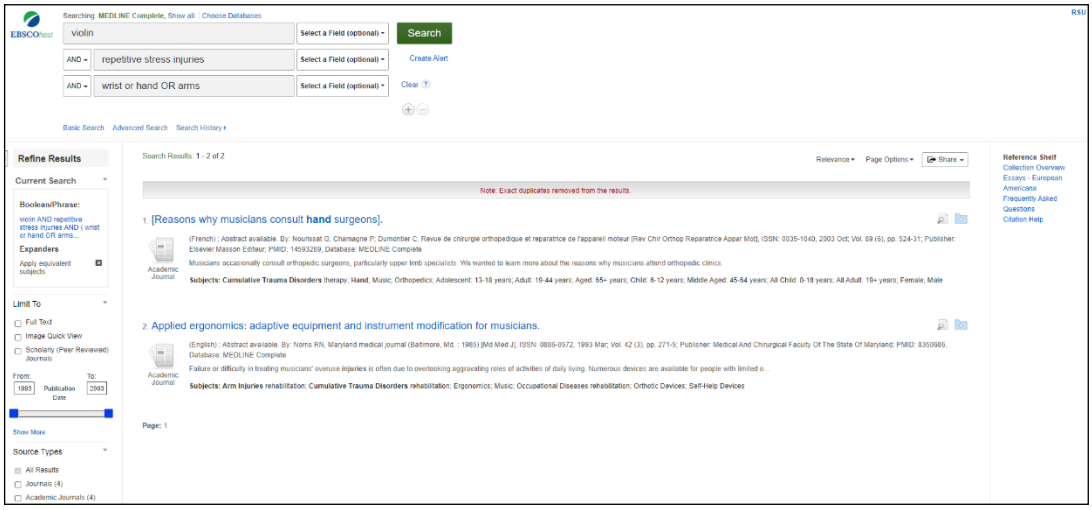

Figure 43. Violin AND repetitive stress injury AND (wrists OR harm OR arms)

Task 2:

(Feeding and eating disorders OR anorexia nervosa OR bulimia nervosa OR binge-eating disorder) AND (family-based treatment OR family treatment OR parent-therapist alliance OR parent-focused treatment OR parent-child relations OR parents OR home treatment)

PubMed Database

Description of PubMed

The **PubMed** database (hereinafter – *PubMed*) is the main bibliography database of the US National Library of Medicine, which provides free access to bibliographic citations and abstracts of online biomedical and life sciences articles. [2; 15; 16;]

PubMed is developed and maintained by the National Center for Biotechnology Information (NCBI), the US National Library of Medicine, and the National Institute of Health. The database has been available online in open access since 1996.

PubMed citations mainly cover biomedical and health sciences and related disciplines, such as life sciences, behavioural sciences, chemistry and bioengineering.

Using the *PubMed* database, it possible to search several literature resources of the US National Library of Medicine. *MEDLINE* is the largest component of *PubMed*. It consists of citations from journals selected in the *MEDLINE* database. *MEDLINE* citations are indexed with medical subjects *(MeSH*) and supplemented with genetic, chemical and other metadata. *PubMed Central* (*PMC)* articles make up the second largest component of *PubMed.* The *PMC* is a full-text archive that includes articles from journals reviewed and selected by the US National Library of Medicine, as well as individual articles selected for archiving in compliance with research funding policy supported by the National Institute of Health. Another component of *PubMed* is the *Bookshelf*,

which contains references to books and their individual chapters. *Bookshelf* is a full-text archive of books, reports, databases and other documents related to biomedical, health and life sciences.

MEDLINE is one of the oldest, largest and most frequently used scientific bibliography databases. [11; 16]

The US National Library of Medicine has been indexing biomedical literature since 1879 to give health professionals access to the information they need in health care, research, and education. Initially it was a printed index *Index Medicus*, but later its electronic version became known as the *MEDLINE* database. *MEDLINE (Medical Literature Analysis and Retrieval System Online)* is a database of medical information containing references to articles in journals regarding medicine, nursing, dentistry, veterinary medicine, microbiology, nutrition, biopharmacy, pharmacology, dentistry and the pre-clinical sciences. It also contains extensive information on the topics in related fields - biology, zoology, botany, environmental health - and publications from journals related to life sciences, as well as anthropology and sociology. The database contains data on scientific research, its methodology, clinical practice, diagnostic and therapeutic methods and public health. [5]

MEDLINE has stored more than 25 million bibliographic citations from more than 5,600 journals published worldwide. Whether the journal will be included in the database is assessed by the Literature Selection Technical Review Committee.

The most characteristic feature of *MEDLINE* is that 5-15 medical subjects *(MeSH)* are added to each of its citations, which provides for information search in the database. Medical subjects are used to detect the content of medical literature, to index, catalogue and search for information and documents related to fields of biomedicine and health.

PubMed comprises more than 30 million citations, including the *MEDLINE* database and the following citations:

- new citations that have recently been added to the database and to which *MeSH* indexes have not yet been added. During the indexing process, a *MeSH* index describing the content of the document is added to each description that further ensures the accuracy of the information search;
- citations for individual publications to which a *MeSH* index is added, but which have been published in journals (general, chemistry, etc.) that are not included in *MEDLINE*;
- citations available prior to publication in journals indexed by *MEDLINE*. They are marked with: *Epub ahead of print*;
- citations of publications published in the journal before being indexed by *MEDLINE* (if supplied electronically by the publisher);
- citations of publications from individual life science journals, the full texts of which are submitted to *PubMed Central*;
- citations from authors' manuscripts funded by the National Institute of Health *(NIH);*
- citations from books available on the *Bookshelf*. References are made to books and, in some cases, to each chapter of the book.

Unlike the *MEDLINE* database, *PubMed* provides also additional technical features that facilitate the search process and improve the quality of searches. [10] *PubMed* provides links to integrated molecular biological databases maintained by the *NCBI*, and contains links to websites where full texts of the articles can be found. Each *PubMed* citation has a link to *Similar articles* that allows

you to view a list of related citations. *PubMed* contains filters for grouping clinical issues and results. *PubMed* makes it possible to find one specific citation. You can create your own individual profile in the database to save your citation collections, save your search strategy, create your own individual settings and filters.

Summary

PubMed is an open access analytical database of publications in biomedical and life science journals, compiled by the US National Library of Medicine (*NLM*), the National Center for Biotechnology Information (*NCBI*), and the National Institute of Health (*NIH*). It is based on *MEDLINE*. *PubMed* is the main bibliography database containing more than 30 million references to publications in journals related to medicine, nursing, dentistry, veterinary medicine, health care systems, and pre-clinical sciences. The information covers more than 5,600 modern biomedical and healthcare journals published worldwide.

PubMed provides a quick and convenient search for citations, links to full texts of journal articles, and references to databases, libraries, and publishers. *PubMed* allows you to search for related articles, search by clinical issues, retrieve and export references, and create your own individual profile, both for saving your search strategy and collections, and for collecting the latest publications related to your topic for viewing them at your convenience. You can set your own individual search filters in your individual profile.

Constructing a Search Strategy

Searching

Search process. The search results in the *PubMed* database depend on how skilfully and accurately the search term is created and the extent to which the extra options offered by the database are used. The result can be achieved in different ways, using different search strategies and extra options. When entering keywords in the search box, you can use the options offered by the system from the drop-down menu. To start the search, click on the *Search* command or use the *Enter* key. You can enter one or more keywords in the search box. *PubMed* algorithms recognize medical subjects, search for them in the singular and plural, and follow British and American spelling and link the keywords to the Boolean operator AND.

The system also searches for the search word as a word in the text in all the existing fields of bibliographic description and in the abstract attached to the bibliographic description. For a word that can be spelled differently, other options are offered with a finished search result.

In addition to the text words, a specific description field label may be specified in the search box (see PubMed Help for examples), in which the search will be carried out. They must be written in square brackets. If no such designation is provided, PubMed starts searching for information by examining specialized indicators: the index of medical subject headings, the index of journals, and the index of authors. [4]

The Boolean operators. The Boolean operators AND, OR, NOT must be used to combine keywords with each other. [6; 15; 16]

Phrase searching and truncation. When searching for a specific phrase or quotation, it is recommended that you use wildcards: quotation marks and hyphens, or specify a search field label. [7; 15; 16]

To find the search term with different endings or suffixes, use a truncation symbol * (an asterisk). When searching for a phrase with truncation, several formats may be used:

*"Breast feed *"* or *breast feed * [tiab]* or *breast-feed **

The abbreviated word must contain at least four characters. The abbreviated word must be the last word of the phrase. It should be remembered that word truncation precludes the process of automatic recognition of a term, which includes the recognition and search of medical subjects, subtopics and specific terms.

PubMed offers a search by author, text words, medical subjects *(MeSH)*, journal title, or clinical issues. The toolbar and section labels used in the rest of the text are shown in Figures 44 and 45.

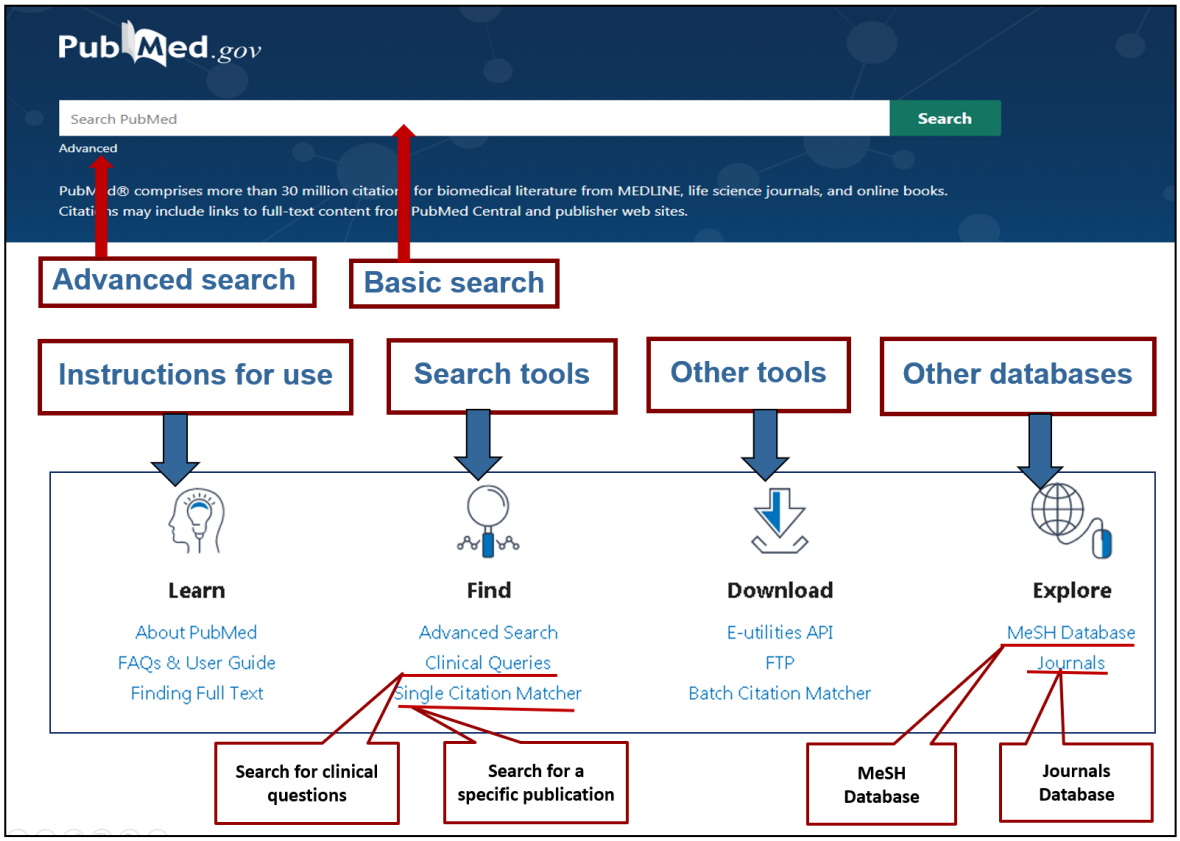

Figure 44. *PubMed* toolbars and extras

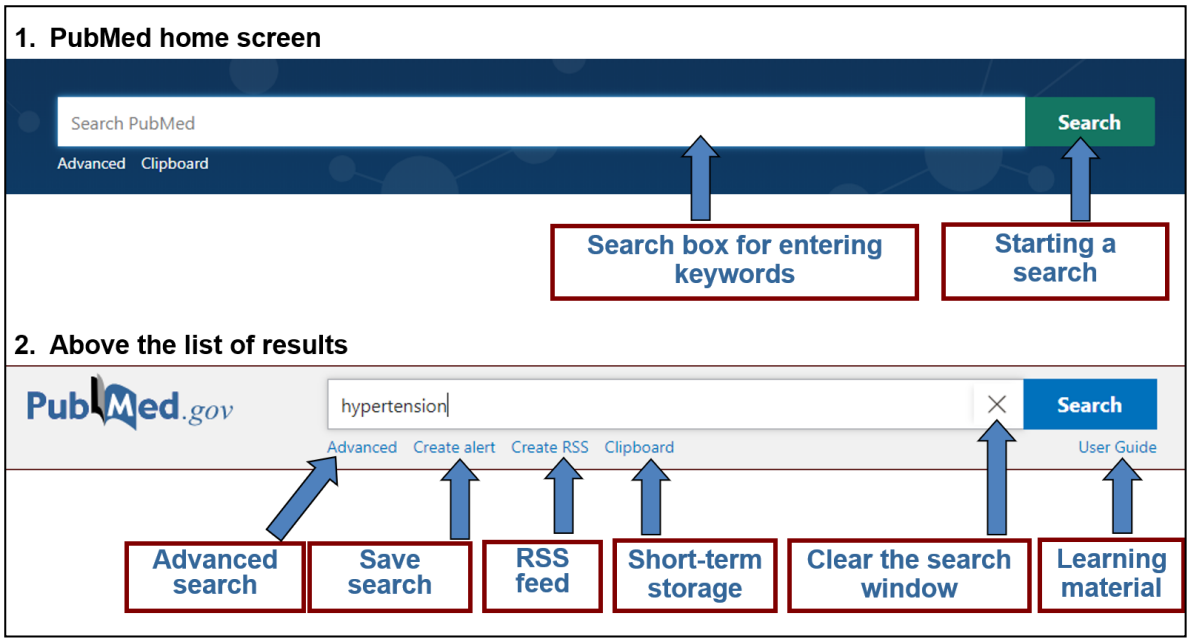

Figure 45. Commands and labels for Simple Search box

Search by author. You can search the database for works by certain authors. By entering the author's surname in the search box, the author is searched for in both the author's field and all the fields of the bibliographic description, as well as throughout the text. If the author's search label [AU] is added to the search, the citations are searched only in the author's fields. If the author's search label is not added to the search, sometimes completely irrelevant citations will be included in the list of results when searching by author. When searching for publications of a specific author, it is recommended that you specify in the *Advanced* search before the search box, in which the author's surname is entered, that the *Author* will be searched. By entering the first three letters of the author's surname you are looking for in the search box, the system offers a complete list of possible author's surnames.

Stopwords are words that are ignored in the indexing process. When searching, *PubMed* ignores stopwords and does not search by stopwords. Examples of stopwords: *a, about, again, all, almost, also, and, are, as, at, but, by, can, etc.*

Spelling. The system offers other alternatives for typing keywords that help to prevent spelling mistakes. The alternative spelling is not based on a dictionary, but on how often the term appears in *PubMed*. The spelling checker does not apply to words with a frequent occurrence in *PubMed*, or to words with fewer than five characters. If the system offers the correct spelling of the term with the number of results in parentheses, all you have to do is to click on that term.

Advanced Search

To find the list of results that are best suited for your query, you need to use the *Advanced Search* options to make more accurate searches, or to combine several previous searches. In the section *PubMed Advanced Search Builder* (see Figure 46) it is possible to specify specific search fields (author, title, journal title), as well as to select more precise topic indexes with the *Show index list*. In the *Query box*, a simple or combined search term is created using the Boolean operators or by selecting previous searches from the *History*. To make a search, use the *Search* command to see a list of results, or *Add to History* to keep track of the searches in the search history**.**

When you indicate that an author or journal will be searched for, as soon as you start writing the author's surname or the title of the journal, the system automatically offers a menu with possible options of the author's surname or the titles of the journal from which you can choose what you need.

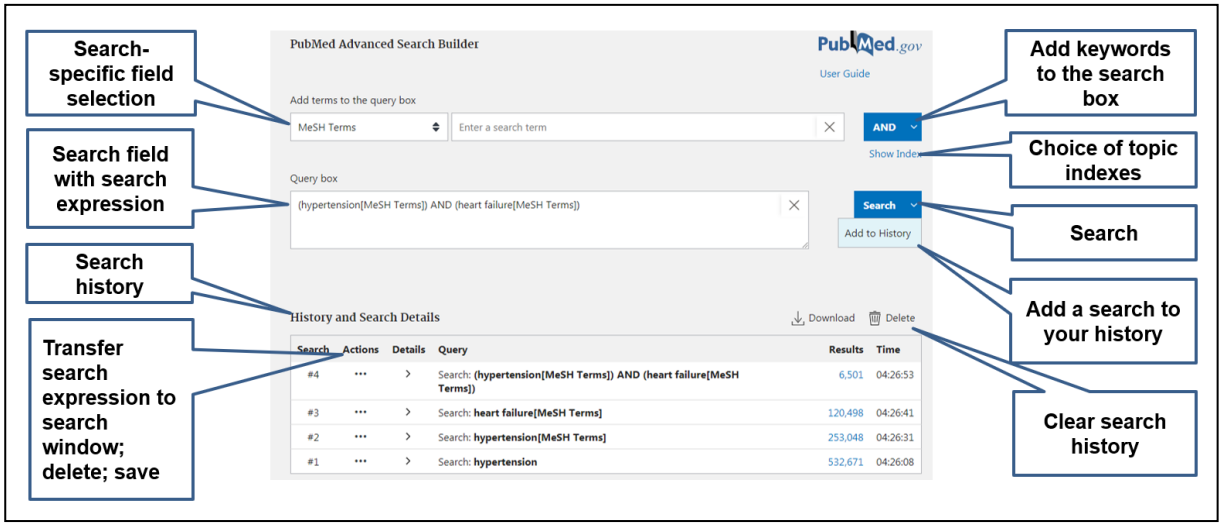

Figure 46. Commands and labels for Advanced Search box

Search History

Each search performed in *PubMed* is automatically saved in the search history *History and Search Details* (see Figure 47). The search history is displayed in the section *Advanced*. The history shows the search term, the time it was made, and the number of selected citations. The search history remains for eight hours after the last activity in the system. A total of 100 searches may be included in the *History.* Each search in the *History* section is assigned its own sequential number, the last search made is displayed at the top of the list.

You can open a detailed search term for each citation in the history with the function *Details.* With the function *Action*, you can add a search to the search box to create a new search term by selecting the appropriate Boolean operator (*Add with And; Add with OR; Add with NOT*). You can delete each citation from the history separately with *Actions* and *Delete*, or clear the entire search history with the *Delete* command above the search history box.

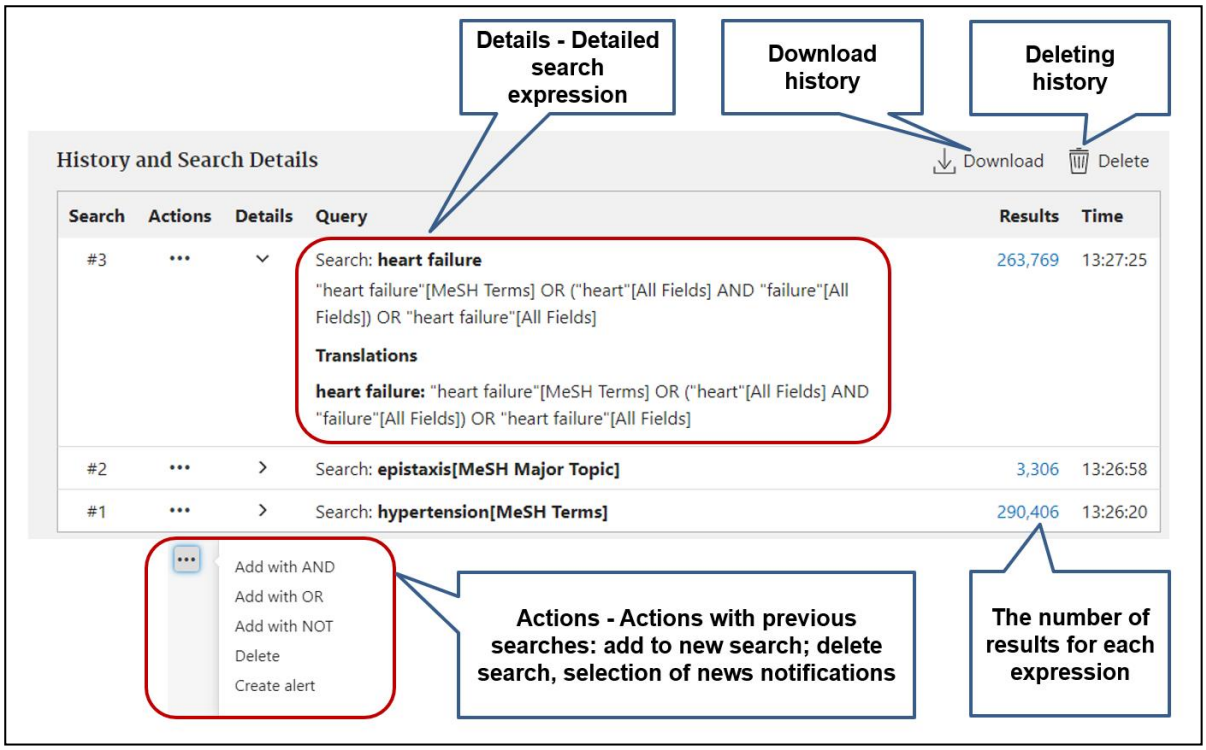

Figure 47. Search history

Search details. To make sure that there is no mistake in creating the term, it is necessary to monitor the progress of the search. The full search term can be viewed in the section *Details* next to the search history (see Figure 47). The function *Details* shows how the system has formed a search term using *MeSH* terms, text words, connecting them to the Boolean operators.

Limiting the results (*Filters)*

The selected results may not be explicit due to large quantity. Therefore, filters are offered to the left of the list of results, which allow you to limit the results (see Figure 48). Search restriction is used to select what is currently needed from a properly selected list, not to improve the quality of the search.

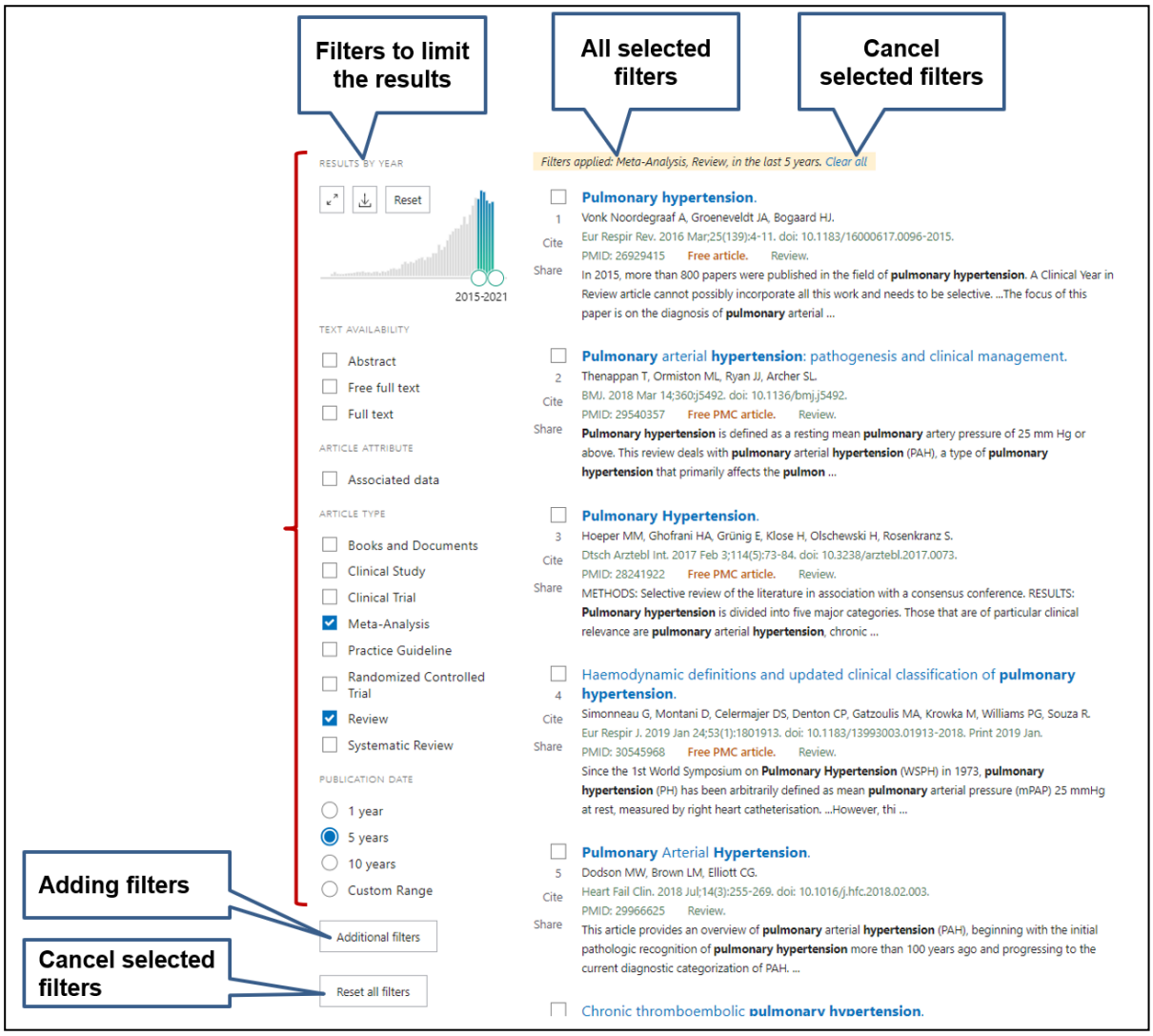

Figure 48. Filters for limiting results

Filters are selected by clicking on the precise filters. When the filters are installed, they are listed above the results list. Clicking on the filter repeatedly, cancels it. All restrictive filters can be removed together using the command *Clear all*.

Initially, some filter groups are visible: *Text availability*, *Article types*, *Publication date*. You can see the full offer of filters by clicking on *Additional filters* (see Figure 49).

In the filter box for filters to be added (see Figure 47) it is possible to select filter groups: *Article types*, people or animals (*Species)*, *Languages*, gender (*Sex)*, current topics (*Subjects)*, types of journals (*Journal)* and age groups (*Ages)*. When selecting a group, a window with filters for this group is displayed, where you can choose or cancel the filters you need in each group by ticking them and confirming with *Show*.

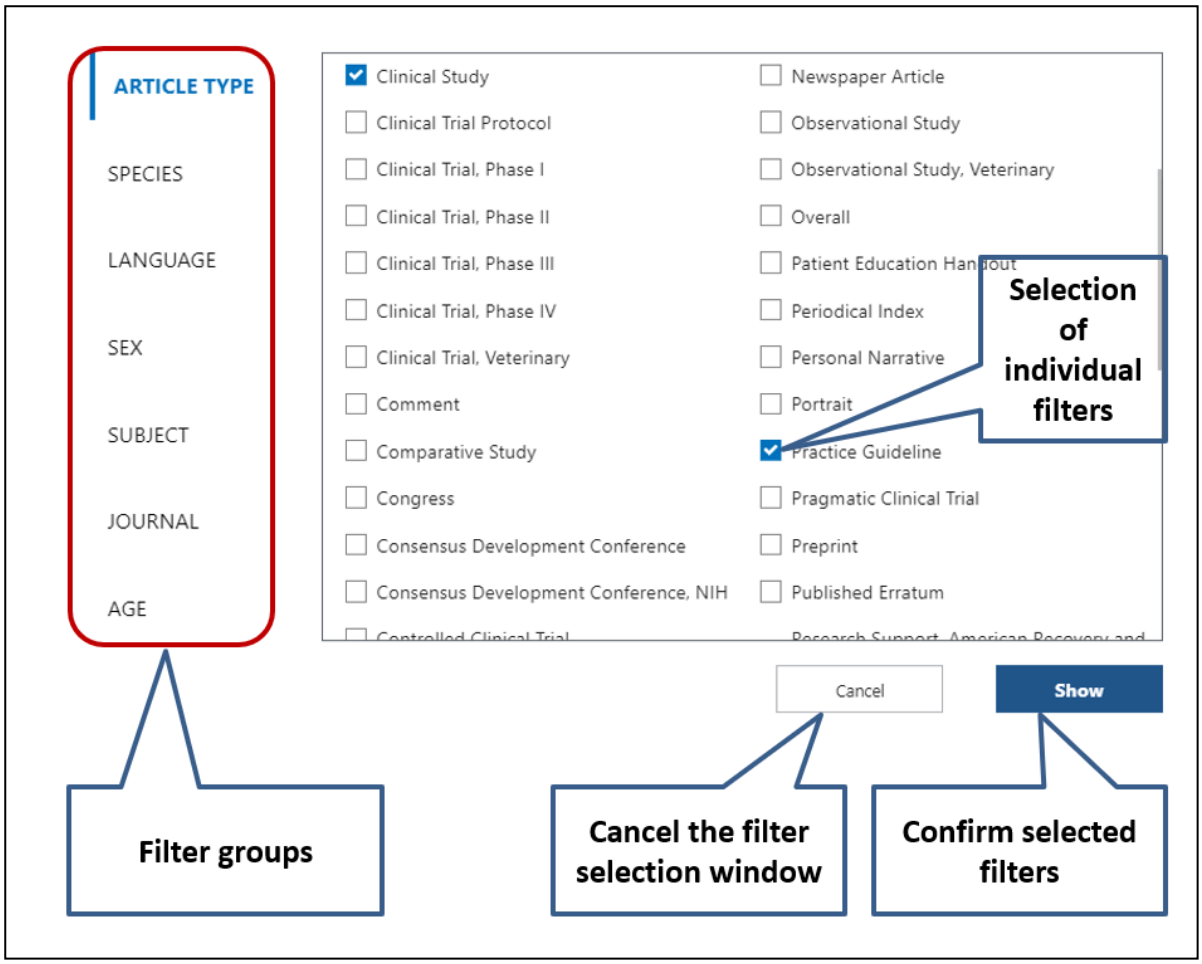

Figure 49. Filters for restricting results

MeSH Database

MeSH is a dictionary or thesaurus of medical terms developed and maintained by the US National Library of Medicine (see Figure 1). *MeSH* is the only thesaurus used for subject matter and information retrieval in medical databases, including *PubMed*.

When carrying out a search, the text word of interest must be entered in the *MeSH Database* search box. After confirming the search with the *Search*, the system selects the medical subjects that match the searched text word - all those *MeSH* terms whose names or their explanations contain the searched word, thus displaying the specific term in various aspects. For example, various aspects of the subject influenza include the human influenza virus, the type of virus, vaccination against influenza, and so on. (see Figure 50).

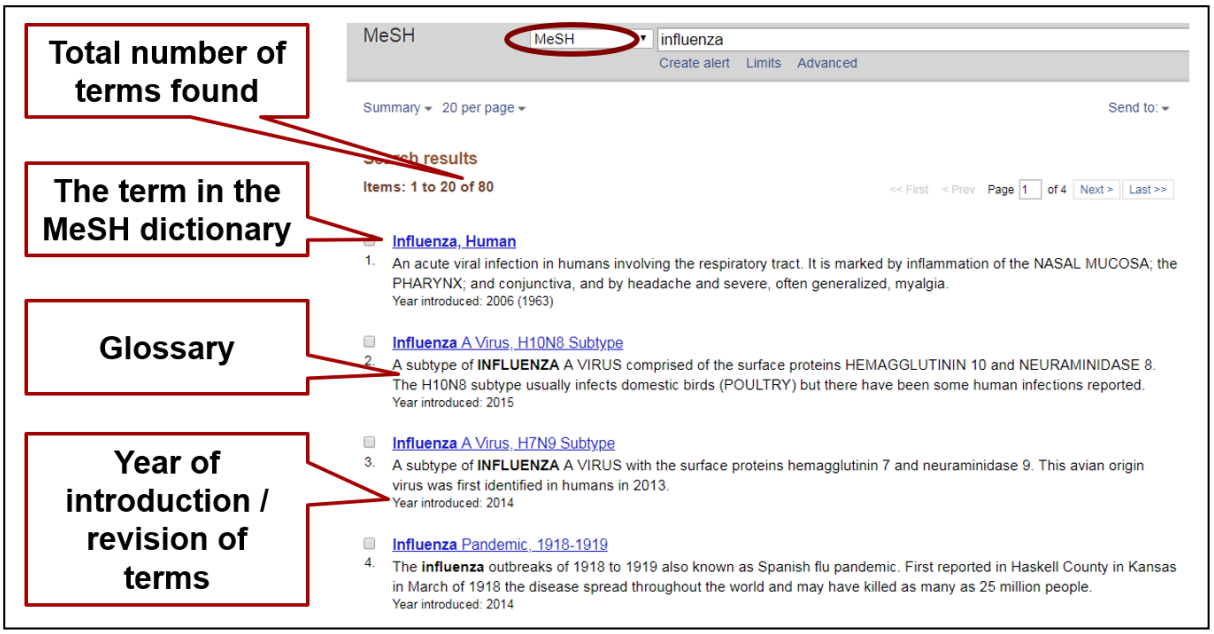

Figure 50. Searching in *MeSH* database

When selecting a medical subject of interest, a new page opens, which provides the definition of the term, synonyms, indicates the period of its use in the database, offers subheadings, indicates the place of the term in the hierarchical *MeSH* tree structure and related terms (see Figure 51).

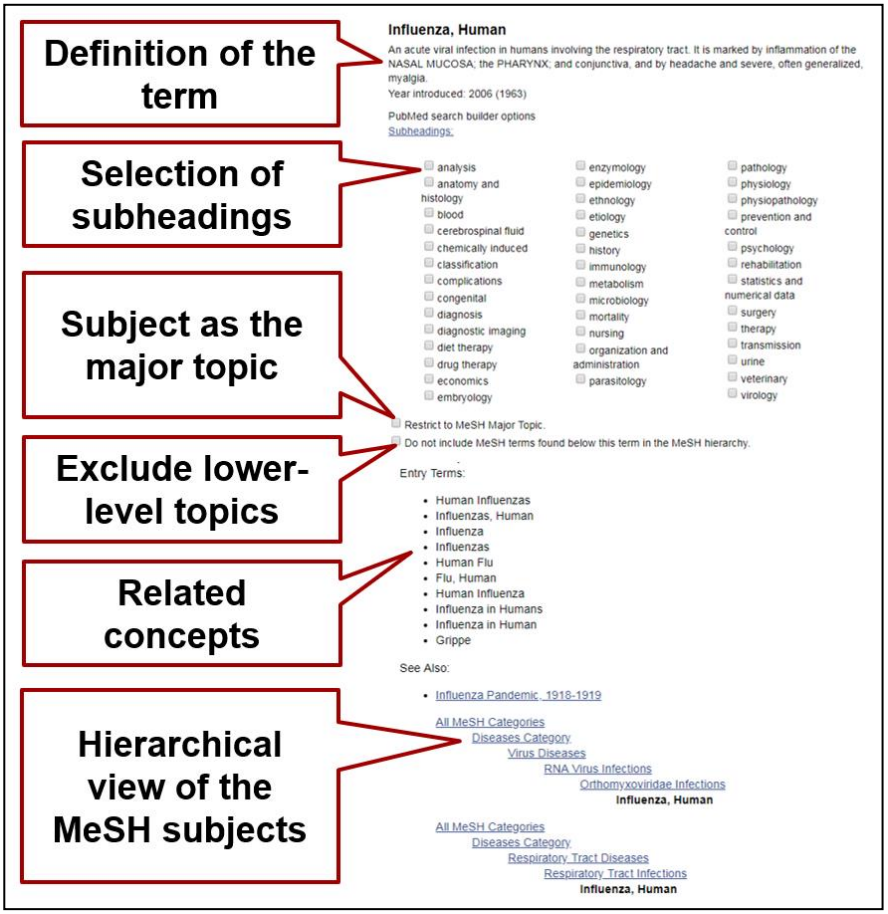

Figure 51. Possible actions and menu in the *MeSH* search box

MeSH hierarchy. The *MeSH* dictionary offers ***main headings*** that describe the subject matter of the publication. The main headings in the dictionary are arranged in 16 main categories: anatomy; organisms; diseases; chemicals and medicines, etc. ***Subheadings (qualifiers)*** are provided for each main heading, which provide an opportunity to show the main term in a specific aspect. For example, the subheading *surgery* may be added to the term *Heart Diseases;* the subheading *Rehabilitation* may be added to the term *Fractures*, and so on.

Each of the main headings is further subdivided into a number of sub-categories from general to specific. Thus, the hierarchical tree structure characteristic of the thesaurus is formed, in which the terms are arranged on several branches and on several levels (up to 11 levels). Each term is assigned a unique code, consisting of a combination of letters and numbers, which indicates the location of the term in the hierarchical tree structure. [5]

In the *MeSH* thesaurus, a term may also be found on several branches, depending on the aspect in which the term is viewed. For example, the term *Nose* is found on three branches: the *Nose* as a *Part of the Body*, the *Nose* as a *Part of the Respiratory System* and the *Nose* as a *Sensory Organ*.

Entry terms. The relationship between terms in the thesaurus is organised with the help of the entry terms. Many terms have synonyms that are combined with the main term into a common group of citations or descriptor block. The compilation of synonyms provides a better opportunity for the information seeker to get to the required term and the bibliographic description or the full text of the publication associated with the term.

See also are cross-references that indicate that another, broader related term is related to this term. Cross-references also show the transition to the same term in another branch of the hierarchical tree. Cross-references suggest to the user how else to search for the required term.

For more accurate selection results, the *MeSH Database* offers the possibility to combine medical subjects. This can be done immediately after sending the first subject to the *MeSH* search box (*Add to search builder)*, and without leaving the *MeSH Database*, continuing to search for the next subject and sending it again together with the subheadings to the *MeSH* search box using the appropriate Boolean operator. The finished search term created in the *MeSH* search box is transferred to *PubMed (Search PubMed*) while performing the search and retrieving the list of results.

When switching from the *MeSH Database* to the *PubMed* system, the possibility to select the specific subject as the name for the main topic in the entry (*Restrict to MeSH Major Topic*) is offered to start the search. Another option offered is not to expand the subject (*Do not include MeSH terms found below this term in the MeSH hierarchy*), which means that subjects in the *MeSH* tree under the relevant rubric will not participate in the search process (see Figure 52).

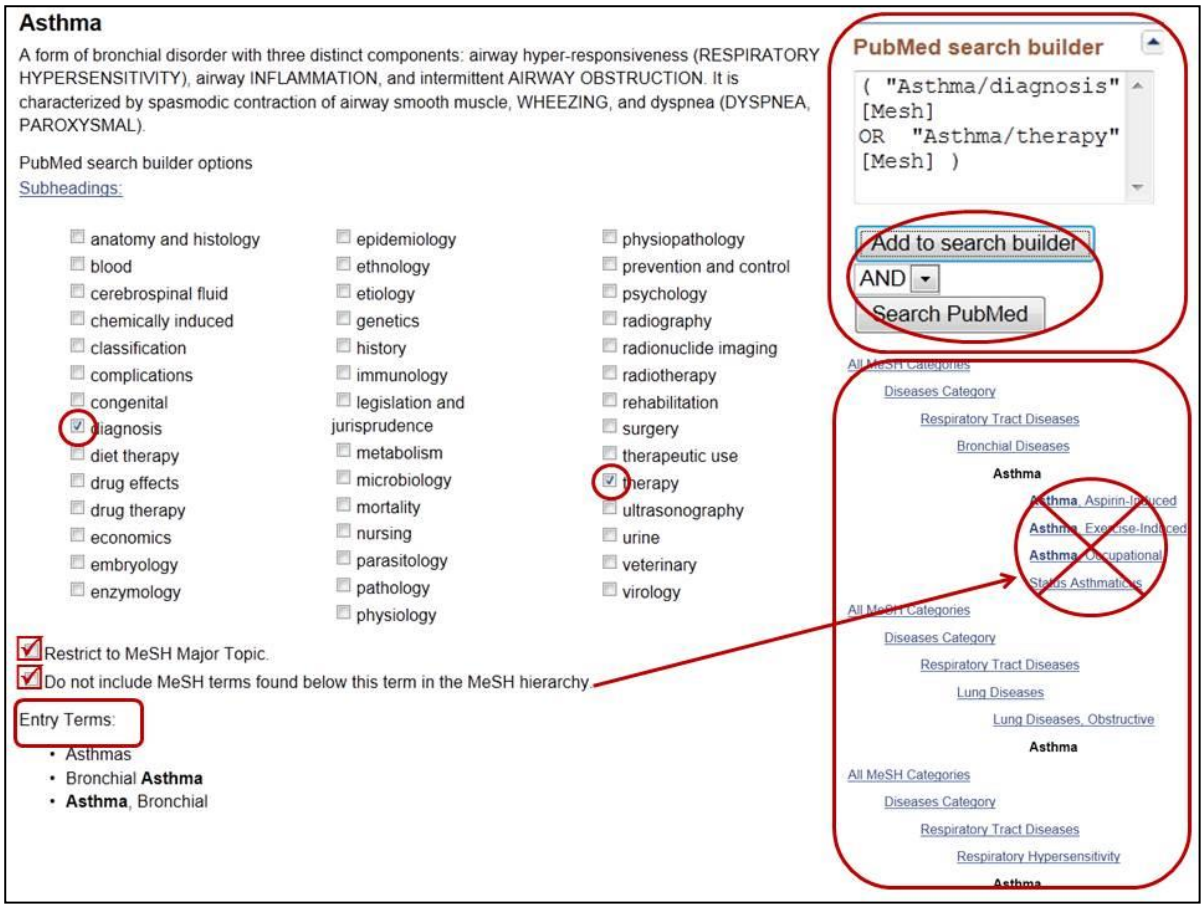

Figure 52. Constructing a search strategy in the *MeSH* search box

Journals Database (Journals)

The journal database makes it easy to search for information about journals whose articles are indexed by *PubMed*. To work with the journal database, you must select the link *Journals* on the *PubMed* home page (see Figure 44). A search can be conducted in the journal database (see Figure 53): by entering the full title of the journal; by entering part of the title; by entering a topic; by entering the abbreviation of the journal; by entering the international serial number *(ISSN*) of the journal or by browsing the journals by topic (*Browse MEDLINE Journals*).

The list of found journals is arranged in alphabetical order of their titles, where a new window will open when a specific title of the journal is clicked on. It provides information about the publisher of the selected journal, frequency of publication, title changes, specified *ISSN* number, start date of publishing, title abbreviation and other parameters, as well as a link to the journal's website, if any, is provided (see Figure 54).

To search for articles from one particular journal in *PubMed*, you need to transfer the title of that journal from the *Journal in NCBI Databases* to *PubMed*. In the list of journals, tick in the box in front of the title of the journal, or open the full information about the journal and add the selected journal with the command *Add to Search Builder* in the section *PubMed search builder*, and conduct the search with *Search PubMed* (see Figure 54).

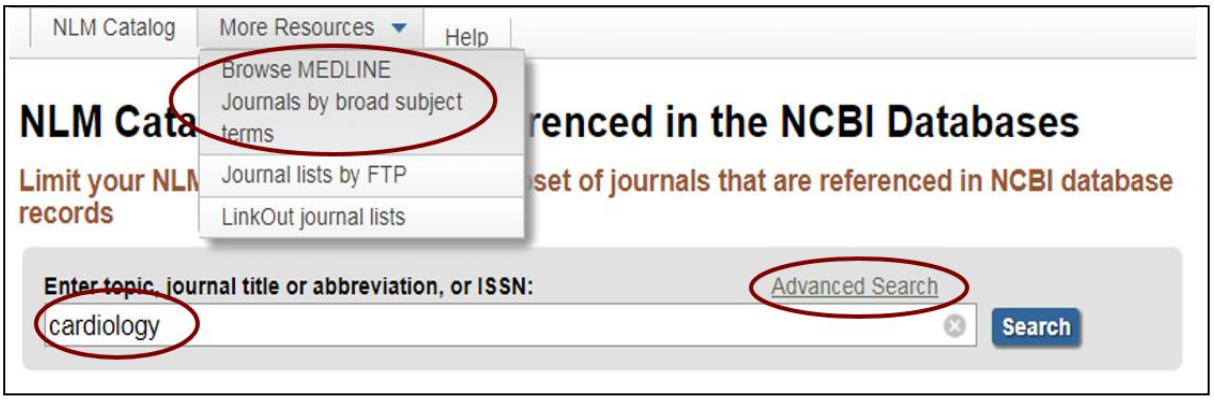

Figure 53. Searching and browsing journals by industry

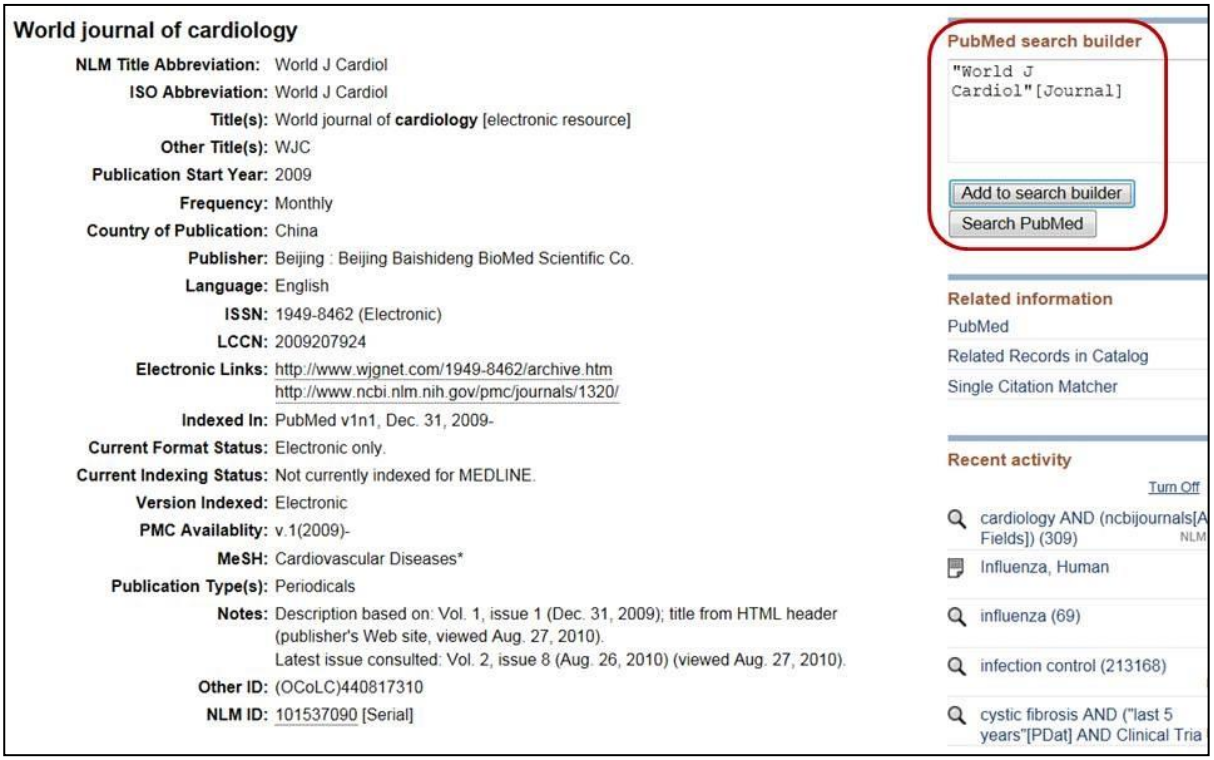

Figure 54. Information about a journal and selection of all its publications

The results will be displayed as a list in the *PubMed* database. As a result of this search, all articles in the particular journal will be found, arranged in reverse chronological order. The resulting list includes a restrictive filter bar and the ability to save this list to your intelligent agent.

You can also search for journals in the advanced search using the *PubMed Advanced Search Builder* (see Figure 46) where you should indicate that journals will be searched (*Journals*) in the search-specific field.

Single Citation Matcher

It is best to look for a specific publication in the section *Single Citation Matcher* of the main menu bar (see Figure 55).

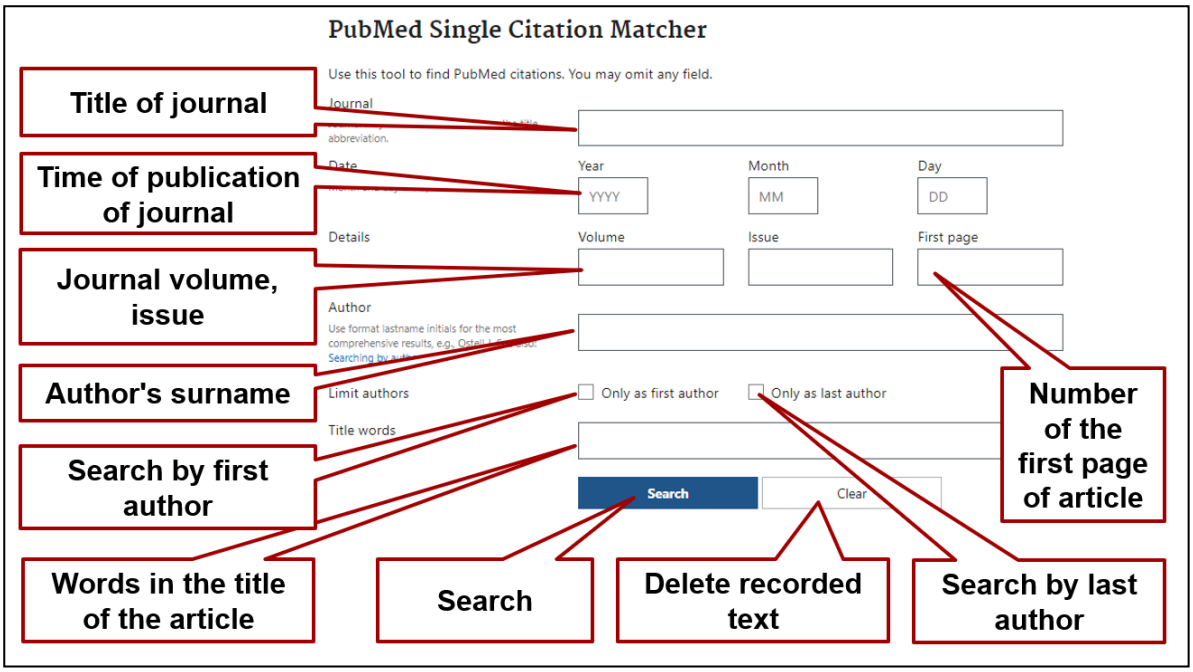

Figure 55. Search for a specific publication in the *section Single Citation Matcher*

With *Single Citation Matcher*, you can find *PubMed* journal articles by any of the elements of the bibliographic description: by heading of the article, author, title of the journal, date, journal volume, and pages of the article. You can find information about the publication even if you know only the year when the article was published and the first page of the article.

It is not mandatory to fill in all the search boxes, it is enough to fill in only a few of them (see Figure 55): *Journal* – title of the journal, *Date* - publication date, *Volume* – the number of the journal volume, *Issue* – the issue number of the journal, *First page* – the first page of the article, *Author name* – the author's surname and initials (if known) and *Title words* - full or partial heading of the article. When you have entered the known data, click the command *Go*, and the particular article appears on the Abstract View page.

Search by Clinical Issues (Clinical Queries)

Clinical Queries is a search tool that facilitates the search for evidence-based medical information within the citations included in the *PubMed* database (see Figure 44). The search in this section is conducted using the search filters already built into the system. The system simultaneously searches in two subsections: *Covid-19 Articles* and *Clinical Study Categories*, by carrying out searches for Covid-19 articles and searches by categories of clinical issues. In this section, you get two separate lists of results that initially show the first five entries, but to see the results in *PubMed*, click on the link *See all* below the preview of the results (see Figure 56).

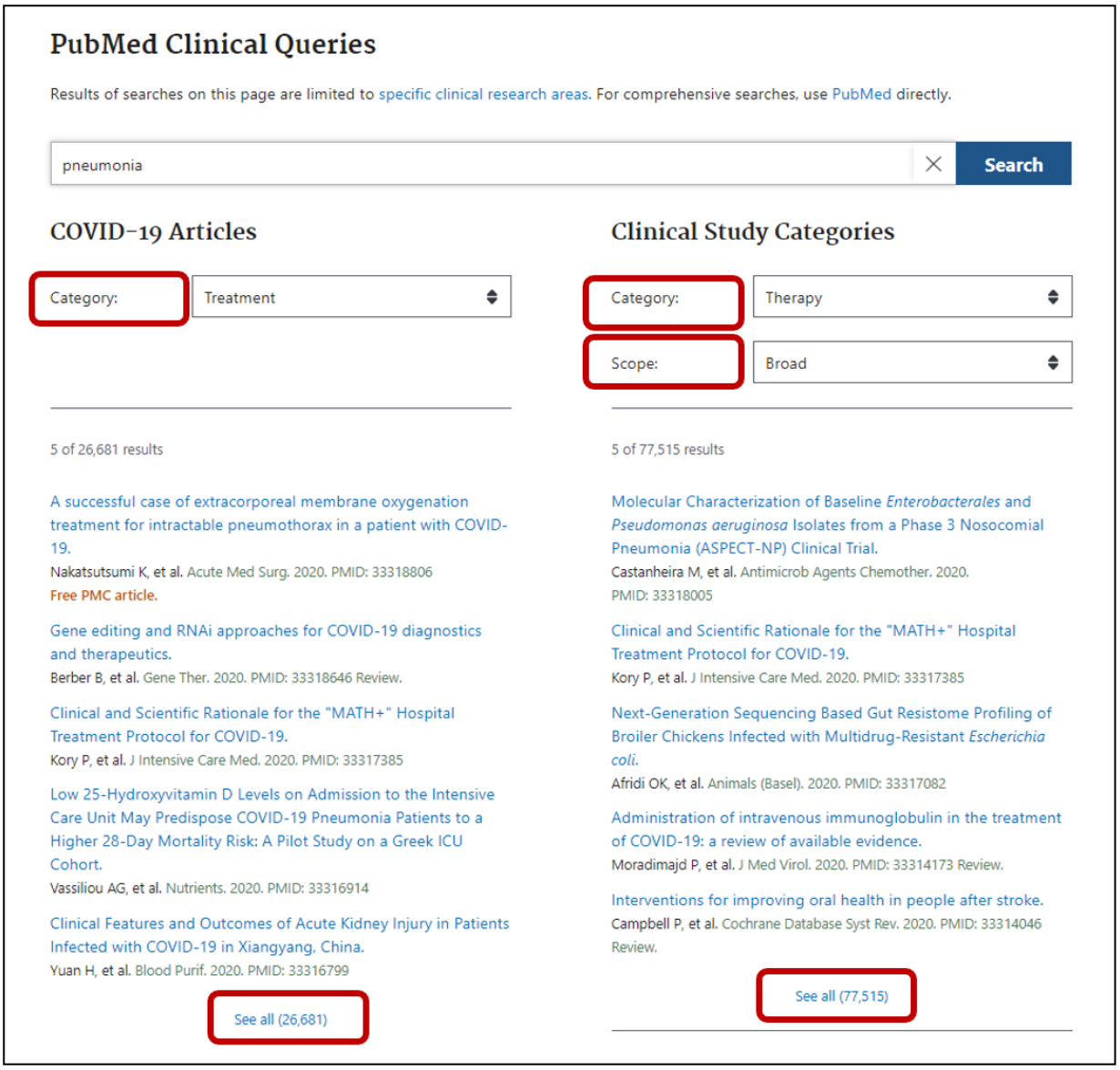

Figure 56. Section related to clinical issues in *PubMed*

Search for Covid-19 publications. In the section *COVID-19 Articles*, special filters limit the retrieval of citations for the 2019 new coronavirus. The results are displayed in a column, and they can be filtered by categories of research topics. When conducting a search, enter the keywords in the search box and click on *Search*. For more accurate results, select one of the categories: *general, mechanisms, transmission, diagnosis, treatment, prevention, case report,* or *forecasting.*

When using the COVID-19 filters of this section in search for articles, special filters are added to the search term, such as: LitCGeneral [Filter], LitCMehanism [Filter], LitCTransmission [Filter], LitCDiagnosis [Filter], LitCTreatment [Filter], LitCPrevention [Filter], LitCCaseReport [Filter], LitCForecasting [Filter]. [16]

Example: Remdesivir AND LitCGeneral [Filter]

The specialized search by ***Clinical Study Categories*** is intended for medical practitioners. The search filters built into the system have been developed and updated based on the opinions of R. B. Haynes, representing McMaster University (Hamilton, Canada), and his colleagues. These filters

limit the results to research conducted with a specific methodology and also include information on the clinical trials used.

The generated search term can be made more precise by one of five categories *(Category)* of clinical issues that are automatically offered as the corresponding search filter: *etiology, diagnosis, therapy, prognosis,* and guidelines for clinical prognosis (*clinical prediction guides*). In addition, the system allows you to select one of the coverage filters (*Scope*): limited, specific *(narrow*) or broad (*broad, sensitive search*).

You can create a search term in the *Clinical Queries* search box or copy a ready search term from the search history.

Summary

PubMed offers to search by typing text words, the author's name, the title of the journal, or a specific phrase in the search box, using the Boolean operators, truncation signs, and search field labels. For more accurate search, the advanced search options may be used, where you can specify search-specific fields for changing, apply exact indexes, search history, and create combined searches.

More specific search is available in the sections *Single Citation Matcher*, *Journals*, *Clinical Queries* and *MeSH Database*. *MeSH* is a special hierarchically structured dictionary of medical terms developed and maintained by the US National Library of Medicine with a diverse reference system used to detect, index, catalogue and search the contents of medical literature.

Search results can be made more precise with the help of filters. Searches carried out in *PubMed* are stored in the search history in the section History, which allows you to view the results repeatedly and to combine your searches. The full strategy term for each search is displayed in the search history using the function Details.

Managing the Selected Information

List of results

After conducting a search, the *PubMed* screen displays a list of results (see Figure 57), indicating the number of results. The retrieved citations are displayed in the *Summary* format. If only one citation is found as a result of the search, it is displayed in the *Abstract* format with an annotation attached to the basic information about the article. The results are grouped into 10 citations per page. They are arranged according to relevance *(Best match)*. However, these conditions may be changed.

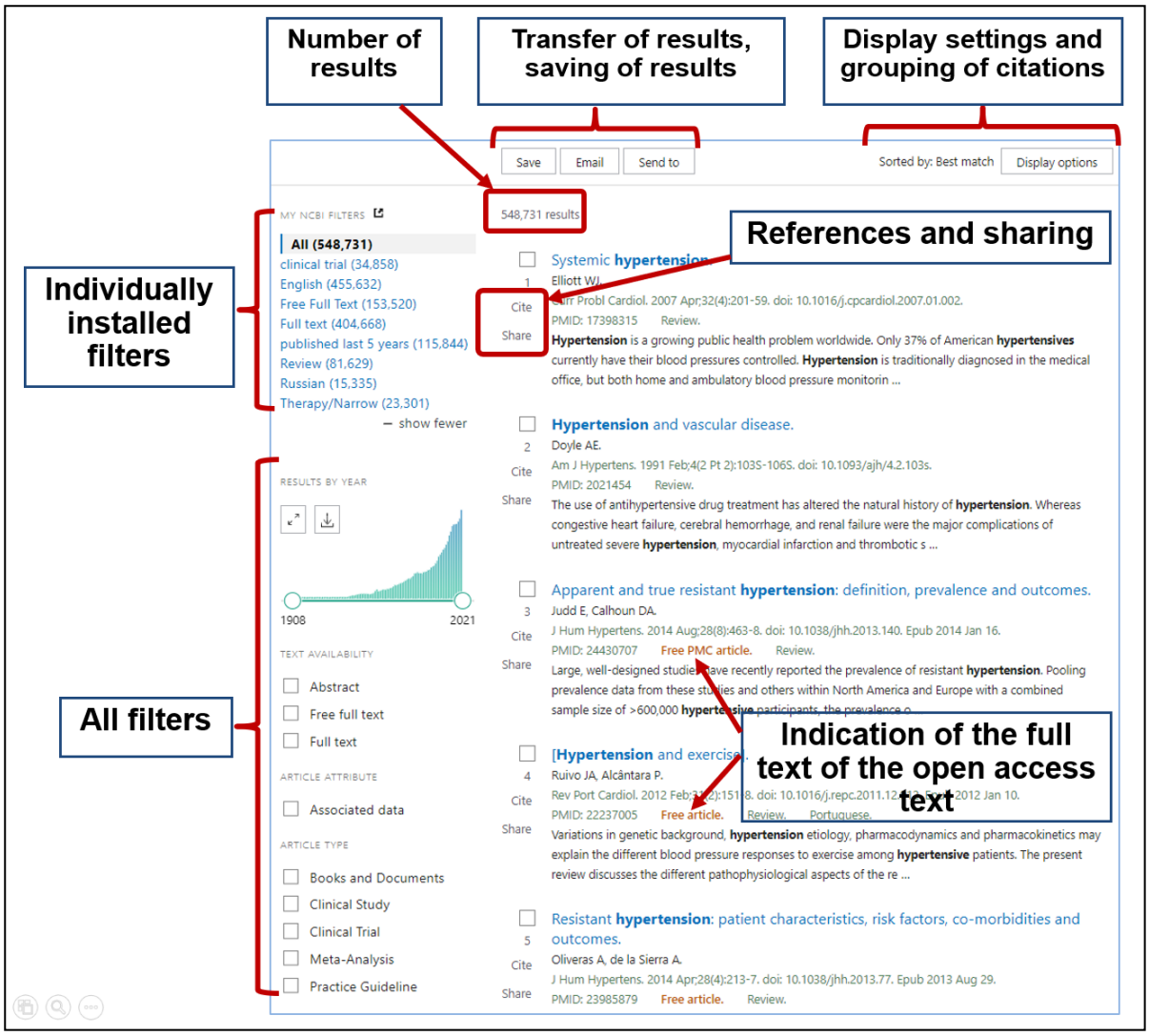

Figure 57. List of results

Filters offered to narrow down the results are given on the left side of the list of results. Individually registered users may also see their own individually installed filters. Commands for transferring and saving results are available above the list of results. The command *Share* may be applied for each citation to share it, and the command *Cite* to retrieve or export references to reference creation tools. If the full text is available in the open access resources for the citation, this is indicated by the reference *Free article* or *Free PMC article*.

The basic information of each article is supplemented by a short excerpt of the text highlighting the search term. If the heading of the article is enclosed in square brackets, its full original text will not be in English.

Display settings and grouping of citations

The *Display options* menu allows you to change the view format of the list of results, the result arrangement, and the number of citations per page (see Figure 58).

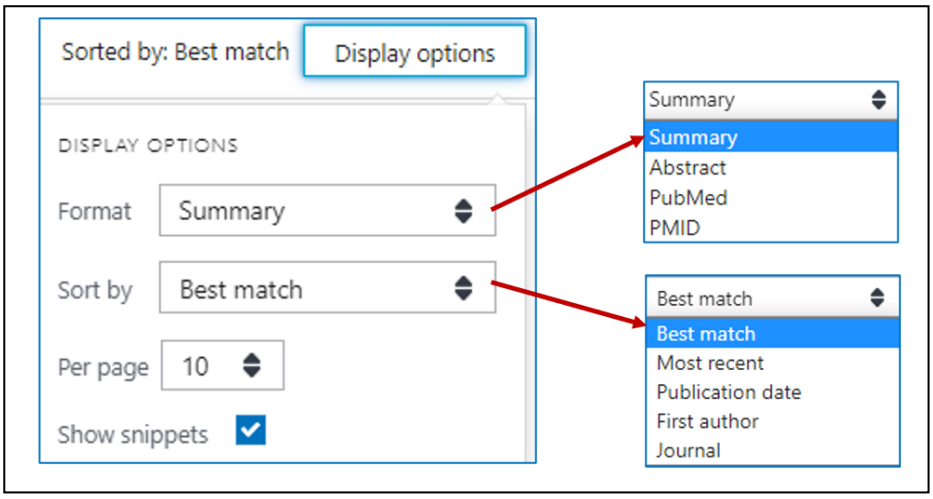

Figure 58. Options for changing the display view

Display Settings offers the following changes to view formats:

- In the *Format* section, you can select different view formats (*Summary, Abstract, PubMed, PMID,* etc.);
- *Sort By* – a possibility to regroup the list of results by various characteristics: according to conformity *(Best Match*), the most recently added to citations (*Most Recent*), the date of publication (*Publication Date*), the alphabetic order of the first author *(First Author),* or the alphabetic order of the title of the journal (*Journal*).
- *Per page* - a possibility to change the number of citations per page;
- *Show snippets* – a possibility to see excerpts of the text from the abstract with search keywords highlighted.

The *Summary* view format includes the heading of the article, the authors, the information about the source of the article (the abbreviation of the journal title, a year of publication, the volume, the issue, pages, the *PubMed* article identification number, the reference regarding open access and the language (if the full text is not in English). Annotation of the publication is linked to this format of the citation, which can be opened by clicking on the heading of the article and opening the summary display page. [4]

The *Abstract* format shows a summary of the article. This format includes the following information: the source of the article, the heading of the article, the reference to the language in which the original article is read (if the full text is not in English), authors, authors' affiliation, the *PubMed* article identification number, the annotation, the attached information (links to references, to resources that offer full texts and commands that allow you to retrieve references or share).

The *PubMed* format shows the breakdown of information according to the description fields. The *PMID* format provides a list of citation identification numbers in the *PubMed* database.

When you click on the title of the publication, the summary view page of the selected publication opens (see Figure 59). This page provides an abstract of the publication, extensive additional information, and tools for a variety of activities. The page contains the following information: the source of the article (the abbreviation of the journal title, the year of publication, the volume, the issue, pages) the heading, authors, authors' affiliation, the identification number of the article, the

summary, a list of related publications, references, the type of publication, attached medical subjects and links to resources that offer full texts.

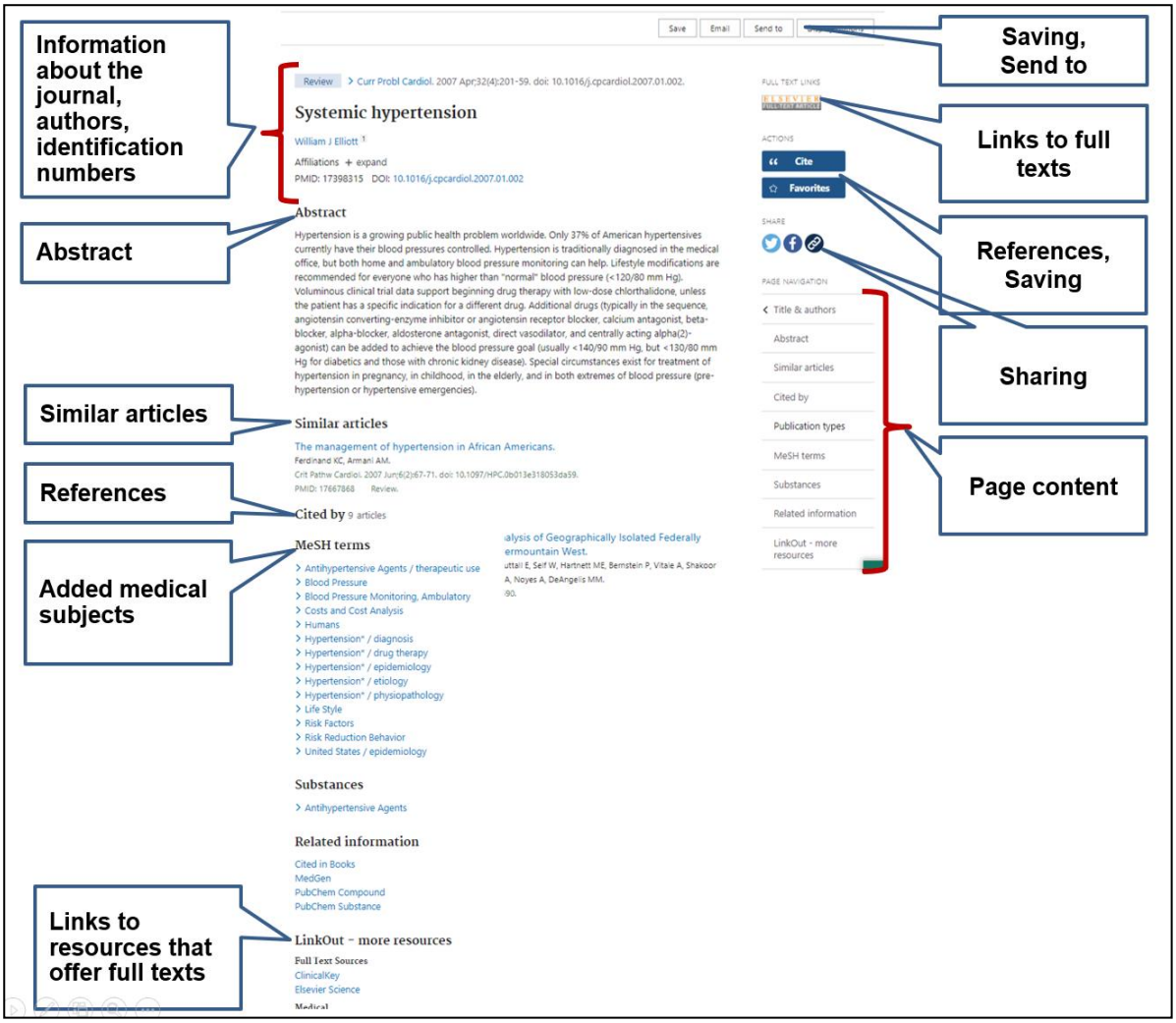

Figure 59. Summary display page

Browsing related articles. (Similar articles). The search options may be expanded by using the link *Similar articles* (see Figure 59). For almost every *PubMed* entry in its summary display there is an option to view a list *Similar articles*, in which the citations have similar content to the selected citation. Initially, the beginning of the list is visible, but with *See all similar articles* it is possible to open the list completely. The *PubMed* system uses a special algorithm to compare and calculate words from other citation headings, summaries, and *MeSH* terms, and then displays them in a list of related citations. The related articles are arranged in the order from the most relevant to the least relevant citation. The citation that is the most relevant in terms of the content is listed first in the list, following the citation for which the related articles have been found.

The list of related citations is not subject to the restrictions that were set for the original search. The open list of related citations is included in the search history. This history search allows you to perform a new search in which the same citations are not arranged by similarity and can be regrouped.

Summary

By default, *PubMed* citations in the list of results are displayed in the form of a *Summary* with 10 citations per page, arranged by relevance. However, *PubMed* offers to view citations in a variety of screen views, in different view formats of citations, and to change the types of list layouts and the number of citations per page. More detailed information about the publication can be found on the summary view page of the selected publication. There you can view a summary of the publication, a list of references, a list of the related citations, attached medical subjects, and take steps for retrieval, storage, and transfer operations.

Individual Profile My NCBI

My NCBI is a tool that saves user information and database settings in all *NCBI* databases. This tool makes it easier to browse through search results by applying individual grouping filters and display formats, to save the results found, individual citations and search terms and to get the latest information to the e-mail. Its main functions include saving data, adjusting settings for more convenient browsing of the results and creating individual search filters.

To create your individual profile, you must register using *Log in* on the upper-right corner of the screen (see Figure 60). There are two ways to do this: by creating your own personal account – *Create new NCBI Account*, or by registering through partner organisations, including Google. (See Figure 61). Use the command *Log out t*o exit your profile (see Figure 61).

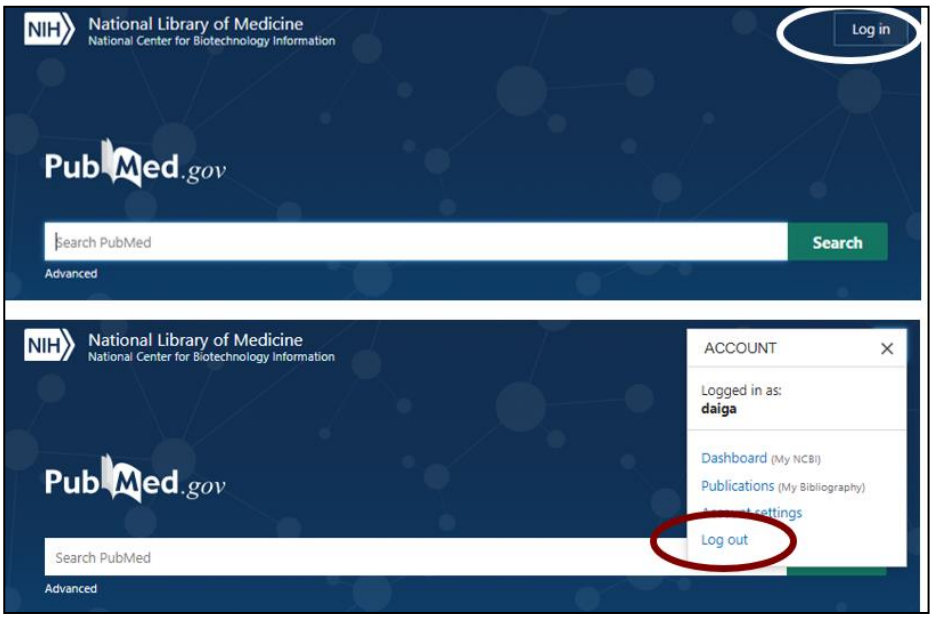

Figure 60. Logging in to the individual profile and logging out of the account

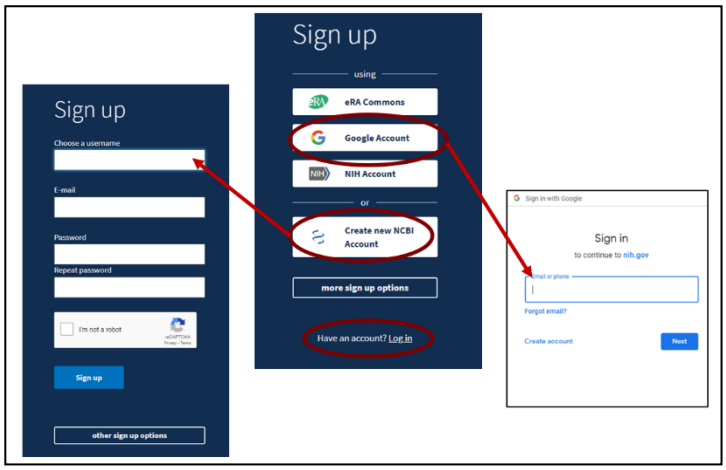

Figure 61. Creating an individual profile *My NCBI*

When creating the personal account, the username, associated e-mail and password should be provided. After registration, a letter of confirmation with a link to your *My NCBI* profile is sent to the user's email. Clicking on this link will complete the registration. Each registration is associated with only one e-mail address that the system uses to send the latest information in the future. To view your individual profile, click on your username in the upper-right corner of the screen and select *Dashboard (My NCBI).*

The following sections are visible in the individual profile (see Figure 62):

- *Search NCBI databases* – a search box, so that you can search from your individual profile;
- *Recent Activity* - activities carried out during the last half year;
- *My Bibliography* - saved bibliography lists;
- *Saved Searches* - saved searches;
- *Collections* – stored collections of citations;
- *Filters* - filters for grouping the list of results.

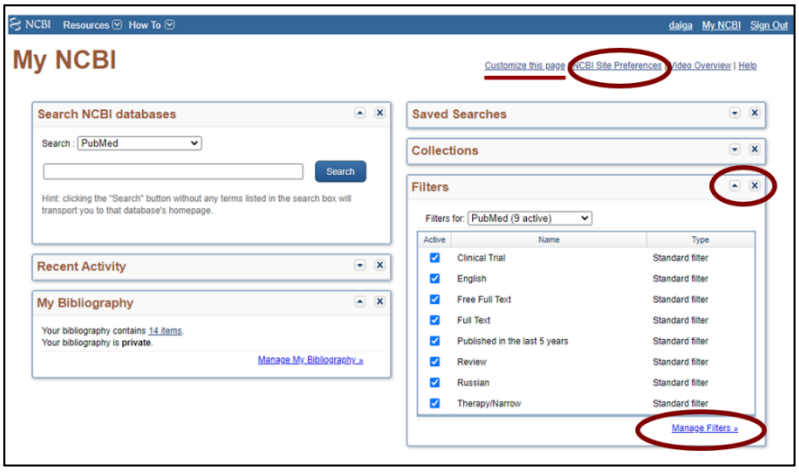

Figure 62. Individual profile *My NCBI*

You can customize the display of your individual profile to suit your needs. The sections in it can be moved, and each of the boxes can be closed or opened, and the sections (boxes) can be deleted and restored with *Customize this page* (see Figure 62).

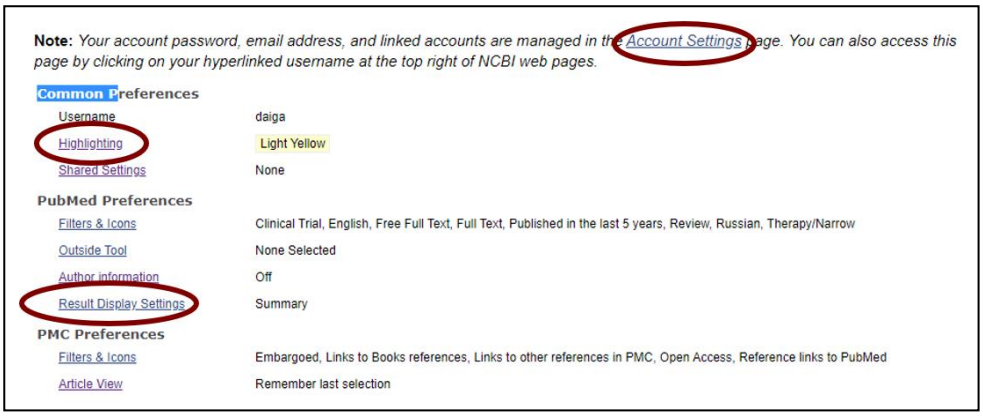

Figure 63. Changing personal settings

You can change your settings in the subsections *Account settings*, *Highlighting*, and *Result Display Settings* of the section *NCBI Site Preferences* (see Figure 62), by changing the e-mail address, password, highlighting keywords, changing the order of citations, and more. (see Figure 63).

One of the advantages of *My NCBI* is the ability to set your own individual filters in your profile. If you do not work with your agent, only the common filters to the left of the results list are available, and you can narrow down the main list. Whereas, above the common filters, individually installed filters (*My NCBI Filters*) are displayed, which group the common list according to the conditions relevant to the individual user (see Figure 64). The individual filters section is accessed via the *Filters section* of the *My NCBI* page via the *Manage Filters* link (see Figure 62).

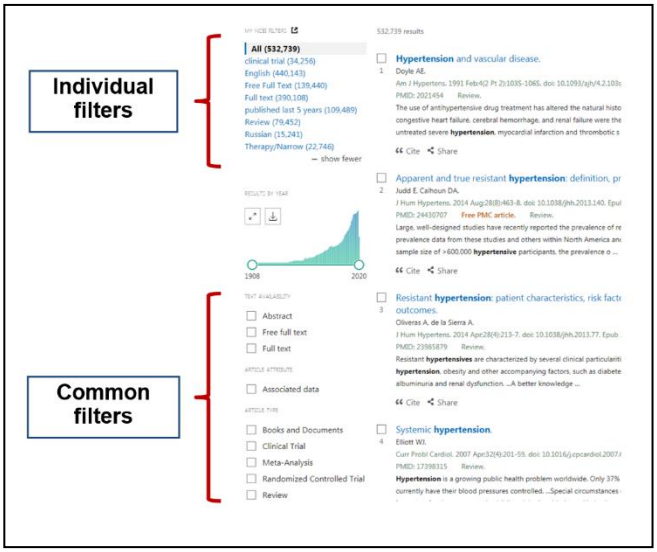

Figure 64. Common and individual filters

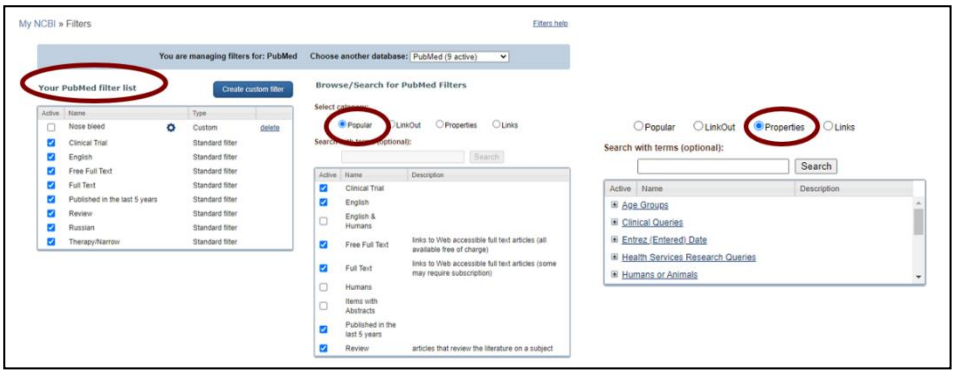

Figure 65. Setting up personal filters

Manage Filters leads to the *NCBI* filter menu, where four filter groups are offered (see Figure 65): *Popular* - the most popular or most frequently used filters, *Properties* - other filters for grouping results, *LinkOut* - links to resources that are not in *NCBI* and *Links* - links to other *NCBI* databases. All of your filters installed from the various sections are generally displayed in the *Filters* section in the box *Your PubMed filter list*. All the filters installed work only when you work in your *My NCBI* account.

Summary

My NCBI offers to personalize the *PubMed* window by selecting the desired grouping of results, setting the desired display forms and highlighting the search word. *My NCBI* offers to receive news lists about selected topics in the e-mail of a registered user or to view them at a convenient time, while maintaining the search strategy, as well as to save collections of useful citations and create your own bibliography lists. The e-mail, password and the filters set during registration can be changed.

Transmission and Storage of Results

You can save specific citations selected from the list of results: on the *Clipboard* (short-term storage), on individual *Collections*, on bibliography lists *(My Bibliography*), and export citations to citation tools *(Citation manager)*. If you have created an individual profile *My NCBI*, you can save the search results *(Create Alert)* and keep track of the latest publications on the selected topic. Selected citations can also be forwarded via Email.

With the commands *Save*, *Email* and *Send* it is possible to save or transfer the required citations (see Figures 57 and 59):

- *Save* - save in plain text format;
- *Email* - forward entries by e-mail;
- *Send to Clipboard* - send to the clipboard or a short-term storage *(Clipboard);*
- *Send to My Bibliography* - send to your bibliography list;
- *Send to Collections* - save entries to *My NCBI* collections;
- *Send to Citation manager* - send to the citation creation tool EndNote.

It is possible to save and send individual publications, selected articles or the entire list as a whole. When saving and sending citations by e-mail, in addition it is possible to specify the desired display form in the menu box.

Short-term storage (*Clipboard)*

Clipboard allows you to save selected citations or the entire list as a whole for a short period of time during the period of work, i.e. for the entire duration of the activity and for another eight hours after the last activity in *PubMed*. With *Clipboard*, you can create lists of citations that can be printed or stored for a long time.

To save to the *Clipboard*, mark the citations of interest in the list of results and transmit them to the *Clipboard* using the menu *Send to* (see Figure 66). If the entire list of results has to be transmitted to the *Clipboard*, you do not need to mark the citations. The maximum number of citations that can be sent to the *Clipboard* is 500.

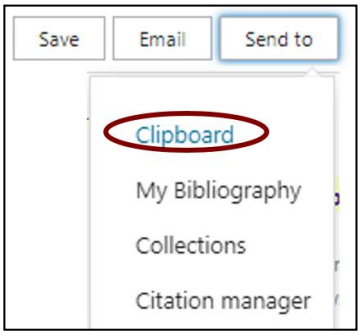

Figure 66. Transmission to short-term storage *Clipboard*

You can see that the *Clipboard* has saved citations both on the *PubMed* home page below the search window and above the list of results under the *"Clipboard"* with the number of citations stored in it (see Figure 67).

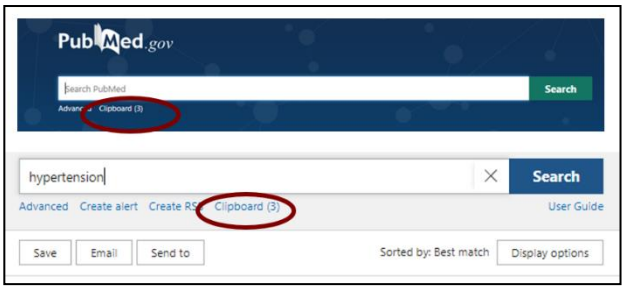

Figure 67. Setting up personal filters

All citations saved in *Clipboard* are displayed in the form of a list, which can be regrouped or modified into different view formats *(Sorted by)*, it is possible to carry out saving activities *(Save)*, as well as send to e-mail *(Email)* or save in your profile for a long time and create reference lists *(Send to)*.

If you need to delete a citation from the *Clipboard* list, use the command *Remove from Clipboard* after the entry. If more than one citation is to be deleted, mark them and select *Remove selected items from Clipboard*. In case you need to delete all the citations from the *Clipboard*, select *Remove all*.

Saving Search Strategy (*Create alerts)*

If the topic searched is of long-term interest to the user, it is possible to save the search strategy and the results of the search carried out, as well as order regular latest citations to the e-mail. You can save both recent searches and previous searches from the *History* section.

To save, first carry out a search, then use the command *Create alert* (see Figure 45) and confirm with *Save*. During the saving process, the system offers to enter the search name, select the frequency of receiving news, the citation format and the number of citations (see Figure 68). You can view the saved searches in your profile in the section *Saved Searches* of *My NCBI* (see Figure 69), where you can see the most recently saved searches and the number of recent citations for these searches since the last time you viewed them.

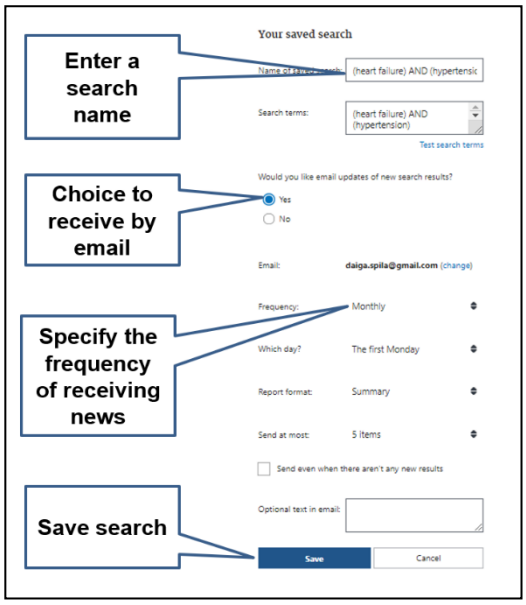

Figure 68. Setting up search retention conditions

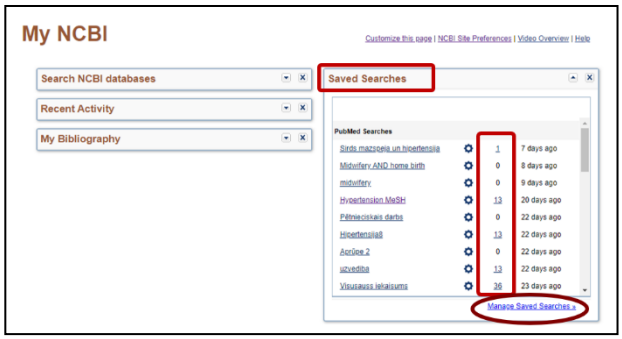

Figure 69. Viewing the saved searches

When selecting the command *Manage Saved Searches*, a list of all the saved searches is displayed. By clicking on a saved search title, you can open a complete list of its citations. By selecting the gear icon ( ), you can change the search settings, such as the name and the frequency of notification to email and the format. The saved search strategy cannot be changed. The saved searches must be saved again after editing, but the old search must be deleted. Irrelevant searches can be deleted from the list of saved searches. Selecting the search and using the command *Delete Selected item (s*), it is deleted.

Choosing the search for which you want to view updates and selecting the command *What's New*, you will see the number of the latest entries found in that search *(New Items Found)*, that will open the list of most recent items since the last time the list was viewed.

Saving Citations in Collections *(Collection)*

My NCBI collection is a collection of user-created citations that can be saved under a specific name for a certain period of time. From the list of citations, tick the ones you need to keep in the collection. In the *Send to* menu, select *Collections* (see Figure 70) and confirm with *Add* (see Figure 71). If the citations are not ticked when creating the collection, the first 1000 citations of the list will be sent to the collection

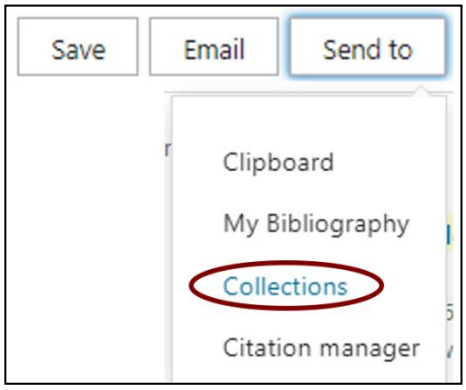

Figure 70. Sending citations to Collection

In the *Collection* window, you can create a new collection *Create new Collection* or add citations to the existing collections by *Add to an existing collection*, by adding the name of the collection (see Figure 71) and confirming it by *Add*.

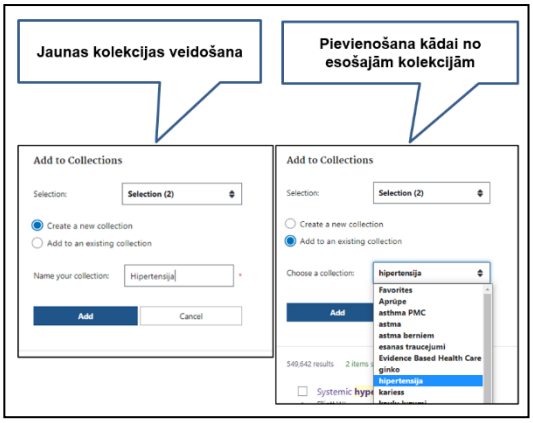

Figure 71. Sending citations to the *Collection*

All the stored citation collections are displayed in the section *My Collections* of *My NCBI*. To view the full list of collections and edit them, choose the link *Manage Collections* (see Figure 72).

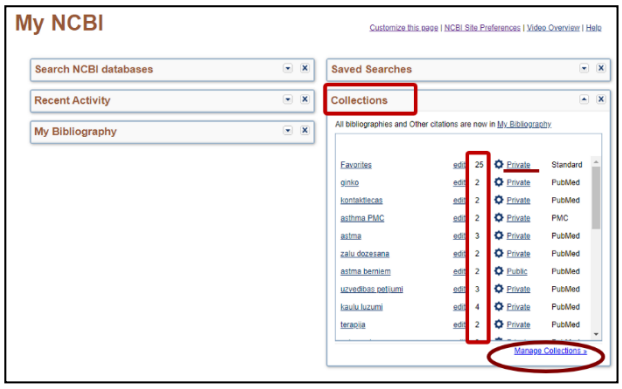

Figure 72. Viewing the stored collections

In the list of collections, you can view all its citations by clicking on the collection name. The *Items* column shows the size of each collection, but you can edit it using the command *Edit*. Collections can be private and can be shared with other database users.

The collection is edited using the command *Edit* opposite its name. Collections of similar content can be combined. To do this, tick the collections to be merged in the section *Collection* and use the command *Merge*. The new collection must be given a new name. In the process of merging collections, the system eliminates duplication of citations and automatically deletes old collections. If you need to delete one of the collections, tick it and use the command *Delete*.

Creating references and receiving news via RSS

The ***My Bibliography section*** is designed to make it easier for authors to search and collect bibliography citations from *PubMed* for their publications in one place. Entries that cannot be found in *PubMed* can also be added to this list manually.

By ticking the required citations in the list of results, they can be sent to the section *Send to My Bibliography* (see Figure 73) and confirming by *Add*.

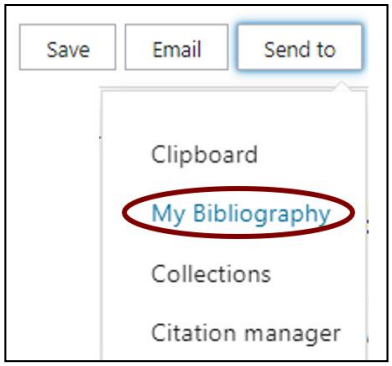

Figure 73. Transmission to the Bibliography section

The *My Bibliography* window shows the number of citations, privacy settings, and recently added citations. Bibliography lists can be edited, and the order of citations may be regrouped.

Citation manager. References to useful publications can be exported to the reference tool *EndNote*. In this case, tick the required citations and send *(Send to)* to the reference creation tool *Citation manager* (see Figure 74).

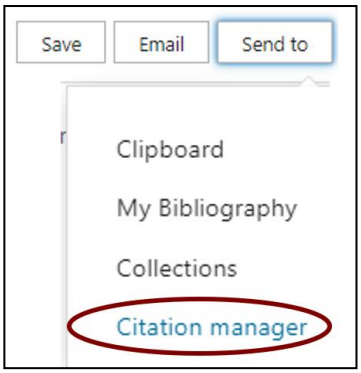

Figure 74. Sending citations to the reference creation tool *EndNote*

RSS *(Really Simple Syndication)* is an *XML*-based format (see Figure 45) used to send the latest citation lists or the latest information about the *PubMed* database to users who use *RSS* feed readers. [Spila, D. (2013). *Pasaules medicīnas citējamo žurnālu datubāze PubMed un informācijas meklēšanas iespējas.* Rīga: RSU. Retrieved from https://www.rsu.lv]

Summary

Search results can be temporarily saved to the *Clipboard*. For long-term storage of search results and search strategy, *PubMed* offers to use the user's individual profile *My NCBI* by obtaining individual registration in advance. *My NCBI* allows you to save an entire search and keep track of the latest citations in it. If necessary, collections of individual citations and bibliography lists can be saved. *My NCBI* also offers to receive news lists on selected topics by e-mail of a registered user or to view them at a convenient time. Using *RSS* technologies, saving your search made and creating an *RSS* feed, you can also regularly follow the most recent posts on the topic of interest. Selected citations can be sent by e-mail. Citations may be exported to reference creation tools.

Links to Other Online Resources

Link system and access to full texts of publications

LinkOut. Linking *PubMed* citations to full texts is offered by the technical solution of the *LinkOut* service, which allows to add a wide range of information to the *PubMed* database. Many *PubMed* citations include links to the full text of journal articles available online, as well as links to databases, libraries, and publishers that offer the full text of the article of interest. Some articles are available free of charge, while access to some articles is subject to a charge.

The section *LinkOut more resources* provides links to various databases and full-text resources on the summary view page. When you click on the resource name, the *PubMed* database is abandoned and the user is taken to another external link. As a result, links of each citation to resources available on the network are different. Full texts can be accessed through *LinkOut* in several ways:

1. For the list of results in the *Summary* view form, many citations are marked *Free Articles* or *Free PMC Article* (see Figure 75);

2. Icons containing links to full texts appear in the upper-right corner of the screen on the summary view page (see Figure 76);
3. All full-text providers and links to other literature sources and databases are given on the summary view page, below the article summary, in the section *LinkOut - more resources* (see Figure 76).

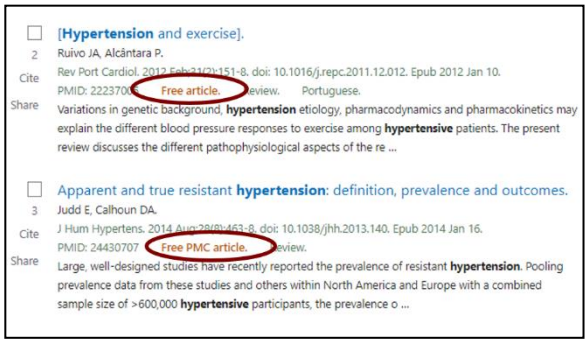

Figure 75. References to the full texts in the list of results

Figure 76. References to the full texts on the summary view page

PubMed Central

PubMed Central (hereinafter referred to as *PMC*) is designed to create an open access digital journal archive in the biomedical and life sciences sectors. It was created in 2000. The full texts of more than 6.6 million articles are currently available in the *PMC* collection.

The *PMC* also contains a large number of scientific manuscripts and articles from a few thousand journals that have published research by researchers supported by the US National Institute of Health and other foundations, but are not included in the *PMC*. The goal of *PMC* is to collect these different sources in one place in the same format and in the same repository. [12; 15; 16]

PMC is not a publisher. The use of the materials is free, but their use is governed by copyright and licenses. Publishers' participation in the creation of the *PMC* resource is voluntary, but journals provided by publishers must meet certain standards and technical requirements. Many publishers make the content of their journals available to the *PMC* shortly after their publication, while others allow access to journal articles a few months or even a year after its publication (embargo period).

Journals whose full texts are available in *PMC* fall into three categories: full sets of journals; incomplete sets of journals and journals, the articles of which have been published at random or in open access. The *Journal List* provided by the *PMC* contains the first and second category journals with information on journal volumes and their table of contents. Manuscripts and articles from third category journals are available through a *PMC* search or via a link from the relevant *PubMed* abstracts.

To access the *PMC*, go to the *PubMed Central* link at the bottom of the *PubMed* page (see Figure 77). When you open the *PMC* home page, you can conduct search in the search box, go to the list of journals *(Journal List*), carry out an advanced search and look into the search history *(Advanced)*, and search for a specific article *(PMC Citation Search)* (see Figure 77).

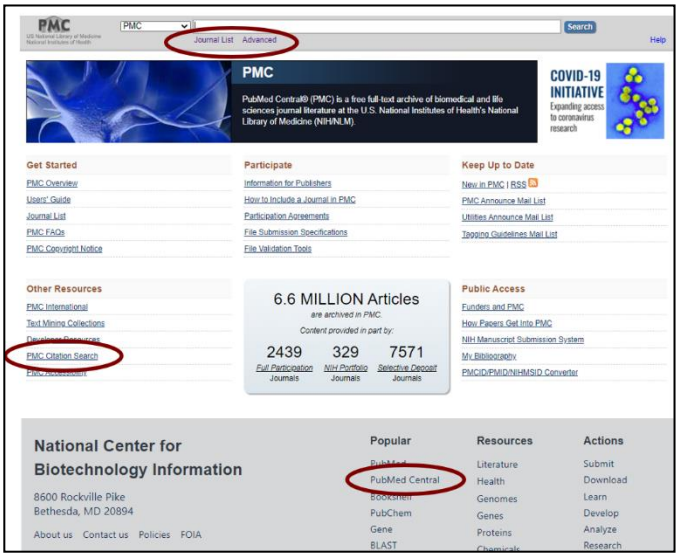

Figure 77. Getting to *PubMed Central* and its tools

The *PMC Journal List* is a complete list of journals available at the *PMC* (see Figure 78), that is arranged alphabetically and also offers journal browsing. Here you can find out what volumes are available *(Volumes in PMC: Latest, First),* information about the full text free access or embargo period *(Free Access),* information about the completeness of the journal collection *(Participation Level)*, as well as the opportunity to view the latest journals for the last 60 days *(New)* and special collections containing articles in a random way *(Special Collections).*

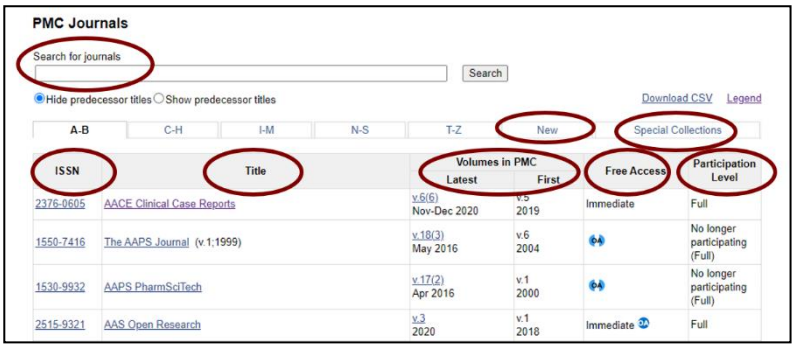

Figure 78. *PubMed Central* list of journals (PMC Journals)

In the section *PMC Journals*, it is possible to search for keywords in the titles of journals *(Search for journals)*. The keywords should be entered in the search box and the search should be conducted with the command *Search*.

Whereas, in the *PubMed* results list, it is possible to use various links to get to the full texts of the article, which can be found in *PMC* (see Figure 79). On the summary view page, click on the *PubMed Central* link in the section LinkOut - *more resources* after the abstract of the article, or on the icon *PMC Full text* in the section *Full text links* in the upper-right corner of the screen.

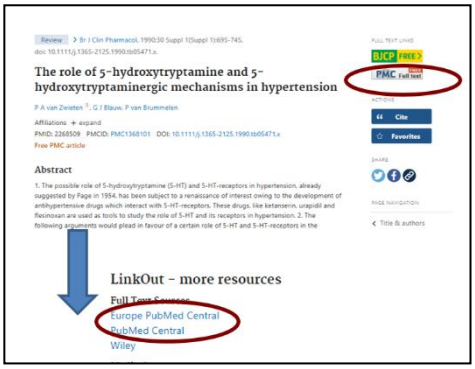

Figure 79. Links to the full text available in the *PubMed Central*

When searching *PubMed Central*, a list of results is obtained, for which the results found may be limited using the section of filters *Show additional filters* according to the features provided by articles *(Article attributes*), availability *(Text availability*), the date of publishing *(Publication date)*, and research funder *(Research Funder*). With the filter *Author Manuscripts*, you can select the author manuscripts on the chosen topic.

From the list of *PMC* results, a bar appears on the right that contains additional information and provides additional options (see Figure 80), such as: installation of *PMC* filters *(Filter your results)*; direct access to *PMC* publication images *(PMC Image Search);* search links to other *NCBI* databases *(Find related data);* viewing search details *(Search details)* and the most recent activities made *(Recent activity).*

Figure 80. *PubMed Central* extra bar

PMC Citation Search (see Figure 81) contains special fill-in fields that can be used to search for specific journal articles if one or more of the citation elements are known.

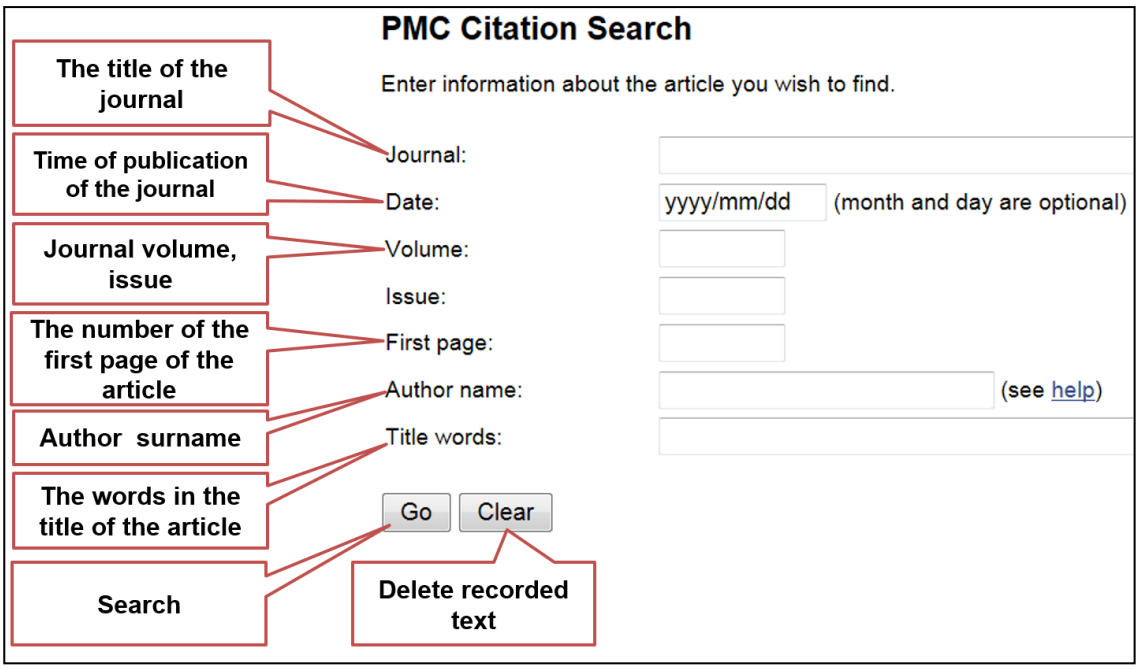

Figure 81. *PubMed Central* specific citation search

PMC full texts are available in *HTML* and *PDF* formats. To open the full text of an article, click on the links *Full Text* or *PDF* below the citation. Some citations also have links to the abstract of the article *(Abstract)*, additional information *(Supplemental Data)*, corrections *(Correction)*, and feedback on the article *(Retraction)*. The full text of the article with attached tables, figures, statistics and references is displayed in *HTML* format (see Figure 82). The *HTML* format includes a variety of additional links and search tools. These are links to bibliography lists of the authors of the current article, to other *PMC* articles and other databases of the *Entrez* system, as well as links to related articles. The *PDF* format of the article is for reading, printing, transmitting, and saving the article, but it does not contain links to similar resources. The appearance of the *PDF* format is identical to the publication of the article in a printed journal.

Figure 82. HTML format of the article in *PubMed Central*

Summary

Links of *PubMed* citations to full texts are offered by the technical solution of the *LinkOut* service. Whereas, *PubMed Central* is an archive of open access digital journals in the biomedical and life sciences sectors. The goal of *PMC* is to collect these different open access sources in one place in the same format and in one repository. Most of them contain relevant citations in *PubMed*. *PubMed Central* also contains a large number of scientific manuscripts and articles from several thousand journals that have published research by researchers supported by the US National Institute of Health and other foundations.

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CHAPTER IV. EVIDENCE-BASED MEDICINE FOR LIBRARIANS

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The aim of this education module is to provide to medical information specialists the basic principles of EBM theory and develop new skills in the process for evidence-based practice.

Objectives:

- to learn about types of study design in EBM process
- to evaluate the importance of research evidence in making clinical decisions
- to understand and formulate the core health care questions
- to improve searching skills and critical appraisal in EBM resources
- be able to consult researchers and participate in the process of writing systematic reviews

The Role of Librarian in the EBM Process

The number of published systematic reviews is constantly growing. Therefore, academic libraries are receiving more and more inquiries about evidence-based medical resources, their use and the preparation of systematic reviews. Specialists of medical libraries of most foreign universities participate in research groups to help with information searches in databases, selection of sources, critical evaluation. In many descriptions of the methodology of systematic reviews, we now see included library professionals who are responsible for information searching strategy, database selection, critically evaluated, included, and rejected sources. When doing a search, you need to be a search expert with a good understanding of the completely systematic review process. The librarian can become an important assistant to the researcher because he or she has the necessary knowledge to participate in the systematic review process: applying the methodology, formulating the research question, defining the inclusion and exclusion criteria. A library specialist can play an important role in advising researchers on search strategy, data collection and aggregation, and in searching key databases, searching printed journals, assisting in the search for gray literature, storing bibliographic records in citation tools such as EndNote, RefWorks, Mendeley or Zotero. The librarian may be involved in other stages of systematic review: review of articles, critical appraisal, and data selection [1].

The role of a medical librarian can be very diverse, ranging from search counseling to becoming a co-author who puts intellectual effort into research. The methodology of preparing a systematic review enables library specialists to play an important role in the synthesis of well-conducted research.

Participating in the systematic review process is a new challenge in librarianship, ensuring access to resources, developing a new systematic review service, or improving an existing one. These are new opportunities to not only expand services, generate additional income, but also new needs: staff training and education, increased workload and time costs, support for students and researchers. Provision of systematic review services may be hampered by a lack of information on the latest standards, best practices and methods. However, this challenge can become a great opportunity for library professionals who want to improve their professional competencies, expand their roles, and test themselves in new activities

What is Evidence-Based Medicine?

Evidence-based medicine has been one of the hottest topics for physicians in the last decades and is becoming increasingly important in making clinical decisions. Health services are supporting and developing this process in order to make more efficient and rational use of limited health resources.

Medical information is changing rapidly, new treatment methods and medicines are emerging, so doctors do not have enough of the knowledge they have acquired while studying at university. They must be constantly interested in the news in their field. In many countries, physicians are the only members of the profession who are required by law to keep their professional knowledge up to date. This means that a doctor can be prosecuted if he does not improve his qualifications or treats with outdated methods.

Over 2 million articles are published in medical journals each year and this number is growing by 4% annually. New medical articles are appearing at a rate of every 26 seconds [2]. It would take 20 hours of reading each day for the average physician to comb through everything published in their speciality [3]. However, according to the STM Report [4], medical doctors read 200 articles per year and spend on average less than two hours a week getting acquainted with medical innovations. How doctors should keep up with medical innovations and orient themselves in the information jungle?

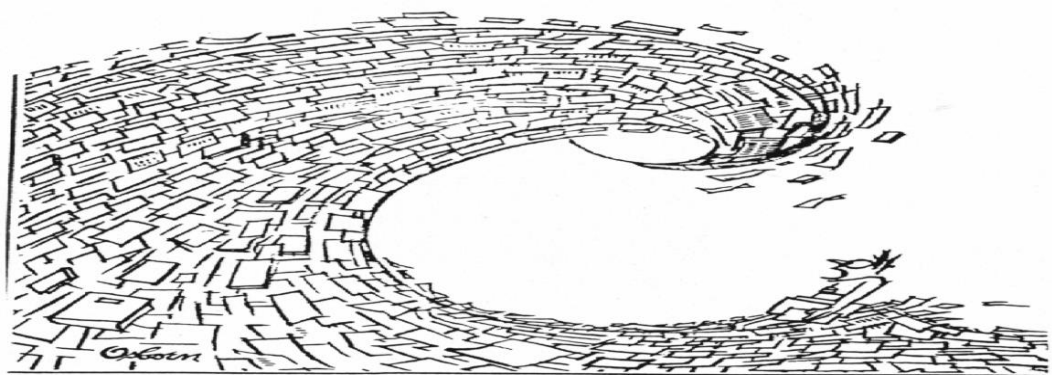

Figure 1. Information Explosion [Osborn A]

The flow of information can be somewhat reduced by medical books, in which the information presented is usually already selected and systematized. However, medical knowledge is changing very rapidly and the book may be outdated yet unpublished. To get the latest information, you have to look it up in medical journals. Evidence-based medicine methodologies and resources can help overcome the flood of information, but they require some knowledge and skills to understand.

So what is evidence-based medicine?

“Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values” [5]. The revised and improved definition of evidence-based medicine states that it is a systematic approach that ensures the application of the best possible research-based evidence, clinical experience, and the integration of individual patient characteristics into clinical practice (see Figure 2).

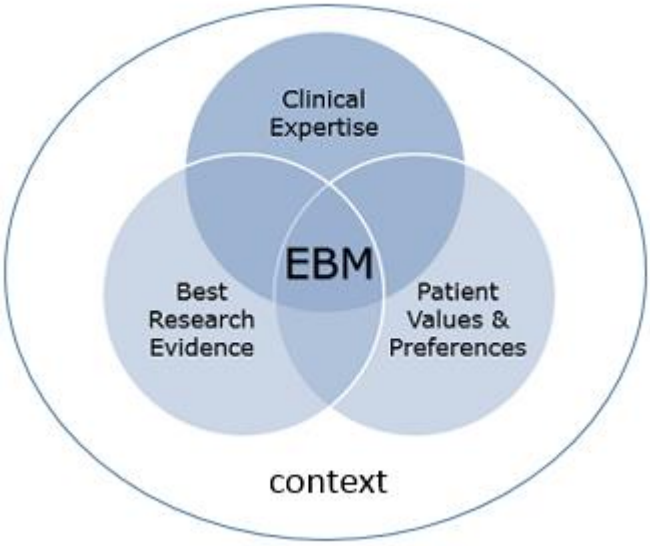

Figure 2. The structure of evidence-based medicine

The best available research-based evidence means that the treating physician must rely on the best and most up-to-date literature to apply the best possible treatment at the time, based on external clinical trials. New research often refutes years of diagnostic tests, treatment methods, health safety of drugs and replaces them with new ones that are more effective and safer.

The individual experience of the doctor allows to make the diagnosis faster and more accurately, to make the right decisions, to behave more carefully and sensitively in unpleasant situations, to respect the patient's rights and choices. A good doctor uses both his own experience and the latest reliable scientific evidence in his practice.

The individual characteristics of the patient, the general condition, his choice are also important factors in this process. Even the most reliable scientific evidence and the experience of the doctor will not guarantee a successful treatment without taking into account the individual characteristics of the patient and his consent.

The context in Figure 2 refers to health policy, laws, economic resources, values. This fourth area affects the three preceding elements and therefore covers all three areas.

Types of Study Design

In order to make effective use of evidence-based sources of medical information and apply them in your clinical practice, it is necessary to become familiar with study designs and the main types of publications.

Reviews

Review is a scientific publication that examines several studies about the research object and draws a general conclusion from them. The main drawback is that the review does not indicate why those particular studies are included in the review, so there may be some inaccuracy.

The last decade has witnessed increased recognition of the value of literature reviews for advancing understanding and decision making in the medicine practice. Researchers estimate that 75 trials and 11 new systematic reviews are published a day recently [6]. According to the study performed by A. Sutton [7] and her colleagues on published reviews which have been searched in PubMed and Google Scholar, it has been indicated forty-eight reviews types and categorised into several families.

Traditional reviews may be titled as **literature** or **narrative review, narrative summary, state of art review, critical review, and integrative review**. Typically, bibliographic database searching is the staple approach for traditional reviews but narrative summaries and state of the art reviews extend to include searching for grey literature, particularly where policy documents are relevant to the scope of the review. An integrative review, which focuses on research into practice, is likely to include searching of research registries to identify prospective or ongoing research [7].

Systematic Review it is defined as "a review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyze data from the studies that are included in the review." [7]. The methods used must be reproducible and transparent. It is far superior in terms of the validity of the scientific evidence. It differs from a simple review in at least two respects. First, the systematic review indicates the purpose for which the review was prepared. Second, the search criteria used to select the articles used in the review. A methodological analysis of the quality of each used article must be performed. In addition, the authors of the review must indicate why those articles were included, as well as provide a list of publications that were rejected after the evaluation. In other words, publications are selected in a systematic way. This allows the evidence on which the authors based their findings to be examined and evaluated.

Overview of reviews (umbrella review). It is a systematic review of systematic reviews. The intent of this type of review is to include systematic reviews or meta-analyses as the main study type and thus examine only the highest level of evidence [8]. Overview of reviews is designed to provide clinical decision makers with the evidence they need when there are too many systematic reviews for them to keep up with for an intervention. Also when decision-makers need a rapid evidence synthesis and higher quality evidence due to limitations of the rapid review methodology.

Meta-analysis - this is a special type of review article. According to the MeSH thesaurus it is „a quantitative method of combining the results of independent studies (usually drawn from the published literature) and synthesizing summaries and conclusions which may be used to evaluate therapeutic effectiveness, plan new studies, etc., with application chiefly in the areas of research and medicine" [9]. Meta-analysis is deeper than a simple review article, using statistical methods to combine and analyze actual data (see Figure 3).

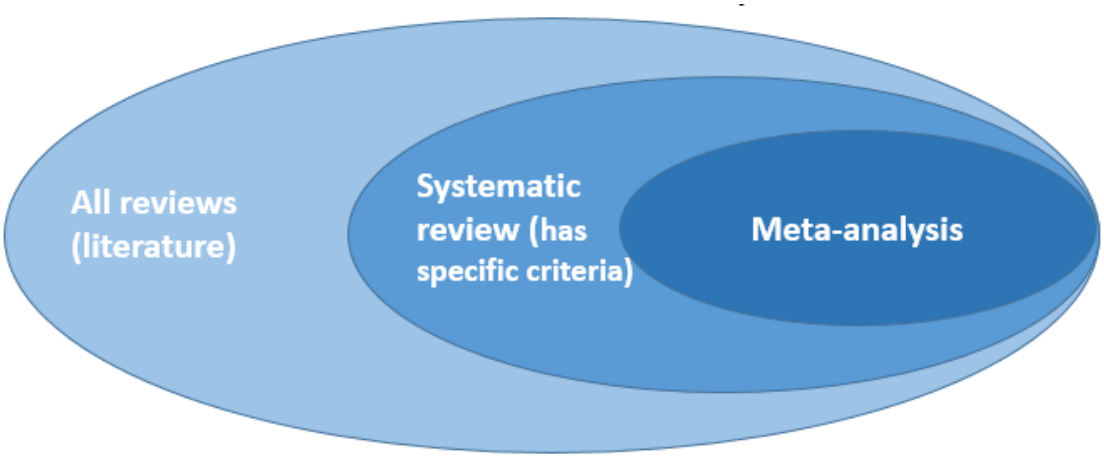

Figure 3. Types of reviews

Network Meta-Analysis. Network meta-analysis compares multiple interventions simultaneously by analyzing studies making different comparisons in the same analysis [10]. Network meta-analyses are best designed for conditions with multiple interventions and to make treatment estimates for an entire treatment network instead of scanning each individual pair-wise comparison, and require a lot more screening of trials. Usually it takes time as a traditional systematic review.

Increased number of published literature reviews has been accompanied by an expansion of research methodologies and types of systematic review. One of them is **scoping review.** Scoping reviews have great utility for synthesizing research evidence and are often used to categorize or group existing literature in a given field in terms of its nature, features, and volume [11]. Often a scoping review is confused with a **mapping review**. They are two different review types. Scoping reviews are more topic based and mapping reviews are more question based. Mapping reviews are best designed when there is an abundance and a diversity of research, as a first step to a systematic review, and to identify gaps in a topic area.

Rapid review is a method of evidence synthesis that may provide more timely information for decision-making compared with standard systematic reviews. Rapid reviews usually are done less than during 5 weeks. This type reviews are designed for new or emerging research topics, for example rapid reviews on Covid -19. Rapid reviews have limitations, because searches may be not comprehensive, in some cases there may be only one reviewer, limited interpretation of the findings, and no universally accepted definition of a „rapid review". For the level of confidence of review types see Figure 4.

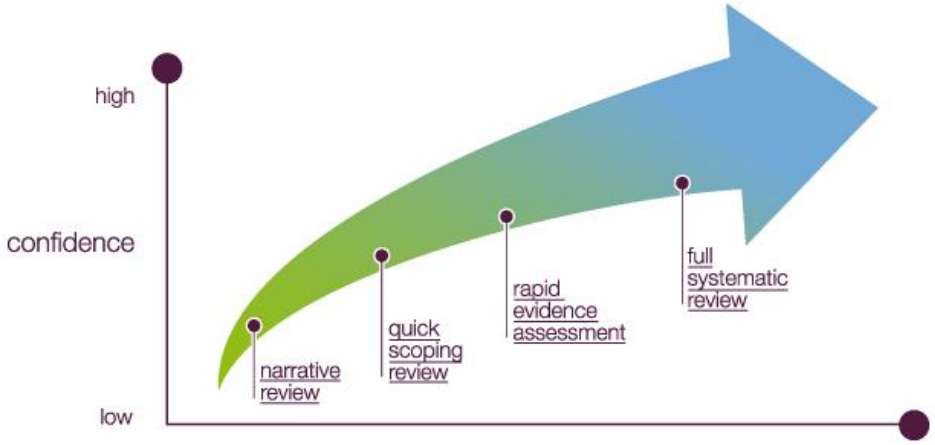

Figure 4. Level of reviews. HLWIKI International. CC BY-NC-SA 2.5 CA

New types of reviews however, there remains uncertainty over definitions and search requirements beyond those for the 'traditional' systematic review.

Randomized Control Trial, (RCT)

Randomized Control Trial, (RCT) – is defined as an experiment in which two or more interventions are compared by being randomly allocated to participants. Large, well-designed, and well-implemented RCTs are considered the gold standard for evaluating the efficacy of healthcare interventions (therapy or prevention). RCTs are the best way to identify causal relationships and can determine efficacy (establish definitively which treatment methods are superior). These studies can be performed to determine the effectiveness of all procedures that can be attributed to treatment methods (medications, surgical procedures, health training). The most important study method is used in clinical trials. For example, two groups of patients are being tested to determine if a new drug is effective. One of them, the interventional patients, is receiving the study medicine and the other is receiving the placebo. The groups are completely the same, only the treatment differs. *Random sample* means that all patients have an equal chance of entering any of the groups (see Figure 5).

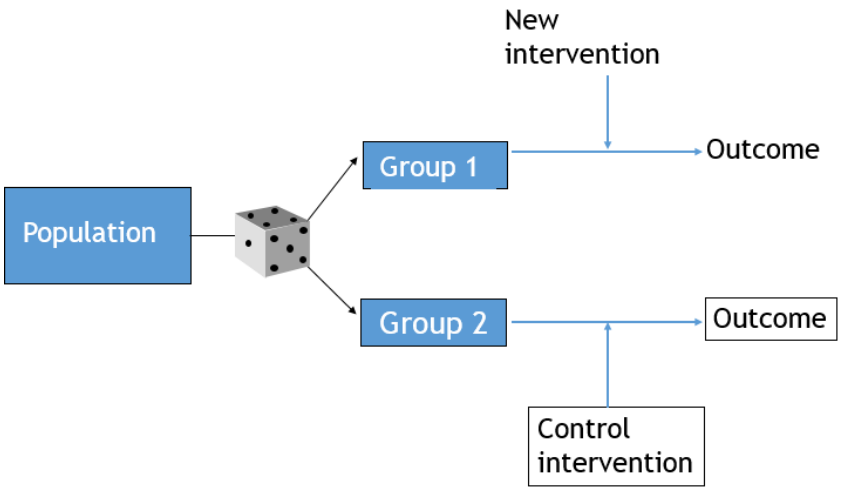

Figure 5. Randomized Control Trial

Cohort Study

Cohort Study - it is an analytical observational study in which a group of healthy people consisting of exposed and non-exposed individuals is observed. To establish a causal relationship between the risk factor and the disease, data on all new cases of the disease are collected (see Figure 6). A cohort study can be predictable - prospective or retrospective.

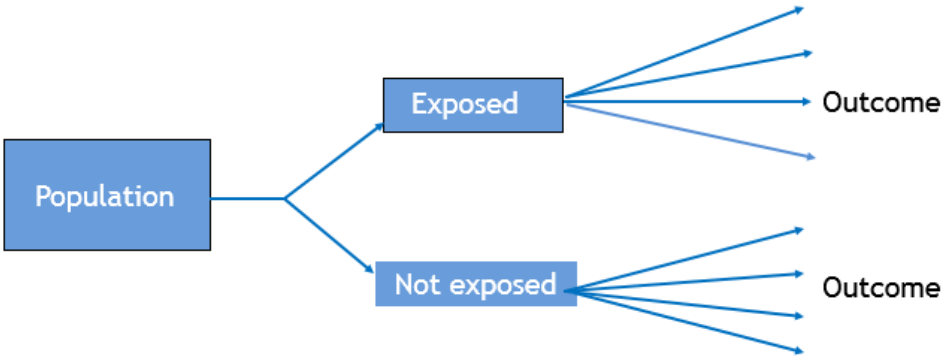

Figure 6 Cohort study

Case-Control Study

Case-Control Study – The observational epidemiologic study of persons with the disease (or other outcome variable) of interest and a suitable control (comparison, reference) group of persons without the disease. The relationship of an attribute to the disease is examined by comparing the diseased and nondiseased with regard to how frequently the attribute is present or, if quantitative, the levels of the attribute, in each of the groups (see Figure 7). This type of study is less reliable than randomized or cohort studies.

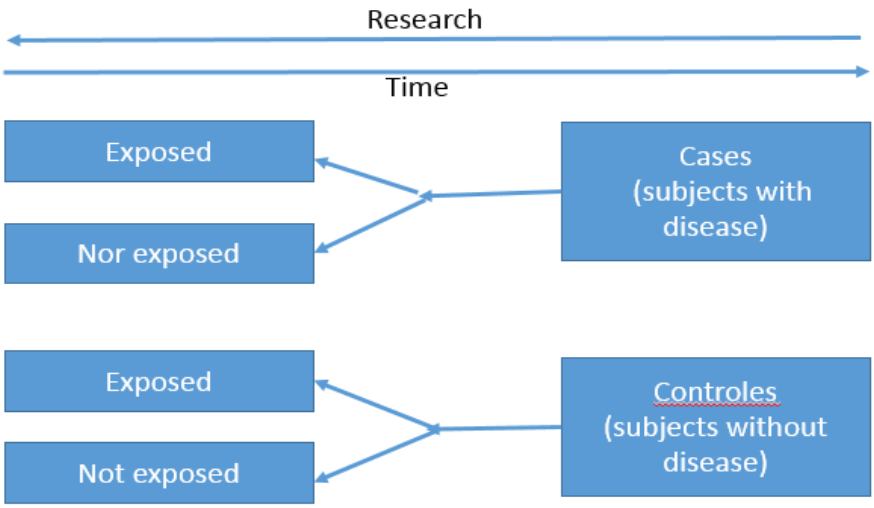

Figure 7. Case - Control study

Case Series

Case series. The most unreliable sources of information are case descriptions and case series. These are individual patient disease descriptions and treatment histories without any statistical validity (see Figure 8).

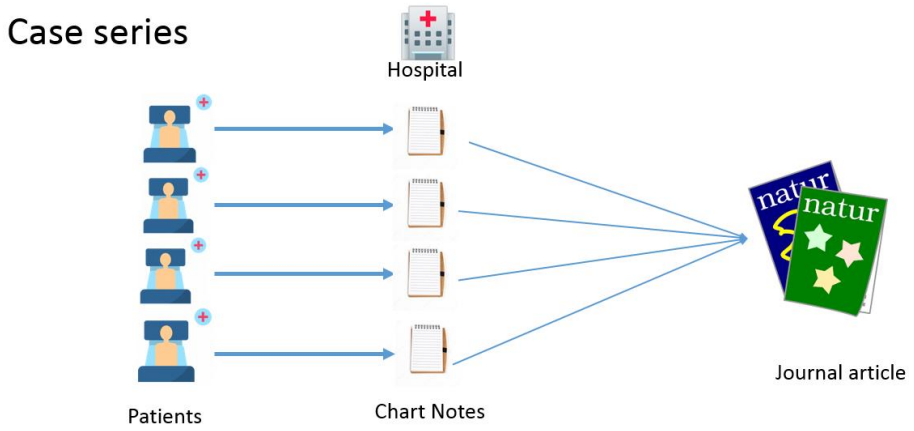

Figure 8. Case series

Which Types of Publications are the Most Reliable? Hierarchy of Evidence

These different types of study designs and types of publications in databases differ not only in quantity but also in quality. The pyramid below shows the ranking of different types of publications according to the validity and reliability of the scientific evidence. A meta-analysis of the most reliable publication type is depicted at the top of the pyramid, and the reliability of publication types decreases from top to bottom. However, it should be noted that the number of types at higher pyramid positions is lower, which means that they are much more difficult to find in databases (see Figure 9).

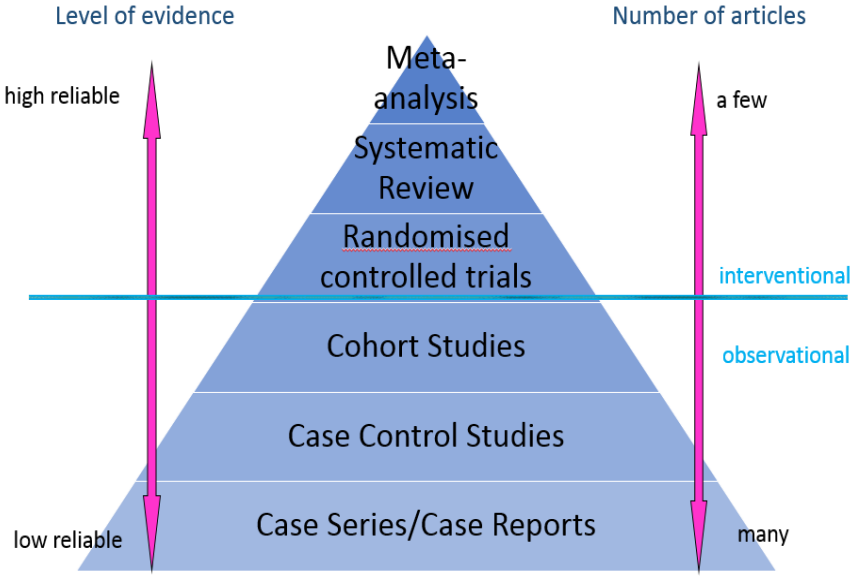

Figure 9. Hierarchy of the evidence

The Process of Evidence-Based Medical Practice

The process of evidence-based medical practice is based on common standards of information literacy and, according to the scheme proposed by the Cochrane community, consists of five stages (see Figure 10), which we will discuss below.

1. Formulation of the question. This is turning the need for information into an accurate clinical query. The quality of the results depends on how the question is formulated exactly.
2. An effective literature search for the best evidence. At this stage, clinicians can be most assisted by an information specialist. The approach of evidence-based medicine to the search for literature differs from the traditional one. The search strategy offered by EBM is much more precise than the traditional one, when searching only by combining the relevant subject sections. It should be noted that most scientific articles are published solely in the academic interest, so additional efforts are needed to formulate search criteria in order to select information that is more patient-centered.
3. Critical appraisal of the evidence found. At this stage, you need to be able to read the publication: it is necessary to review the structure of the article, pay attention to the type of publication and the methodology used in the research, and assess the reliability of the evidence. This means that each article needs to be examined in more detail in order to weigh the scientific methods used. The methods used can be used to judge how reliable the conclusions of a scientific publication could be. Critical appraisal technique involves the analysis of articles in terms of their application to clinical practice. For example, the critical evaluation method for therapeutic trials should formulate the following types of questions:

- Are the criteria of randomness (statistical reliability) in the selection of patients for research met?
- Is the requirement that both the patient and the physician should not know to which study group the patient belongs fulfilled?

4. Analysis of evidence, its combination with clinical experience and patient specifics. At this stage, the key is to close the gap between scientific knowledge on one hand and patient treatment practices on the other, both in hospitals and in primary care. The integration of these three parts is a prerequisite for the practice of evidence-based medicine.
5. Decision making in clinical practice and evaluation of treatment results.

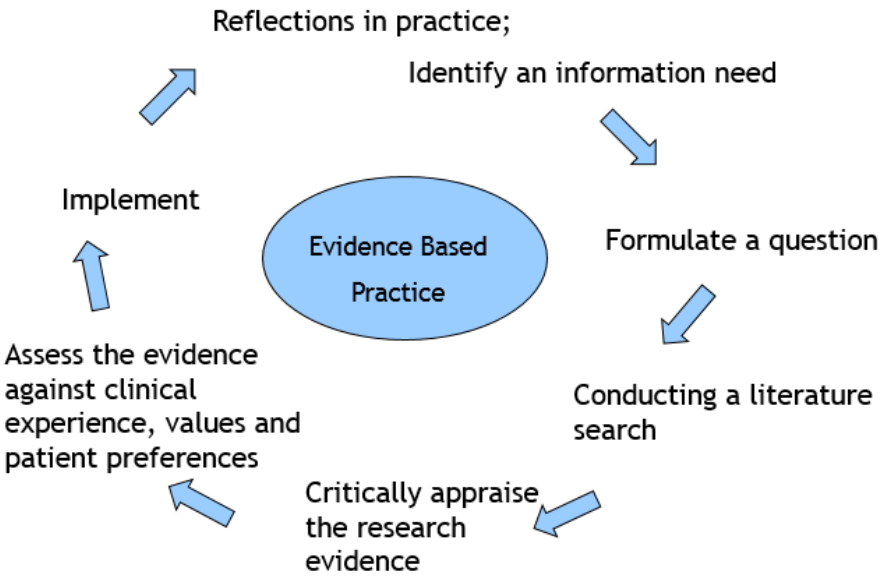

Fig. 10. The process of evidence-based medical practice

Formulating Clinical Question

In the practice of evidence-based medicine, it is necessary to apply the best evidence when making decisions in daily work. Therefore, in order to find them quickly among the rich sources of information, it is very important to be able to formulate the clinical question correctly with all the elements that will help to find what is needed.

The first step is to determine the type of question: whether it is a background question about conditions and diseases or a foreground question for a specific clinical action or decision (see Figure 11).

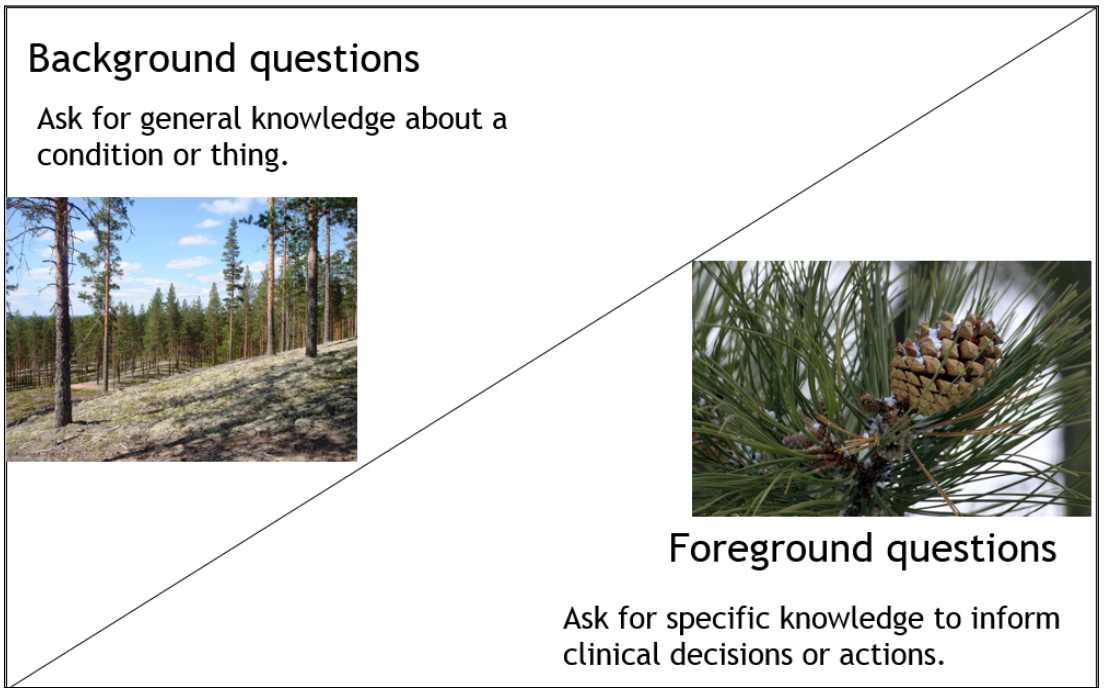

Figure 11. Types of questions

Background questions are asked about a disease, its course and necessarily consist of two essential components: the question words what, how, when and the verb, for example: What causes cellulitis? How to prevent migraines? What are the clinical manifestations of menopause? What is mild hypertension?

Such information is most likely to be found in relevant textbooks, manuals, and databases, in the PubMedPlus database.

Foreground questions are related to a specific patient's disease and its treatment. The foreground question consists of 3 or 4 components, such as:

• patient and/or problem,
• intervention,
• comparison, comparative intervention (optional, include if relevant)
• outcome

Examples of clinical questions: Does acupuncture help prevent migraine attacks? Is short-term antibiotic treatment as effective as long-term treatment for acute otitis media in children? Using of cardiac resynchronization therapy in heart failure, is it reduce mortality?

It is often difficult to formulate the clinical question precisely, so it is recommended to use the PICO method (the first letters of the English terms Population, Intervention, Comparison, Outcome) and to break down the question into the 4 mentioned elements.

The PICOT method has recently been introduced, in which it is recommended to add an additional component T - (Type of Study) term when formulating the question. Other sources refer to PICOS, where S - Study Design

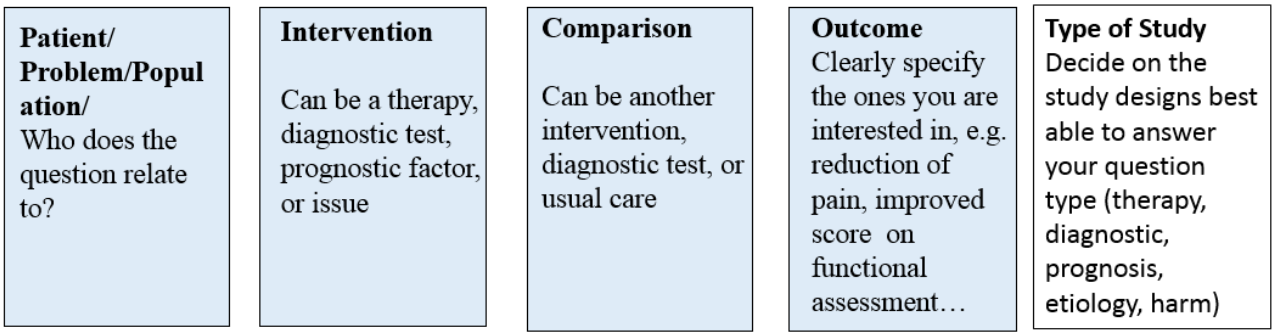

Figure 12. PICOT method

Scenario:

The patient's son is worried that his father's memory is severely impaired. He read online that ginkgo biloba leaf extract is effective in treating dementia. What advice would you give to a visitor?

***P**opulation/Problem*	***I**ntervention*	***C**omparison*	***O**utcome*

	(treatment)	(with which the intervention is compared (not always necessary)	(what effect, expected results)
Dementia	Ginkgo biloba leaf extract	Traditional treatment or placebo	Memory improvement

Figure 13. Breakdown of the question according to the PICO method

After breakdown of the question into PICO elements, the query is further formulated according to a general information searching strategy using thesaurus MeSH terms, including synonyms, logical operators, insertion, and other methods, depending on the specifics of the information sources.

Population/Problem	**I**ntervention	**C**omparison	**O**utcome
Dementia (MeSH) **OR** amentia **OR** Alzhiemer **AND**	Ginkgo biloba (MeSH) **OR** maidenhair tree **OR** Alzhiemer	**AND**	Cognition (MeSH) **OR** awareness

Figure 14. Query formulation using the PICO method

In order to formulate a clinical question correctly and obtain an accurate answer, it is not enough to distinguish between a background question and a foreground one, it is necessary to define the main category of healthcare.

The main categories are:

• diagnosis (what tests to prescribe and how to interpret their results?);

• etiology (what are the causes of the disease?);

• therapy (what treatment methods to use?);

• prognosis (what is the probable course of the disease or condition?).

In addition, question types by category can be both general and specific. Clinical inquiries about the diagnosis and treatment of the disease are most common.

When searching for information, it is important to determine the category correctly, because it will determine which study design and type of publication we can expect to find and which sources of information should be searched for.

Category	Study design	Data base/ source
Diagnosis	Cross-sectional study.	1. DARE / Other reviews + HTA (Cochrane Library). 2. Evidence Based journals 3. PubMed and /or other licensed data bases
Prognosis	Cohort study	1. Evidence Based journals 2. PubMed and /or other licensed data bases
Etiology	Cohort study Case control study Case series	For questions about harms in the treatment of specific diseases: 1. Clinical Evidence. 2. DARE / Other reviews (Cochrane Library). 3. Evidence Based journals 4. PubMed and /or other licensed data bases Inquiries about the causes or risks of diseases 1. Evidence Based journals. 2. PubMed and (or) other databases.
Therapy / Intervention	Randomized controlled trial, RCT Non-randomized controlled trial Cohort study Case control study	1. Clinical Evidence. 2. Cochrane Reviews (Cochrane Library). 3. DARE / Other reviews (Cochrane Library).). 4. Evidence Based journals. 5. Clinical Trials / CENTRAL (Cochrane Library). 6. PubMed and /or other licensed data bases

Figure 15 Selection of information source by category

It is recommended to use worksheet for less skilled persons to formulate well-built patient oriented question, (see Figure 16)

Question Components	Your Question
P – Patient or Population Describe the most important characteristics of the patient. (e.g., age, disease/condition, gender)	
I – Intervention; Prognostic Factor; Exposure Describe the main intervention. (e.g., drug or other treatment, diagnostic/screening test)	
C – Comparison (if appropriate) Describe the main alternative being considered. (e.g., placebo, standard therapy, no treatment, the gold standard)	
O – Outcome Describe what you're trying to accomplish, measure, improve, affect. (e.g., reduced mortality or morbidity, improved memory, accurate and timely diagnosis)	
The well-built clinical question:	

Type of Question	Ideal Type of Study
□ Therapy	RCT
□ Prevention	RCT > Cohort Study > Case Control
□ Diagnosis	Prospective, blind controlled trial comparison to gold standard
□ Prognosis	Cohort Study > Case Control > Case Series/Case Report
□ Etiology/Harm	RCT > Cohort Study > Case Control
□ Cost analysis	economic analysis

Note: Meta-analyses and systematic reviews, when available, often provide the best answers to clinical questions.

Search Strategy Development

	Primary search term	Synonym 1	Synonym 2
P			
I			
C			
O			

Figure 16. Patient oriented worksheet

Types of EBM Resources and Where to Find Them?

Similar to the pyramid of the reliability of research methods, Canadian scientist Haynes R.B. has formed a hierarchical pyramid of information source quality, known worldwide as the 6S Pyramid of Evidence-Based Medical Information Sources [12]. It is recommended to be used to facilitate the search for EBM information, (see Figure 16). The 6S pyramid consists of six levels:

Single Studies. These are individual types of original studies of all kinds (RCT, clinical trials, Cohort studies, etc.), which are assigned to the lower level of the pyramid and are considered to be the sources of information of the least scientific value. They can be searched and found in the search engines *Google Scholar*, specialized evidence-based medical search engines *TRIP*, *Accessss*, databases *PubMed*, *CINAHL*, *EMBASE*.

Synopses of Single Studies. These are very short summaries of individual studies that provide sufficiently detailed information on the results of high-quality research that can be applied in clinical practice. This is usually information from the results of randomized tests (Randomized Controlled Trials) or other high-quality studies with internal and external validity. Standard format consists of title, reference, question, method, results, conclusions, commentary and implications for practice. They can be found in secondary information journals in evidence-based medicine, such as *Evidence-Based Medicine, Evidence-Based Mental Health, Evidence-Based Nursing*, etc., as well as the *ACP Journal Club Archives, Annals of Internal Medicine*. This type of journal provides critically evaluated short summaries of journal articles on relevant topics.

Synthesis is an evidence-based resource of medical information that includes systematic reviews, scoping reviews, meta-analyzes, and other knowledge syntheses on specific topics. These resources are recommended to search at *Cochrane Library*, *BMJ Best Practice*, *PubMed*, *CINAHL*, *PEDro*.

Synopses of Synthesis. These are very brief, structured descriptions of original systematic reviews, consisting of a title, a clinical question, a brief research methodology, results, conclusions, and comments on the application in practice. They can also be searched and found in the evidence-based medical journals *Evidence-Based Medicine, Evidence-Based Mental Health, Evidence-Based Nursing*, etc., as well as *ACP Journal Club Archives, Annals of Internal Medicine*, NHS Center for Reviews and Dissemination (CRD).

Summaries. Summaries integrate best available evidence from the lower layers (drawing on systematic reviews as much as possible) to provide a full range of evidence concerning management option for a given health problem. Evidences are regularly updated for clinical practice guidelines, protocols that provide information for the diagnosis and treatment of specific diseases. All countries develop and make open access clinical practice guidelines that physicians must use in their daily work. In Lithuania, all prepared diagnostic and treatment guidelines are available on the website of the Ministry of Health. Searching for foreign clinical guidelines it is recommended to use the NICE Clinical Guidelines (UK), CPG Infobase (Canada), National Guideline Clearinghouse (USA). Commercial evidence-based medical databases *UpToDate, DynaMed, Clinical Key, Best Practice*, which provide the latest clinical practice methodologies, are widely used worldwide. Commercial EBM resources are created using advanced technologies, so they are convenient to use in everyday work, adapted to mobile devices.

Systems. It is a top-level information resource where evidence-based information at all levels is integrated into the hospital's information system and linked to individual patients' medical records. This is an ideal EBM model used in everyday clinical practice.

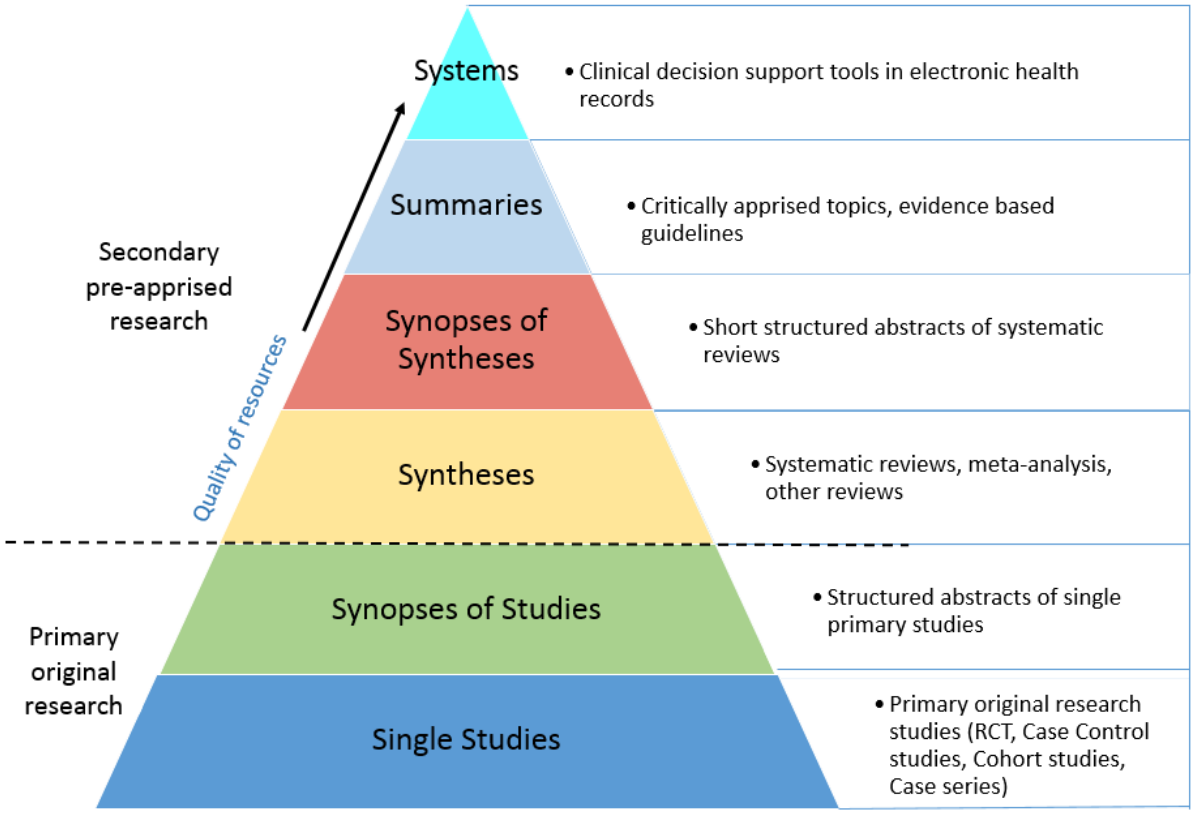

Figure 17. 6S Hierarchical pyramid of *EBM* resources

Resources According to 6S Classification

6S level	Definition	Resources
Systems	The individual patient's characteristics are out linked to the current best evidence that matches his or her specific circumstances and the clinician is provided with key aspects of management.	Clinical decision support tools in electronic health records
Summaries	Regularly updated high-level evidence-based practice guidelines Resource types: clinical reviews, practice guidelines, position statements	Data bases *UpToDate, DynaMed, Clinical Key, Best Practice*, National guidelines
Synopses of Synthesis	Short, structured descriptions of original systematic reviews. Study types: Meta-analyses, systematic reviews, other review types	EBM journals, NHS Centre for Reviews and Dissemination (CRD)
Synthesis	These resources contextualize and integrate the research findings of individual studies within the larger body of knowledge of the topic. Study types: systematic reviews (by the Cochrane Collaboration), meta-analyses of quantitative research, meta-syntheses of qualitative research, and critically appraised topics.	Databases: Cochrane Library, *BMJ Best Evidence*, *PubMed*, *CINAHL*, PEDro.
Synopses of Studies	Short structured summaries of critically appraised primary original studies. Study types: RCTs and high-quality studies with scores for internal and external validity	EBM journals: Evidence - *Based Medicine, Evidence - Based Mental Health, Evidence – Based Nursing, ACP Journal Club Archives, Annals of Internal Medicine*, etc.
Single Studies	Primary original studies of all types: randomized studies, cohort studies, spot studies, quantitative studies (surveys, target groups)	Search engines: Google Scholar, TRIP, Accessss, data bases: PubMed, CINAHL, EMBASE, Ovid MEDLINE

Figure18. Resources according to 6S classification

The Overview of EBM Information Sources

In this chapter, we will discuss the most popular databases and search engines that can be used to find evidence-based information.

EBM Clinical Information Databases

UpToDate
Address – https://www.uptodate.com/
Terms of use - for subscribers.

UpToDate is an evidence-based medical database for physicians in their daily work to find answers to clinical questions. The information in the database is approved by research and is based on physician practice, has no clinical errors, and is independent of the influence of advertising by pharmaceutical companies or other organizations. UpToDate database is integrated into the e-health systems and patient records in advanced hospitals worldwide.

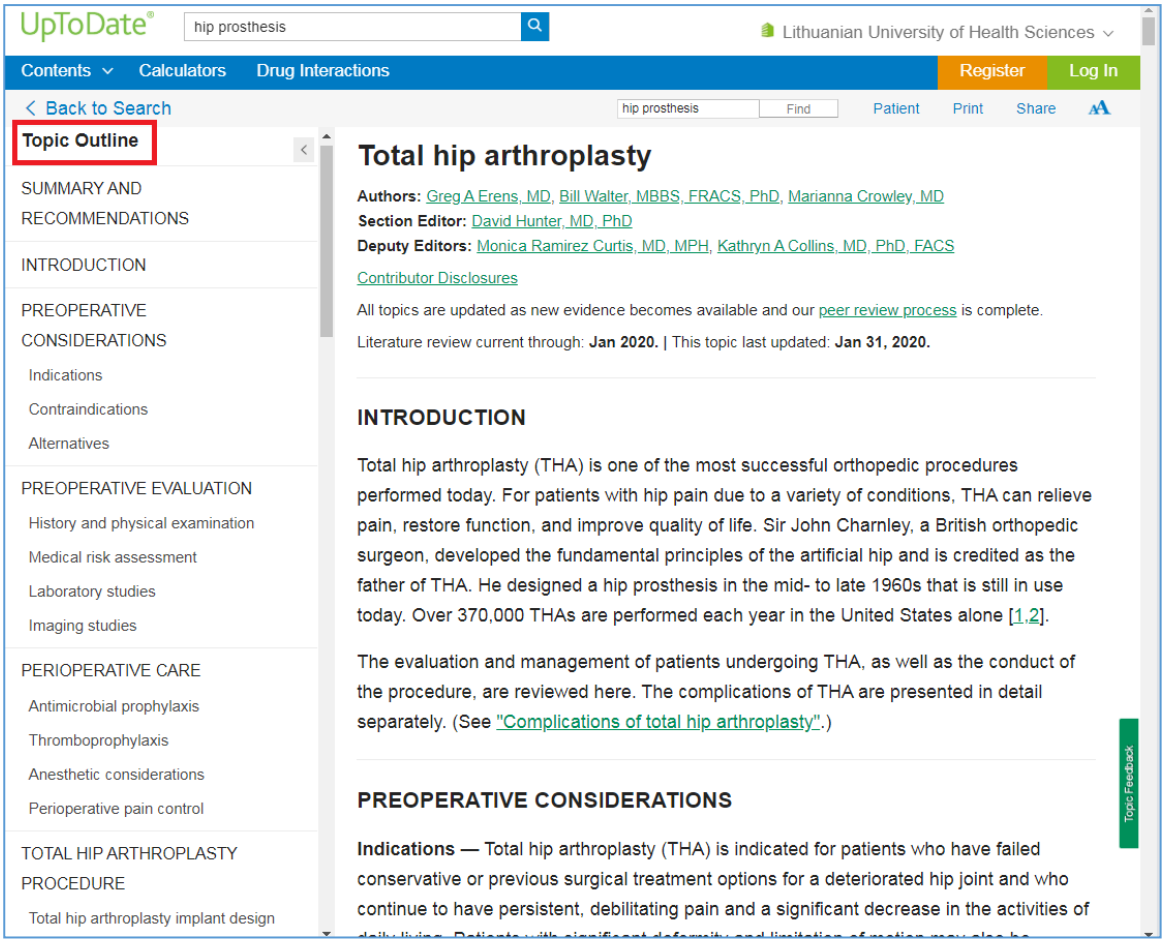

Figure 19. *UpToDate* topic outline

Clinical Key
Address – https://www.clinicalkey.com/
Terms of use - for subscribers.

The Clinical Key (see Figure 20) is a universal, constantly updated, evidence-based medical database. It is an important source of information for scientists, doctors of various specialties and other medical specialists, students. Books, monographs, information publications, journals, illustrations and videos of medical and surgical procedures, patient training recommendations, information on drugs and drug interactions, clinical-practical reviews, information on clinical cases and results of clinical and experimental studies, diagnostic and treatment recommendations provide the opportunity to find answers to clinical questions, to choose the most appropriate diagnostic and treatment methods. The information is divided into areas of clinical medicine. Search results can be filtered by types of EMB study design.

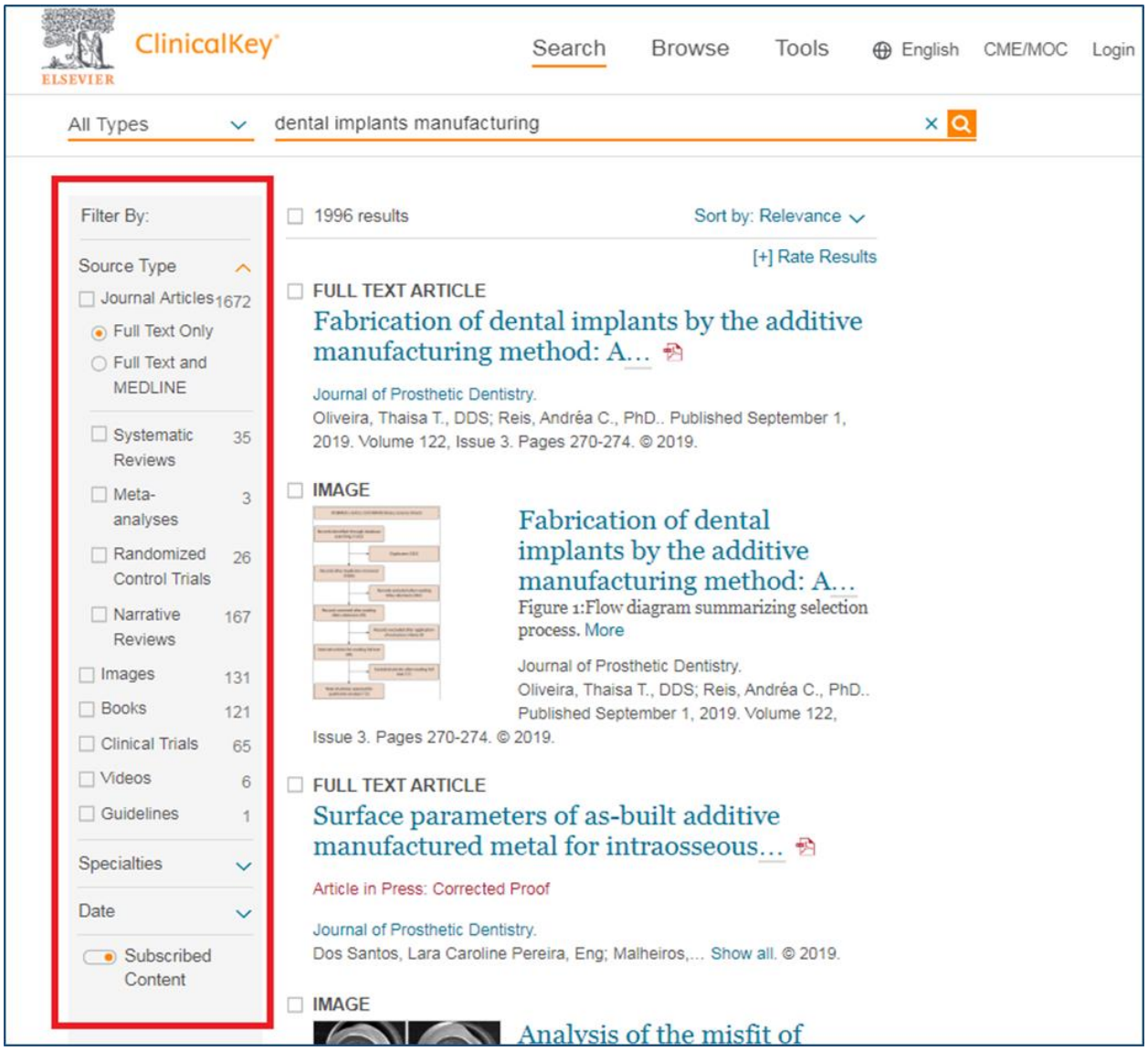

Figure 20. *Clinical Key* filters by publication/ study design types

DynaMed
Address – http://www.dynamed.com/
Terms of use - for subscribers.

DynaMed's mission is to provide the most useful information to healthcare professionals at the point of care to improve health outcomes worldwide.

DynaMed surfaces actionable recommendations, key takeaways, and synopses, as well as allowing users to dig deep into the underpinning body of knowledge and study details.

DynaMed users are encouraged to create individual accounts which allows for a personalized experience, enhanced ability to track content of interest, and the ability to easily claim continuing education credits for use of the product (see Figure 21).

Figure 21. *DynaMed* website

BMJ Best Practice
Address – https://bestpractice.bmj.com/
Terms of use - for subscribers.

It is a database of evidence-based clinical information and solutions for healthcare professionals, researchers, students to find answers to clinical questions, choose the most suitable experts recommended, diagnosis, prognosis, prevention and treatment options (see Figure 22)

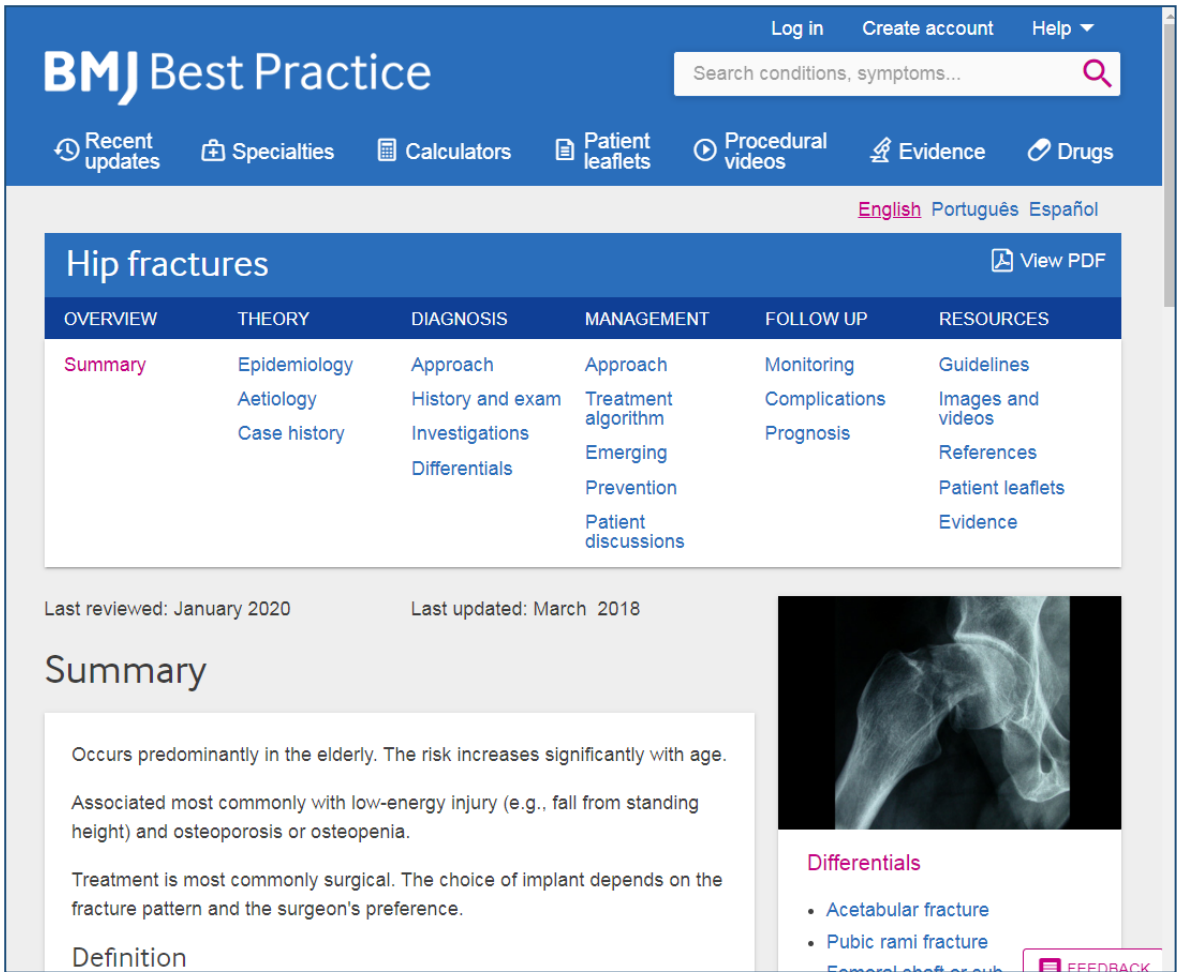

Figure 22. *BMJ* Best Practice topic layout

IBM Micromedex

Address – http://www.micromedexsolutions.com/
Terms of use - for subscribers.

The Micromedex database contains expertly selected and evidence-based information on drugs and other chemicals, drug dosing, pharmacokinetics, drug safety, interactions, clinical application, side effects, relative efficacy, and more (see Figure 23).

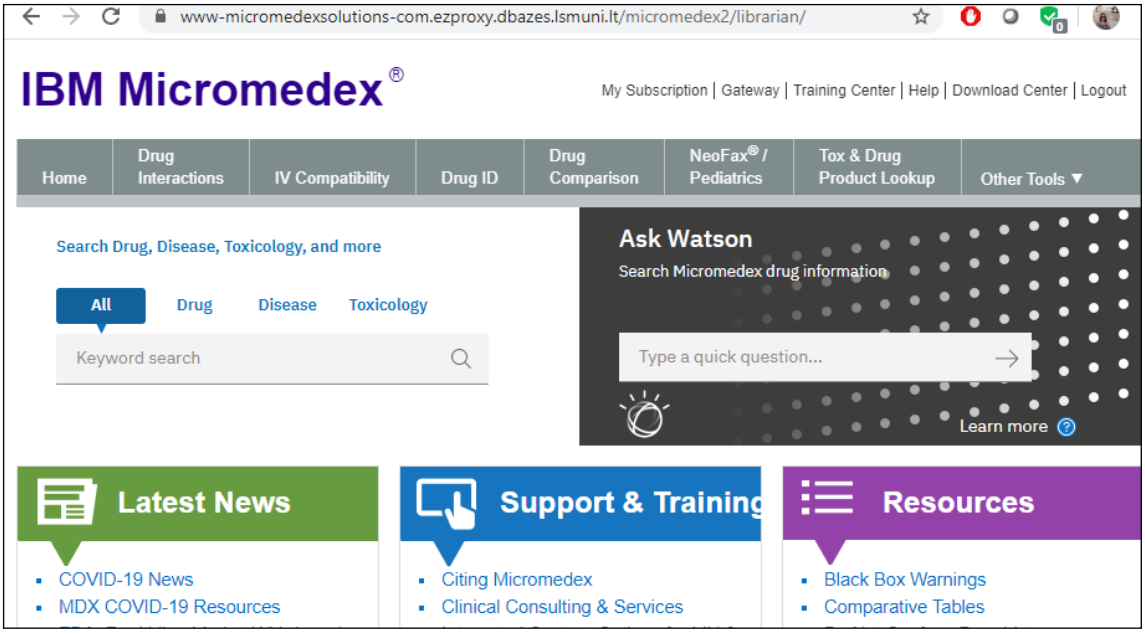

Figure 23. *Micromedex* website

EBM Research Publication Databases

The Cochrane Library
Address – http://www.thecochranelibrary.com/
Terms of use – for subscribers; summaries – free access.

The Cochrane Collaboration is an international independent non-profit organization with more than 20 centers on all continents and covering all medical fields and specializations. The organization's goal is to find and present the world's most effective and reliable scientifically proven methods of diagnosis and treatment. This scientific output is published in The Cochrane Library. It is the source of the highest level of evidence-based medicine in health care. The Cochrane Library consists of several databases:

Cochrane Database of Systematic Reviews (CDSR) - is the leading resource for systematic reviews in health care *CDSR* includes all Cochrane Reviews (and protocols) prepared by Cochrane Review Groups. Each Cochrane Review is a peer-reviewed systematic review that has been prepared and supervised by a Cochrane Review Group. CDSR also includes Editorials and Supplements.

Cochrane Central Register of Controlled Trials (CENTRAL). – is a highly concentrated source of reports of randomized and quasi-randomized controlled trials. In addition to bibliographic details (author, title, source, year, etc.) CENTRAL records often include an abstract (a summary of the article). They do not contain the full text of the article.

Cochrane Clinical Answers (CCAs) contains a clinical question, a short answer, and data for the outcomes from the Cochrane Review deemed most relevant to practicing healthcare professionals, our target audience. The evidence is displayed in a user-friendly tabulated format that includes

narratives, data, and links to graphics. Cochrane Clinical Answers were developed by Cochrane Innovations and Wiley.

Search can be made based on a general search strategy using the PICO method or the Thesaurus MeSH (Medical Terms MeSH). You can search the entire Cochrane Library or specific databases (Cochrane Reviews, Trials or Clinical Answers) (see Figure 23), as well as use the Browse method, search by topic, review groups (by Cochrane Review Groups), alphabetically (AZ); results can be filtered by *publication date*, *updated status*, or only *new* or *Conclusions changed* (see Figure 24).

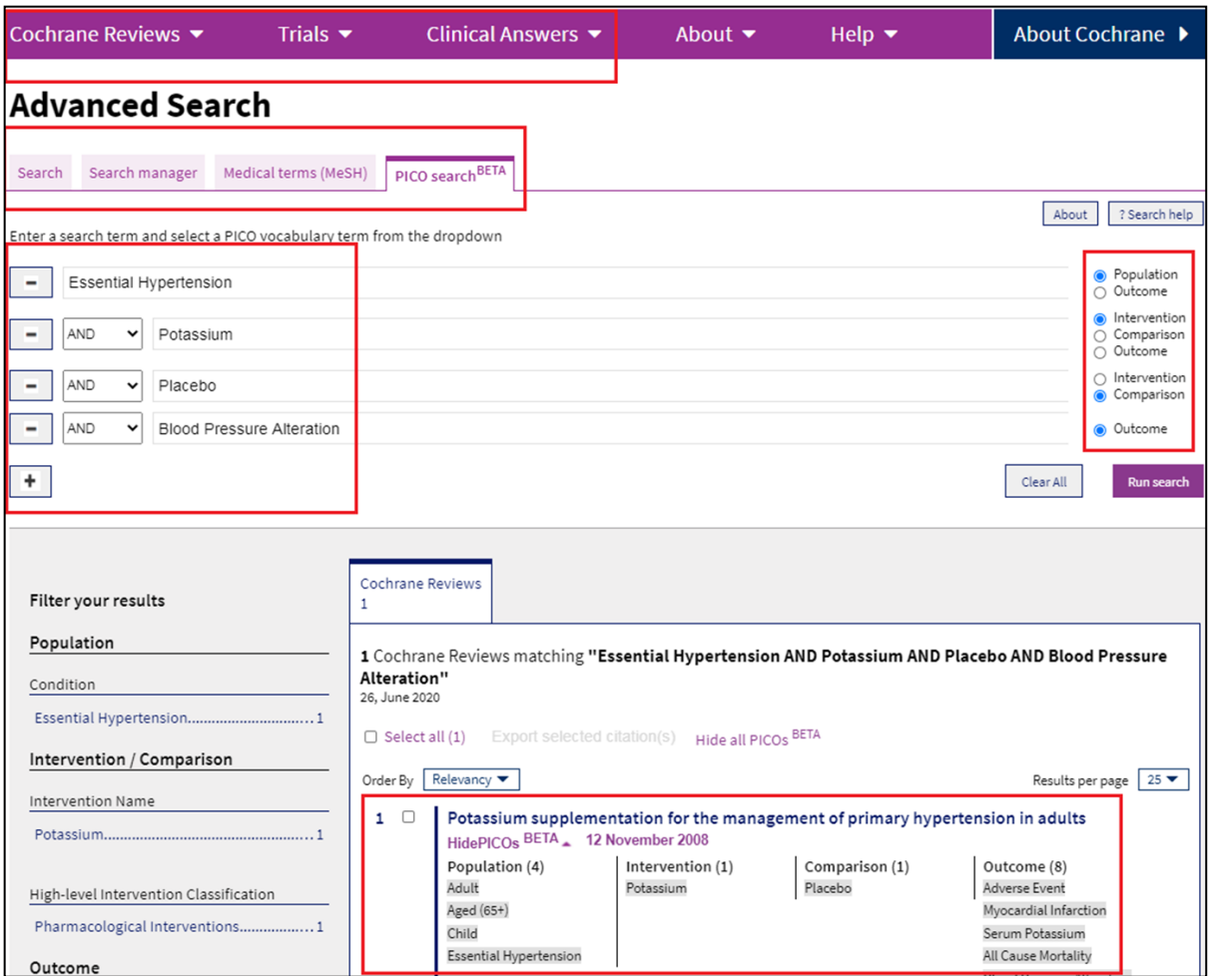

Figure 24. Search possibilities in *The Cocharane Library*

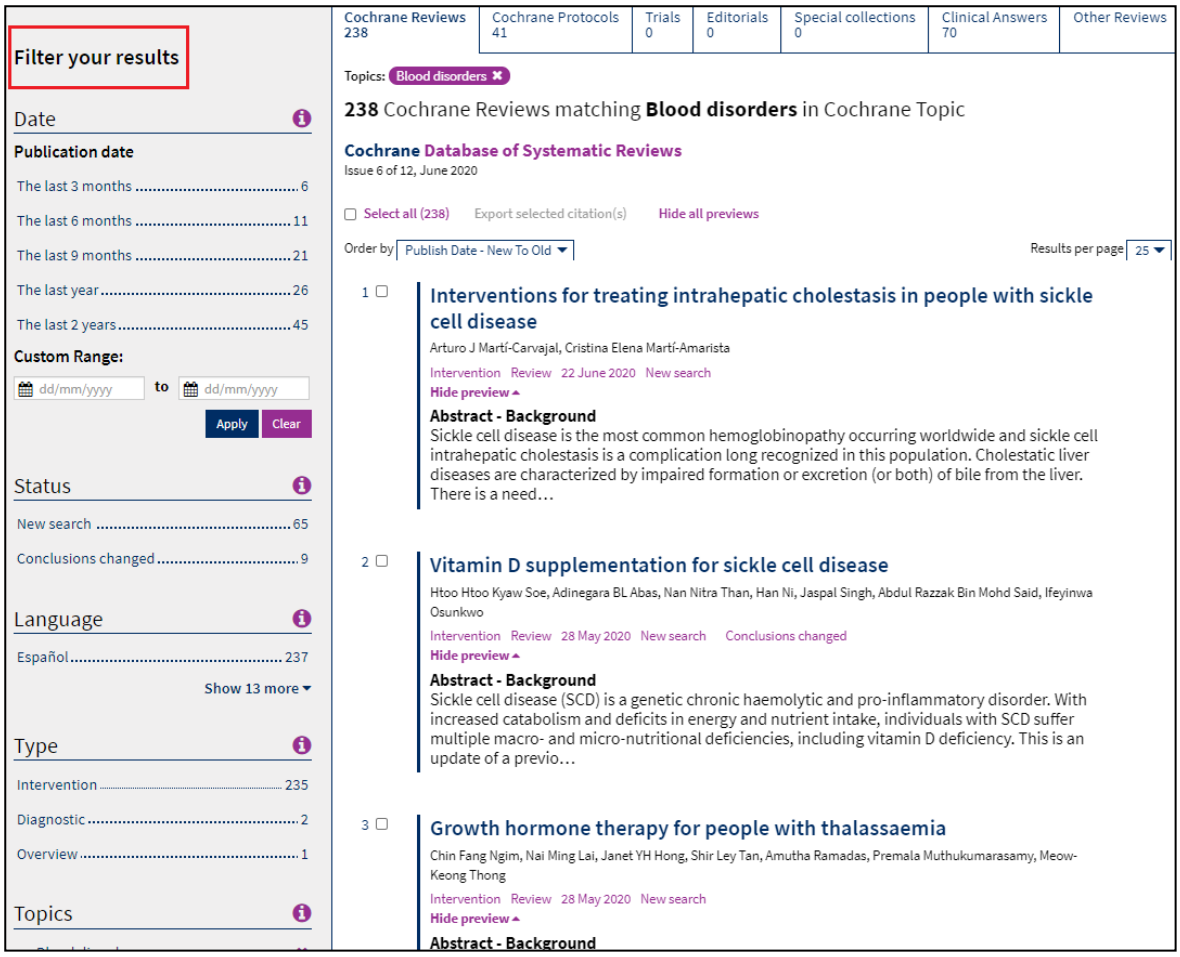

Figure 25. Filters of search results

PEDro
Physiotherapy Evidence Database

Address: https://pedro.org.au/
Access: free access to abstracts

The Physiotherapy Evidence Database (or 'PEDro') provides physiotherapists around the world with easy access to high-quality clinical research so they can practise and teach effectively. PEDro is a well-established, robust and trusted site that provides access to over 48,000 randomized controlled trials, systematic reviews and evidence-based clinical practice guidelines relevant to physiotherapy.

PEDro is produced by physiotherapists for physiotherapists. It is the most highly regarded information resource for physiotherapists globally. PEDro was initiated and is maintained by the PEDro Partnership at the Institute for Musculoskeletal Health (The University of Sydney and Sydney Local Health District) and Neuroscience Research Australia (NeuRA). The Partnership's mission is to maximize the effectiveness of physiotherapy services by facilitating the clinical application of the best available evidence.

Figure 26 *Pedro* website

PubMed
Address – https://www.ncbi.nlm.nih.gov/pubmed/clinical
Terms of use – free access.

Evidence-based medical articles can also be searched in the PubMed database using special methodological filters. For this purpose, a special search tool for clinical queries has been created in the PubMed database. You can search by three methodological search filters: you can select a clinical trial category, perform a systematic review, or search for medical genetics.

When searching by clinical trial category, one of five categories can be selected: etiology, diagnosis, therapy, prognosis, or clinical prognosis methodology. It is also possible to specify what information - broad or narrow - we want to search, or to search for related documents (see Figure 27).

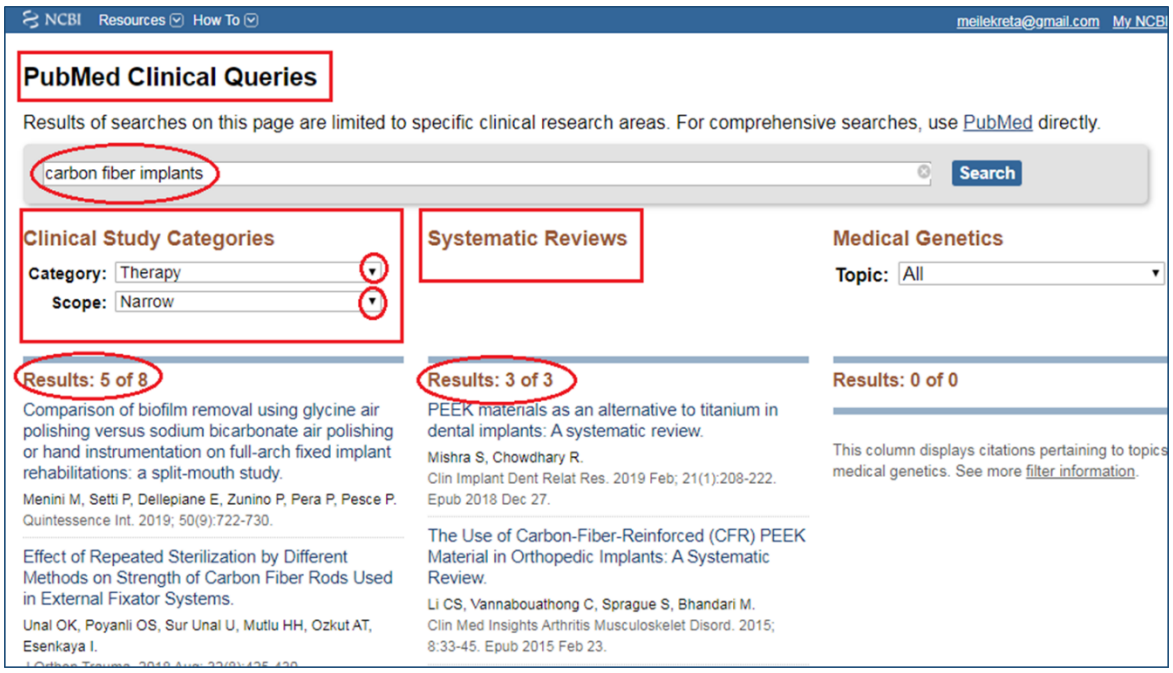

Figure 27. *PubMed* Clinical Queries

Epistemonikos
Address – https://www.epistemonikos.org/en/
Terms of use – free access.

Epistemonikos is a collaborative, multilingual database of health evidence. It is the largest source of systematic reviews relevant for health-decision making, and a large source of other types of scientific evidence. Epistemonikos is aimed to health professionals, researchers and health decision-makers. It is maintained by Epistemonikos foundation, a not for profit organization based in Santiago, Chile (see Figure 28).

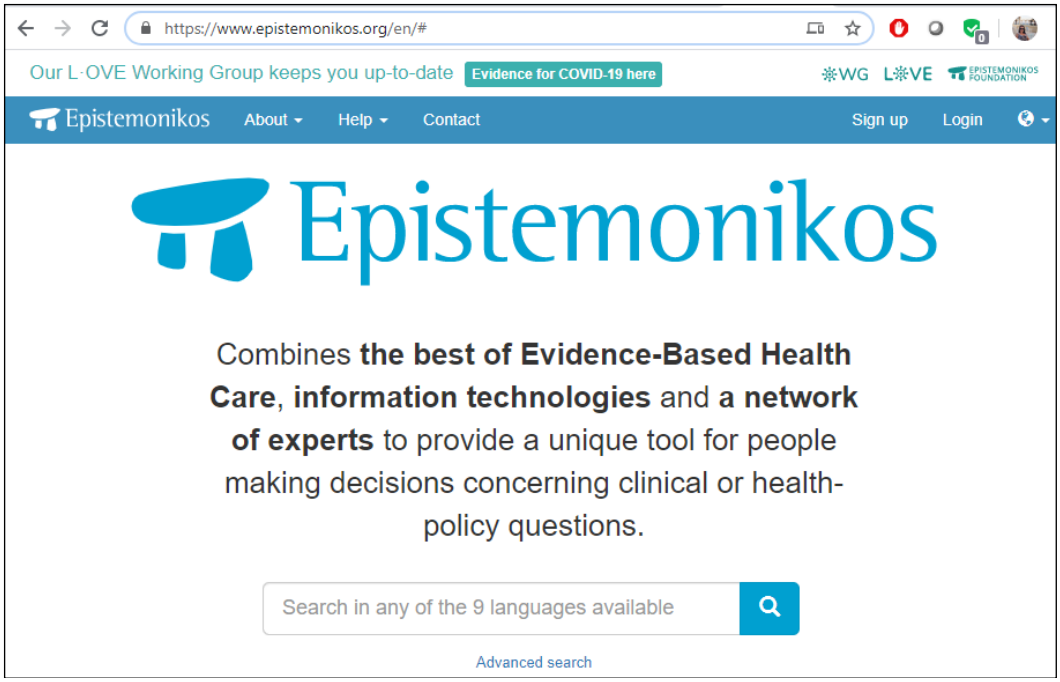

Figure 28. *Epistemonikos* website

Other EBM Databases

Natural Medicines
Address – https://naturalmedicines.therapeuticresearch.com/
Terms of use - for subscribers.

Natural Medicines provides an objective, scientific rating for over 195,000 commercially available natural medicines and dietary supplement products.

Each product is rated based solely on scientific evidence. Each rating has three components: Safety, Effectiveness, and Product Quality (see Figure 29).

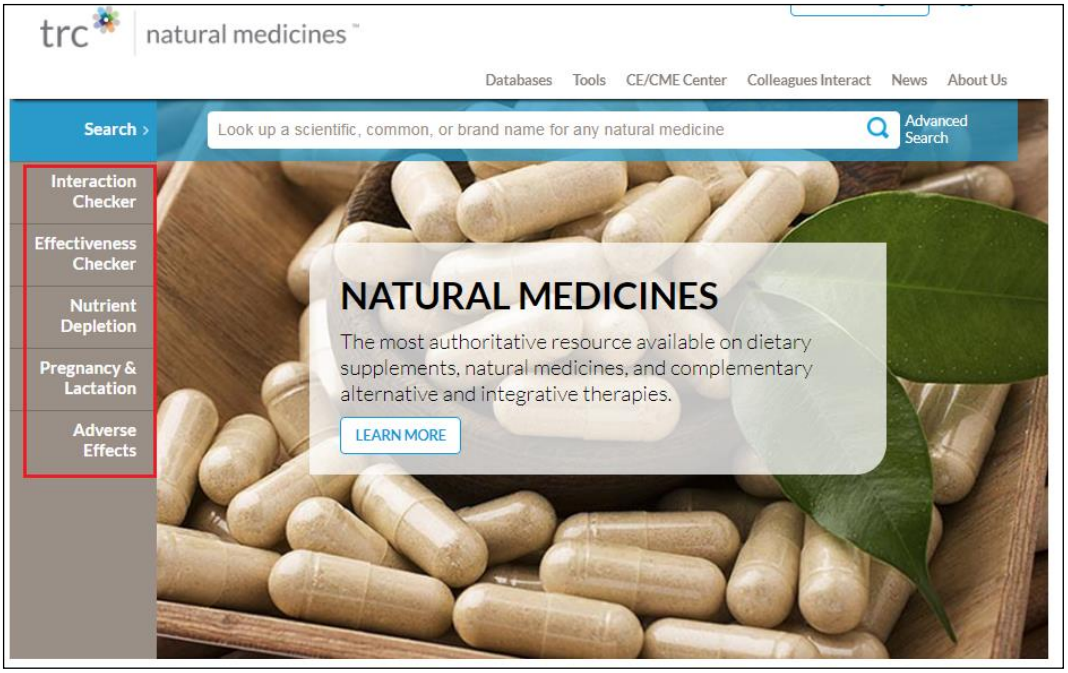

Figure 29. *Natural Medicines* website

NIH U.S. National Library of Medicine

ClinicalTrials.gov

ClinicalTrials

Address – https://clinicaltrials.gov/

Terms of use– free access.

ClinicalTrials.gov is a resource provided by the U.S. National Library of Medicine. ClinicalTrials.gov is a database of privately and publicly funded clinical studies conducted around the world (see Figure 30).

Explore more than 335,000 research studies in all over the word.

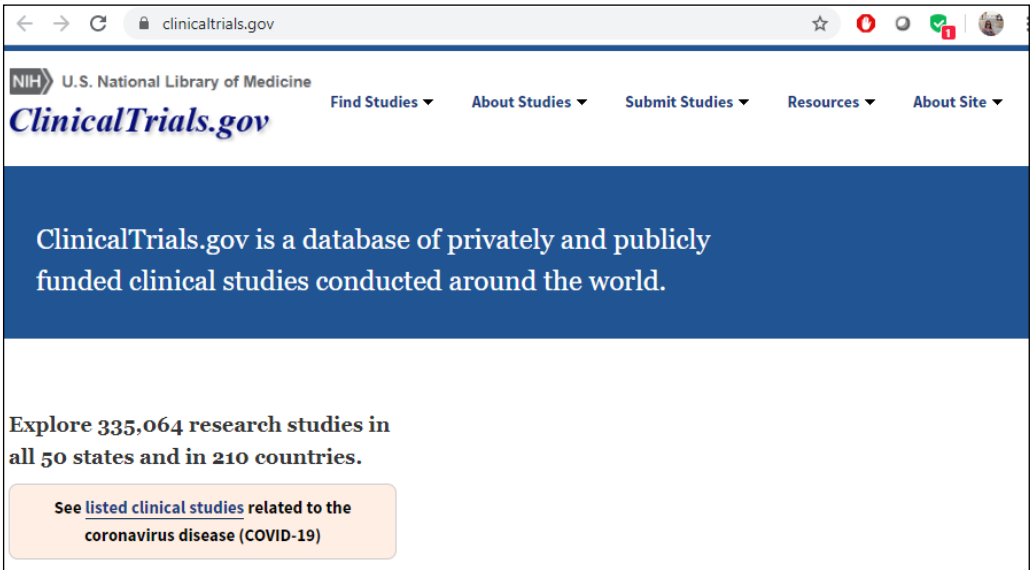

Figure 30. *ClinicalTrials*

Centre for Reviews & Dissemination
Address – https://www.crd.york.ac.uk/CRDWeb/
Terms of use – free access.

The search is performed in several databases:

- *DARE - Database of Abstracts of Reviews of Effects*. It consists of structured summaries of qualitatively assessed systematic reviews. This database is important for physicians to make urgent clinical decisions.
- *NHS EED - NHS Economic Evaluation Database*. It consists of structured summaries of the economic evaluation of health interventions.
- *HTA - Health Technology Assessment Database*. It consists of already published and ongoing health technology assessment reports (see Figure 31).

In the database, you can find records that were published before 2015. The archive is stored until 2021. You can find the latest entries related to health technology assessment at INAHTA.

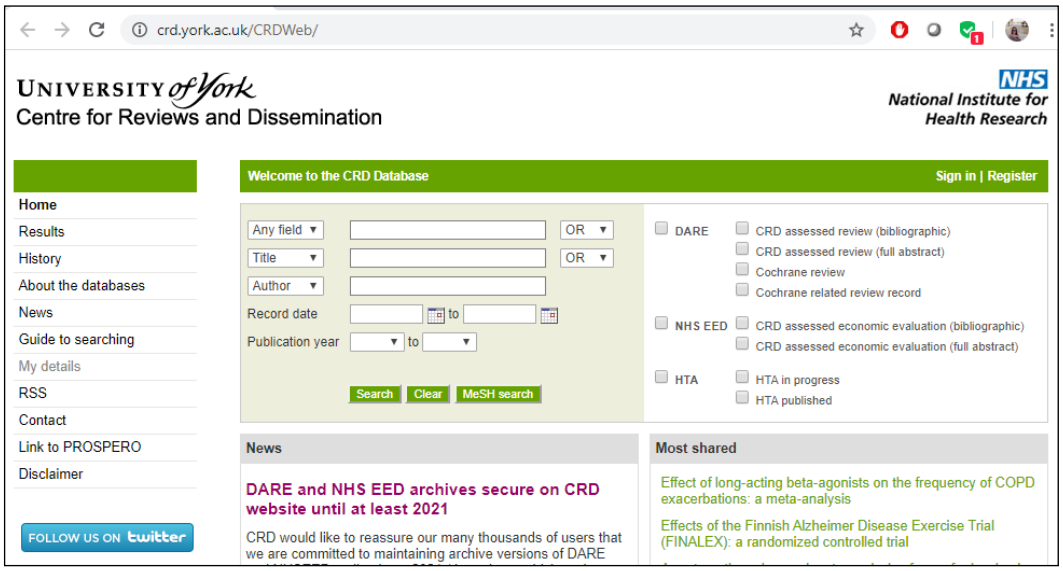

Figure 31. *Centre for Reviews & Dissemination*

INATHA (The International Network of Agencies for Health Technology Assessment)
Address – http://www.inahta.org/
Terms of use – free access.

At present there are many organizations in the world engaged in health technology assessment (HTA) and all produce documents targeted at helping decision-making in the introduction of new technologies and appropriate use of existing technologies. These documents are published in the form of assessment reports (ARs), technical reports (TRs), technological briefing (TBs) and clinical practice guidelines (CPGs), among others. INAHTA database provides all these documents (see Figure 32).

Figure 32. *INATHA*

CADTH Evidence Driven.

CADTH
Address – https://www.cadth.ca/
Terms of use – free access.

CADTH (see Figure 33) is an independent, not-for-profit organization responsible for providing health care decision-makers with objective evidence to help make informed decisions about the optimal use of health technologies, including:

- drugs
- diagnostic tests
- medical, dental, and surgical devices and procedures

In addition to evidence, we also provide advice, recommendations, and tools.

Figure 33. *CADTH*

HEALTH SYSTEMS EVIDENCE

Health Systems Evidence
Address – https://www.healthsystemsevidence.org/
Terms of use – free access.

The world's most comprehensive, free access point for evidence to support policy makers, stakeholders and researchers interested in how to strengthen or reform health systems or in how to get cost-effective programs, services and drugs to those who need them (see Figure 34).

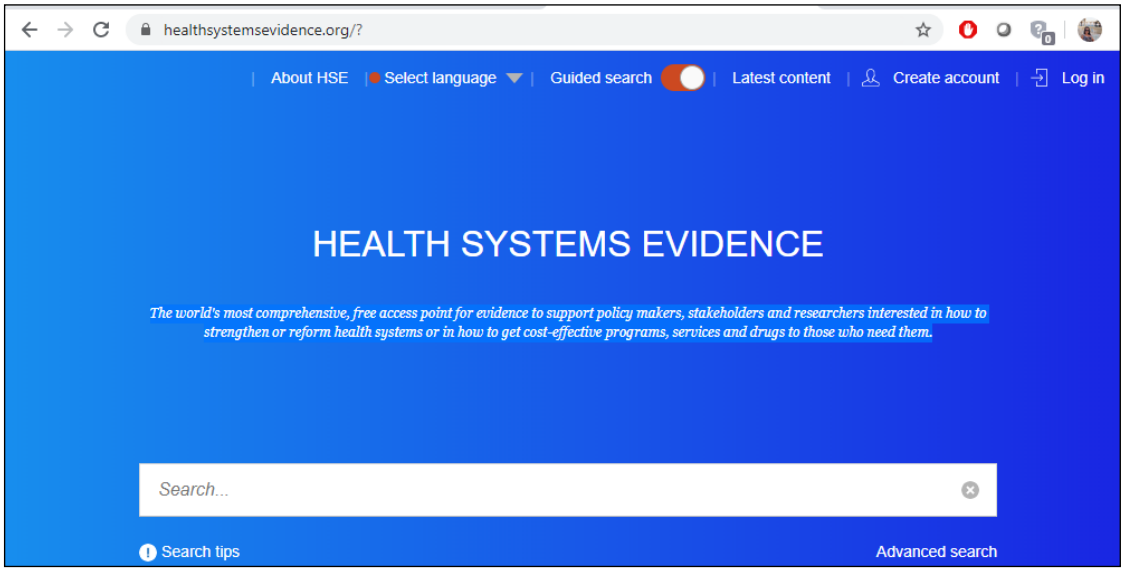

Figure 34. *Health Systems Evidence*

Trip database
Address – http://www.tripdatabase.com/
Terms of use – partially available (some information for subscribers only).

TRIP (*The **T**urning **R**esearch **I**nto **P**ractice*) Trip is a clinical search engine designed to allow users to quickly and easily find and use high-quality research evidence to support their practice and/or care.

Searches are done on such resources as the *Cochrane Library, PubMed DynaMed, Clinical Queries*, EBM journals, and more. The search result includes evidence-based reviews, systematic reviews, recommendations, peer-reviewed journal articles, continuing medical education, patient education, medical images, and video and audio. The search results are divided into categories, and search filters are used to refine them (see Figure 35).

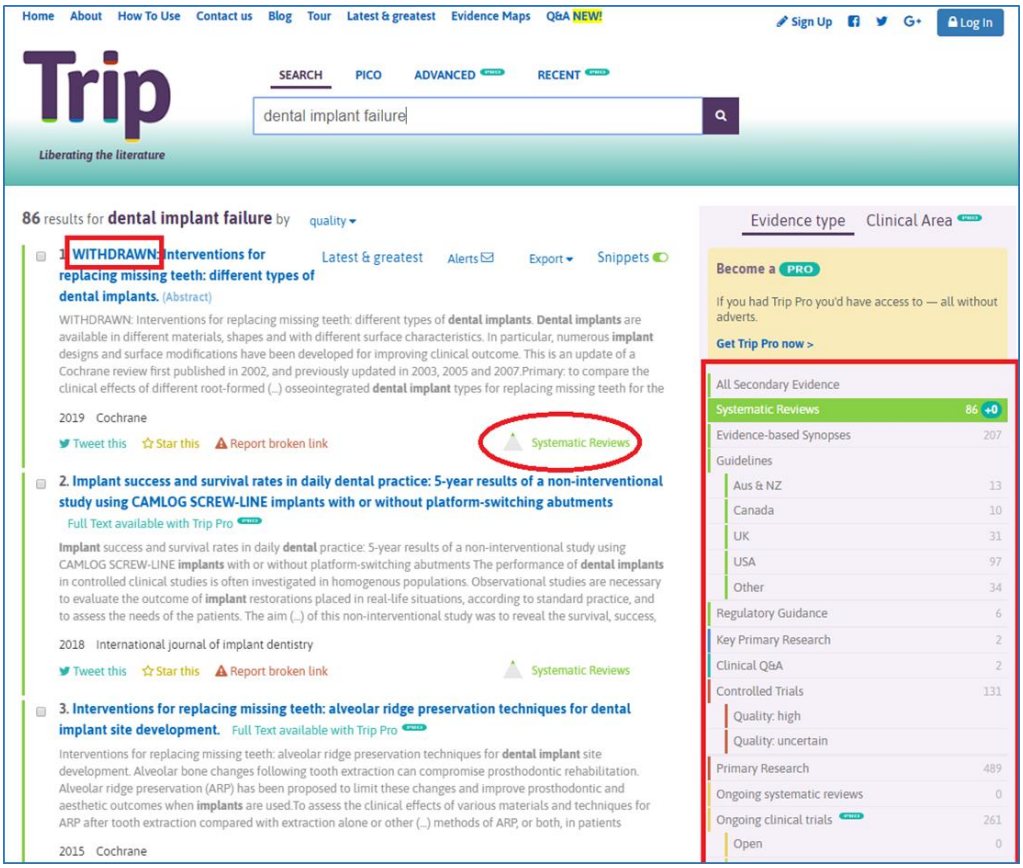

Figure 35. Results list in *Trip* database

Accessss
Address – https://www.accessss.org/
Terms of use – free access.

ACCESSSS is a service to help provide current best evidence for clinical decisions. It conducts searches simultaneously in several evidence-based information services (online evidence-based texts, evidence-based guidelines and pre-appraised journal publications).
Searching ACCESSSS yields content that is hierarchically organized: Always look first at the content available at the highest level of the hierarchy, as it is most likely to be useful for clinical purposes (see Figure 36).
Search requires registration.

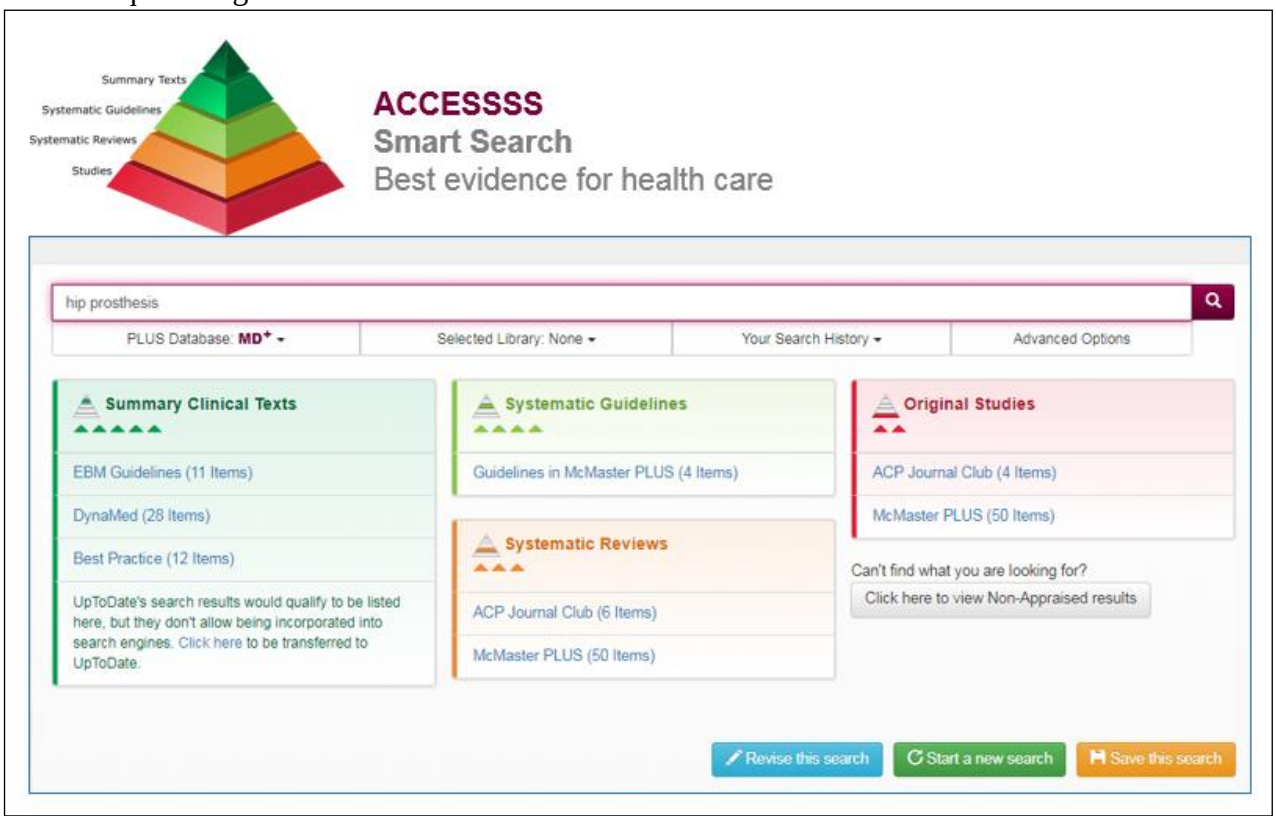

Figure 36. Layout of search results in *Accessss* database

Registration of Systematic Reviews at the International Register

NIHR | National Institute for Health Research

PROSPERO
Adress – https://www.crd.york.ac.uk/PROSPERO/
Terms of use - free access

Register of systematic review protocols PROSPERO is an internationally supported organization that registers ongoing systematic reviews in the fields of health, social security and animal sciences (see Figure 37).

Figure 37. *Prospero* website

Researchers are advised to search the PROSPERO data registry before starting preparing a systematic review to avoid unnecessary duplication with a study already underway or previously published. The PROSPERO data register contains already registered systematic review protocols with the indicated registration numbers and basic information (name of the systematic review, expected/actual start date, expected end date, review steps, contact details, sponsors, conflicts of interest) and methodological data (systematic review study question, search strategy, study population, interventions, types of studies performed, control, results, risk of bias, data synthesis strategy).

In the initial stage of the systematic review, it is necessary to prepare a protocol in which the researchers must clearly indicate the objectives of the study, the parameters, and the entire research methodology. Detailed protocols should be developed a priori, made public and registered

Systematic reviews of the Cochran Community are not individually registered because they are automatically included on an ongoing basis.

Systematic reviews, rapid reviews and umbrella reviews can be registered in the PROSPERO data register. PROSPERO does not register scoping reviews and mini-reviews prepared by students.

Data from existing system overviews can also be updated in the PROSPERO database. According to the Cochrane recommendations in the field of health, it is recommended that the systematic reviews be updated every two years. The data registered in the PROSPERO database is stored permanently.

Reporting the Systematic Review

PRISMA
TRANSPARENT REPORTING of SYSTEMATIC REVIEWS and META-ANALYSES

PRISMA
Address – http://www.prisma-statement.org/
Term of use - free access

PRISMA is an evidence-based minimum set of items for reporting in systematic reviews and meta-analyses. PRISMA focuses on the reporting of reviews evaluating randomized trials, but can also be used as a basis for reporting systematic reviews of other types of research, particularly evaluations of interventions.

Before starting the systematic review or meta-analysis, each researcher should first be familiar with a set of information pack for authors that provides guidelines, methodology, research elements, workflow, and other requirements. This will lead to a better systematic review, starting with the preparation of the protocol and ending with the publication of the scientific publication in the journal.

PRISMA is also intended for journal peer reviewers and editors as it may also be useful for critical appraisal of published systematic reviews, although it is not a quality assessment instrument to gauge the quality of a systematic review.

PRISMA is a new, expanded and improved version of the previous QUOROM site, which was limited to a data base of Randomized Control Trials (RCTs).

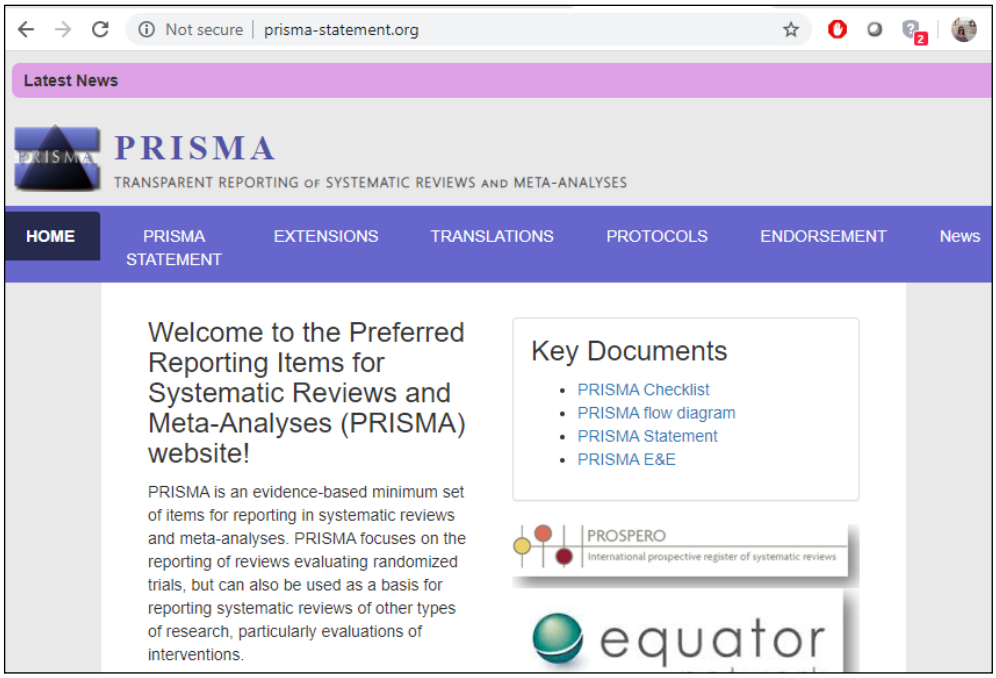

Figure 38. *Prisma* website

According to the recommendations in the PRISMA guidance package, systematic reviews should follow a clear and logical course of the study. A systematic review must answer a specific and well-formulated question that is obtained by conducting a study according to a particular methodology.

First of all, before starting the research, it is necessary to prepare a systematic review protocol, which provides the justification of the research, the question, and the planned research methodology. The protocol must specify the databases used to search for information and use additional sources, MeSH terms or keywords used in the search strategy, the search filters applied (eg age, language, etc.), the selection process (inclusion and exclusion criteria, etc.) . Conducting systematic reviews is a changing process. The research depends on the scope of the study and the quality of the data, so changes may need to be made in the course of the process, which must be included in the protocol.

The PRISMA methodology for preparing systematic reviews and meta-analyzes consists of 27 checklist items (see Figure 39)

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

Figure 39. *PRISMA* Checklist
CC. doi:10.1371/journal.pmed.1000100.g001

PRISMA flow diagram depicts the flow of information through the different phases of a systematic review. It maps out the number of records identified, included and excluded, and the reasons for exclusions.

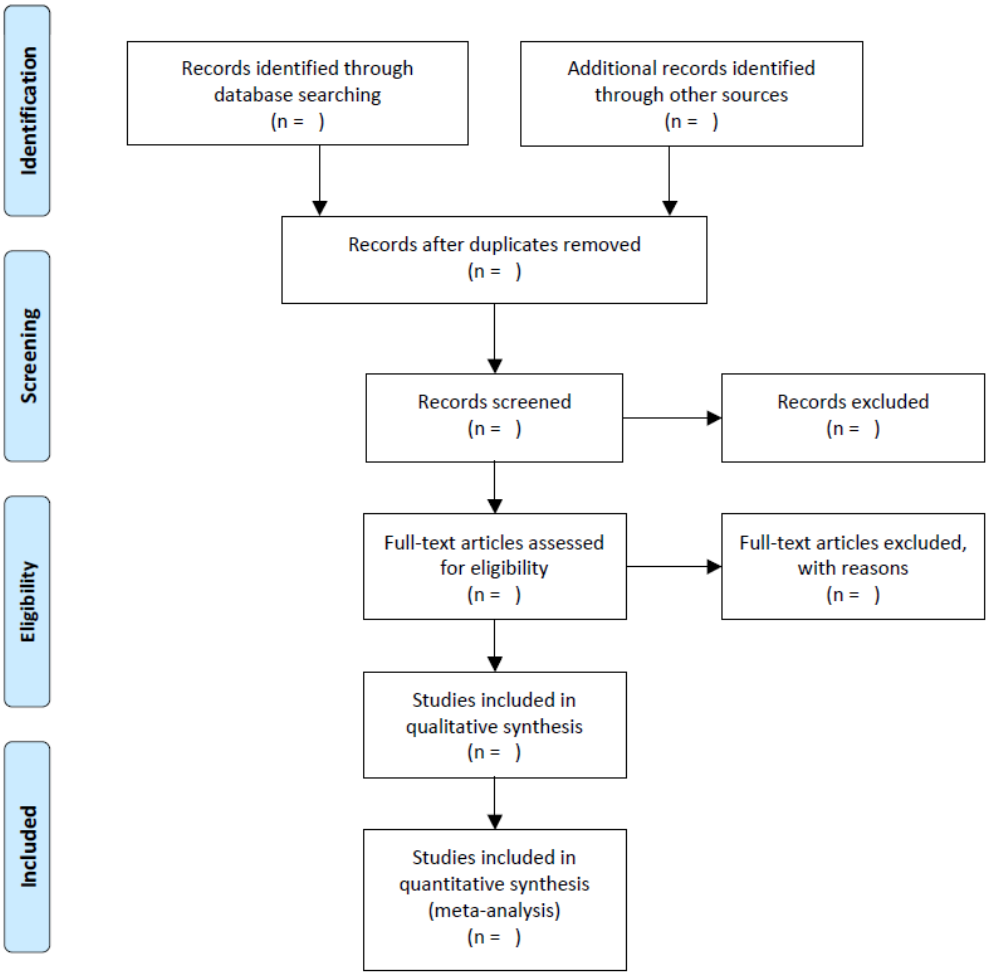

Figure 38. *PRISMA* flow diagram through the different phases of a systematic review
CC. doi:10.1371/journal.pmed.1000100.g001

It is strongly recommended that the PRISMA Statement be used in conjunction with the PRISMA Explanation and Elaboration Document [13]. This document is intended to enhance the use, understanding and dissemination of the PRISMA Statement. Through examples and explanations, the meaning and rationale for each checklist item are presented.

Questinos and Tasks

Theoretical Part

1. What are the three components of evidence-based medicine?
2. What is the differencies between literature review and systematic review?
3. What type of study design /publication has the lowest evidence according hierarchy pyramid?
4. What does PICOT abbreviation mean?
5. Scenario: The patient's son is worried that his father's memory is severely impaired. He read online that ginkgo biloba leaf extract is effective in treating dementia. What advice

would you give to a visitor? Breakdown a question into PICO elements. Formulate a searching query according to general searching strategy and using MeSH terms.
6. What type of resources are placed at the top of 6S pyramid?
7. What review types does not register at Prospero?
8. What it is Prisma checklist and flow diagram?

Practical Exercises

9. **Case**: John, a 26 year old botanist, has been diagnosed with depression. Reluctant to take prescribed medication he prefers to try alternative medicines which he feels are better for the body and work just as well. You feel that his disorder would improve more effectively with an SSRI, but he feels strongly that St. John's Wort will be equally as effective.
   P adult male with depression
   I SSRI
   C St. John's Wort
   O reduce depressive symptoms
   question: In adult males with depression, are SSRI's more effective than St John's Wort in reducing depressive symptoms?
   MeSH: Depressive Disorder/*drug therapy or /*therapy or /*prevention and control; Hypericum/*therapeutic use or /adverse effects; Serotonin Uptake Inhibitors/*therapeutic use or /*adverse effects

10. **Case**: A 17 year old male with drug overdose it brought into the ER. He's taken paracetamol, tylenol, & sleeping pills. Do recommend using activated charcoal or not?
    P Patient with drug overdose
    I Activated charcoal
    C Nothing or Placebo
    O Therapeutic effectiveness
    Question: in patients with drug overdose, is activated charcoal an effective therapy?

11. **Case**: 55-year-old woman has loved coffee all her life, but she has now high blood pressure. What you could suggest for this woman? Find the evidence using PICO method.
    P woman woman with high blood pressure
    I cup of coffee
    C Nothing
    O Effect
    Question: Does cup of coffee increase blood pressure?

12. Are effective Chinese herbs combined with western medicines versus Western medicines alone for SARS patients?
13. What are the effects of convalescent plasma for people with COVID-19?
14. Is effective remdesivirfor hospitalized patients treatment with severe COVID-19? Find the evidence in EBM database (Clicinal key, Best Practise, DynaMed, Micromedex).
15. Is Ginkgo biloba leaf extract effective for dementia treatment? Find the evidence in Cochrane Library.
16. Find the latest trials on Covid-19 in the WHO and USA federally-funded studies registry. (https://clinicaltrials.gov/ct2/who_table).
17. Is Gardasil 9 vaccine safe and effective to prevent an infection? Find reports on Gardasil 9 vaccine.

18. Find economic evaluation reports for meningococcal vaccine.

List of EBM Resources

- UpToDate (licensed)
- Clinical Key (licensed)
- DynaMed (licensed)
- BMJ Best Practice (licensed)
- Micromedex (licensed, clinical farmacology)
- Cochrane Library (licensed database, free access to abstracts)
- PEDro (free access to abstracts)
- PubMed (free access)
- Epistemonikos (free access)
- Natural medicines (licensed, natūral products)
- ClinicalTrials (free access)
- NHS Centre for Reviews & Dissemination (DARE, EED, HTA) up to 2015 m.
- INATHA (free access)
- CADTH Evidence Driven (INAHTA) from 2015 m.
- TRIP (metasearch engine)
- Accesss (metasearch engine)
- PROSPERO (international registry of systematic reviews)
- Prisma (set of items for authors)

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Glossary of Terms

Advanced Search: options are a set of filters offered by databases.

Blinding: A technique used in research to eliminate bias by hiding the intervention from the patient, clinician, and/or other researchers who are interpreting results. The blinding method is used in randomized clinical trials. There are two types of this method - the single-blind and the double-blind research method. A single-blind method - when test participants do not know which intervention, test or control, is applicable to them. A double-blind method is when study participants are subjected to a research intervention that is unknown not only to the subject but also to health professionals.

Boolean operators: words (AND, OR, NOT) used as conjunctions to combine or exclude keywords in a search, resulting in more focused and productive results.

Case control study: The observational epidemiologic study of persons with the disease (or other outcome variable) of interest and a suitable control (comparison, reference) group of persons without the disease. The relationship of an attribute to the disease is examined by comparing the diseased and nondiseased with regard to how frequently the attribute is present or, if quantitative, the levels of the attribute, in each of the groups.

Case-series: A group or series of case reports involving patients who were given similar treatment. Reports of case series usually contain detailed information about the individual patients. This includes demographic information (for example, age, gender, ethnic origin) and information on diagnosis, treatment, response to treatment, and follow-up after treatment.

Cohort study: The analytic method of epidemiologic study in which subsets of a defined population can be identified who are, have been, or in the future may be exposed or not exposed, or exposed in different degrees, to a factor or factors hypothesized to influence the probability of occurrence of a given disease or other outcome. The main feature of cohort study is observation of large numbers over a long period (commonly years) with comparison of incidence rates in groups that differ in exposure levels.

Confounder: A variable, which is not the one you are interested in but which may affect the results of trial.

Controls: A group of individuals, whose study data are compared in case-control, randomized clinical trials, or similar studies. The control group may receive interventional treatment, placebo, or no treatment at all.

Cross-sectional study: Analytical observational study to determine the prevalence of diseases and risk factors among members of a population at one particular time.

***Database alerts*:** let you run a search and be notified when new content is added to the database that fits your search.

Database: a systematically or methodically organized collection of independent works, data and other material that is individually accessible by electronic or other means.

Diagnosis: Identification of the disease according to its signs or symptoms.

Double blind trial: A randomized clinical trial in which neither the investigator nor the subject knows to which group (exposure or control) the subject belongs.

Health Literacy: – degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.

Health: - the condition of the body and the degree to which it is free from illness, or the state of being well: to be in good/poor health.

Information literacy*:* knowledge, skills and attitudes to finding, evaluating and using information.

Information request: a verbal need for information. Formulating a query in an information search is a skillful combination of selected query words.

Information retrieval*:* the search for information from all available information sources and channels. Information retrieval focuses on browsing, information retrieval is part of searching.

Intervention: An intervention can be a treatment, a procedure, or a change in clinical practice.

Keyword search (*also a* ***word search):*** a search for individual words in records or full texts in a database.

Keyword*:* a word of your choice used to perform a (key) word search.

Knowledge synthesis: Is an area of research in health care delivery science that evaluates and summarizes all available evidence on a particular topic through comprehensive literature searches and advanced qualitative and quantitative synthesis methods. The process includes conducting systematic reviews, meta-analysis, clinical practice guidelines and methodology research.

Living systematic review, (LSR): LSR as a systematic review, which is continually updated, incorporating relevant new evidence as it becomes available.

Mapping review: Mapping reviews are focused on a visual synthesis of the data and are question based rather than topic based like the scoping review.

Medicine: – the art and science of stuying, performing research on, preventing, diagnosing, and treating disease, as well as the maintenance of health.

MeSH (Medical Subject Headings)*:* a vocabulary of medical terms. It is used for indexing records in the Medline database. MeSH was created and is being updated by the United States National Library of Medicine. MeSH is updated once a year.

Meta-analysis: A statistical research method that allows to combine the results of independent studies (scientific publications) and to synthesize general summaries and conclusions evaluating therapeutic efficacy**.**

Networking meta-analysis: Network meta-analysis compares multiple interventions simultaneously by analyzing studies making different comparisons in the same analysis.

Open access (OA): a set of principles and a range of practices through which research outputs are distributed online, free of cost or other access barriers.

PICO method: a tool used for formulating questions, which helps to build a good search strategy. PICO is the acronym that stands for the words Patient, Intervention, Comparison, Outcome.

Placebo: An inactive medicine that mimics the medicine being given.

Prognosis: The prospect of survival and recovery from a disease as anticipated from the usual course of that disease or indicated by special features of the case.

Publication bias: It is a bias due to the tendency of researchers, editors, pharmaceutical companies to publish information about the positive effects of interventions in advance, regardless of the negative or final results of a consistent study.

Randomisation: Study groups, referred to as treatment and control groups, are formed at random. In other words, random sampling means that any individual has an equal chance of entering the exposure or control group.

Randomised controlled trial (RCT): A study in which a number of similar people are randomly assigned to two (or more) groups to test a specific drug, treatment or other intervention. One group (the experimental group) has the intervention being tested, the other (the comparison or control group) has an alternative intervention, a dummy intervention (placebo) or no intervention at all. RCT is considered the "gold standard" for examining the effectiveness of interventions because it allows the study to reduce bias and the impact of distortions.

Rapid review: Rapid reviews are a form of evidence synthesis that may provide more timely information for decision-making compared with standard systematic reviews.

Research synthesis: The process through which two or more research studies are assessed with the objective of summarizing the evidence relating to a particular question.

Review, Narrative review, Literature review: examines two or more studies (scientific publications) from which a general conclusion is made about the research object.

Scoping review: a volume review that provides a synthesis of a large and diverse review of the literature on a particular topic that has not previously been thoroughly reviewed and systematized to answer broader thematic questions and identify research gaps.

Search strategy: a plan for using search keys and performing search.

Specialty: - the field of activity corresponding to the profession, in which the relevant person has obtained a professional qualification.

Subject heading or the descriptor*:* word describing the content of books, articles, etc. One word has been selected to express a concept under which all documents with the same content are grouped.***Stopwords:*** - words that are ignored in the indexing process.

Systematic review: a review of the evidence on a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant primary research, and to extract and analyze data from the studies that are included in the review.

Term: a strictly defined word or expression used in some kind of speciality.

Truncation: – a searching technique used in databases in which a word ending is replaced by a symbol.

Universal Decimal Classification (UDC): **-** the world's foremost multilingual classification scheme for all fields of knowledge and a sophisticated indexing and retrieval tool.