Keeping up to date with evidence-based practice

A guide to searching research databases

Contents

Foreword

This guide has been developed to support the prosthetic and orthotic workforce to engage with research. This guide will provide the reader with information on how to search a research database in a structured and effective way.

We encourage staff and learners at all levels to get involved with research, quality improvement, and work-based projects; this includes prosthetists, orthotists, technicians, support workers, students, and apprentices. BAPO is committed to providing resources that empower and support the prosthetic and orthotic profession to engage with research.

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Authors

Dr Nicky Eddison
Dr Nicky Eddison is an Associate Professor of Orthotics, a Consultant Orthotist, and the Chair of BAPO.

Eileen Morrow
Eileen Morrow is a Doctoral Clinical Academic Fellow at the University of Oxford, and the Research Committee Chair for BAPO.

Laura Barr
Laura Barr is an advanced practitioner within the orthotic and orthopaedic services at NHS Greater Glasgow and Clyde. Laura also holds a NRS Careers Research Fellowship position

Pam Coulton
Pam Coulton is the Director of Locum Notion and Vice-Chair of BAPO

Introduction

The purpose of this document

This document has been designed to provide you with a step-by-step guide to searching a research database. The same process can be used for most major databases although there will be slightly different formats for each platform. This guide uses PubMed as an example.

The guide uses an example search sample. However, the same process will apply for all search terms.

Please use the example search and follow each step to familiarise yourself with the process. Once you are happy with how the process should be followed, exchange the search terms for terms relevant to your area of practice.

NOTE

This example search was conducted in 2022 which means the number of papers found at each stage of the search is likely to be slightly different if this search is conducted in the future. Therefore, don't be confused if you apply the same search terms and end up with a different number of available papers.

Evidence-based practice in healthcare

Evidence-based practice is a fundamental principle of modern healthcare that emphasises use of the best available evidence to inform clinical decision-making. This involves integrating research findings and clinical expertise, alongside patient values and preferences, into healthcare delivery[1]. It is important because it helps healthcare providers to make informed decisions about patient care, based on best practices.

Improving the quality of healthcare and reducing treatment variation are key objectives of evidence-based practice. It also helps to streamline the patient journey through the healthcare system, reducing healthcare costs by promoting cost-effective interventions and reducing unnecessary treatments[2,3]. Evidence-based practice can lead to improved patient outcomes by ensuring that healthcare providers are using the most effective treatments and interventions.

One of the main principles of evidence-based practice is the use of literature reviews, systematic reviews and meta-analyses, which synthesise research findings and assess the quality of evidence. This helps healthcare providers to critically evaluate the available evidence and make decisions about which treatments are the most appropriate and effective for their patients. As with all areas of healthcare, evidence-based practice is considered an essential aspect of the prosthetics and orthotics profession[4,5], although it has been recognised that some prosthetists and orthotists feel they lack the necessary critical appraisal skills to conduct their own literature reviews to inform their clinical practice[6]. In this respect, this guide has been designed to help individuals in the prosthetic and orthotic profession to improve their skills in conducting comprehensive and effective literature reviews.

HCPC registration and evidence-based practice

In the UK, evidence-based practice is not just encouraged - it is a professional obligation. The Health and Care Professions Council (HCPC) outlines specific standards of proficiency[7] that clinicians must meet to maintain their professional registration. Among these is the requirement to engage in evidence-based practice and critically evaluate research to inform clinical decisions.

Prosthetists and orthotists must continually draw on research, reasoning and problem-solving skills when determining appropriate actions (HCPC Standard 4.7) and engage in evidence-based practice (HCPC Standard 11.1). They are also expected to critically evaluate research and other evidence to ensure that their practice remains current and effective (HCPC Standard 13.10).

The importance of staying up to date

Research in prosthetics and orthotics, as well as related fields which can inform prosthetic and orthotic practice, continues to evolve. The findings offer new insights into more effective treatments, improving patient outcomes, and helping to refine clinical techniques. By regularly engaging with the latest research, clinicians can ensure they are delivering the highest quality of care based on the most recent and reliable evidence.

This guide provides the tools needed to search for research evidence. By improving these skills, prosthetists and orthotists will be equipped to enhance their professional development and meet the needs of their patients and the expectations of their profession.

Research databases: an overview

Research databases are electronic libraries that collect, organise, and provide access to research articles, published literature, and other academic resources. These databases are essential not just for researchers and academics, but also for clinicians who wish to keep up to date with evidence-based practice.

One of the most widely used research databases is PubMed, which is a free resource provided by the National Library of Medicine (NLM), containing over 30 million citations and abstracts of biomedical literature, including journal articles, conference proceedings, and other scientific publications.

PubMed has access to a wide range of journals, a large number of which are open-access, meaning that the articles are freely available to read without a subscription. One of the key features of PubMed is the ability to search for such articles based on specific keywords or phrases. This guide will show you a step-by-step process which you can follow and adapt to conduct your own literature review on PubMed.

How are databases organised?

To understand how research databases work, it is firstly important to know how they are constructed and organised. Research databases use a controlled vocabulary, which is a set of terms that are standardised and organised in a hierarchical structure. This structure allows users to search for specific terms and find relevant results.

For example, in PubMed, the MeSH (Medical Subject Headings) vocabulary is used to categorise articles based on their subject matter. Each MeSH term is linked to a set of related terms, allowing users to explore a wide range of topics related to their search.

Another important aspect of research databases is the process of indexing. Indexing involves assigning keywords to articles based on their content. This allows users to search for articles based on specific terms and find relevant results. PubMed uses a combination of MeSH terms and other keywords to index articles.

Searching a database

To search for articles in a research database, users can use a variety of search techniques. One of the most common techniques is using search filters. Search filters are pre-defined sets of keywords that are used to narrow down search results. For example, in PubMed, users can use the "limit to" function to search for articles that were published within a specific date range or that meet specific criteria, such as having a certain number of authors or being published in a specific journal.

Another technique for searching research databases is using Boolean operators. Boolean operators are words that are used to combine search terms and create more complex search queries. For example, users can use the "AND" operator to search for articles that contain two or more specific terms, or they can use the "OR" operator to search for articles that contain either of two specific terms.

In addition to search techniques, research databases also provide tools for analysing and organising search results. One of the most useful tools is the ability to create a saved search. A saved search allows users to save their search criteria and receive automatic alerts when new articles are added to the database that meet their search criteria.

More specific information on keywords, controlled vocabulary, truncation and wildcards is included at the end of this guide.

Now let's take a look at the steps you need to take to effectively search a database.

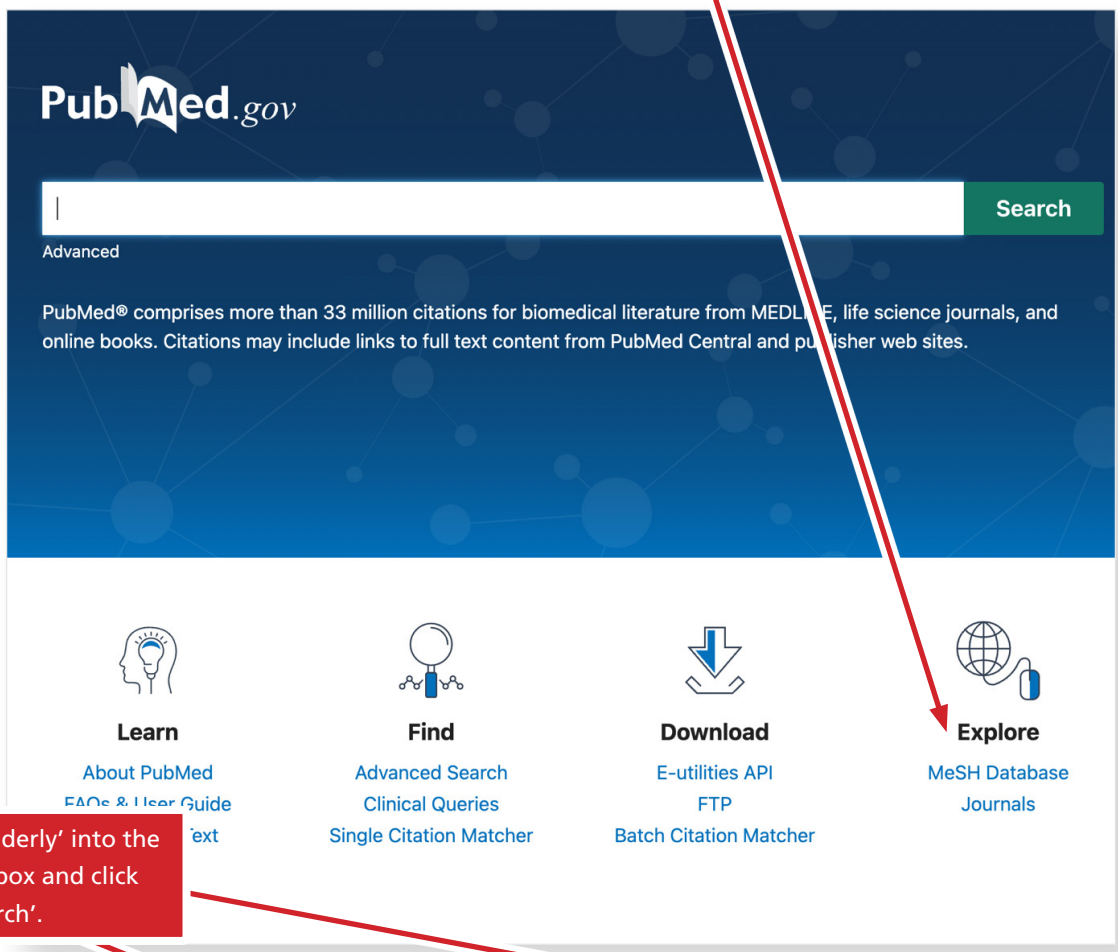
Example search used

"articles on the prevention of falls in the elderly"

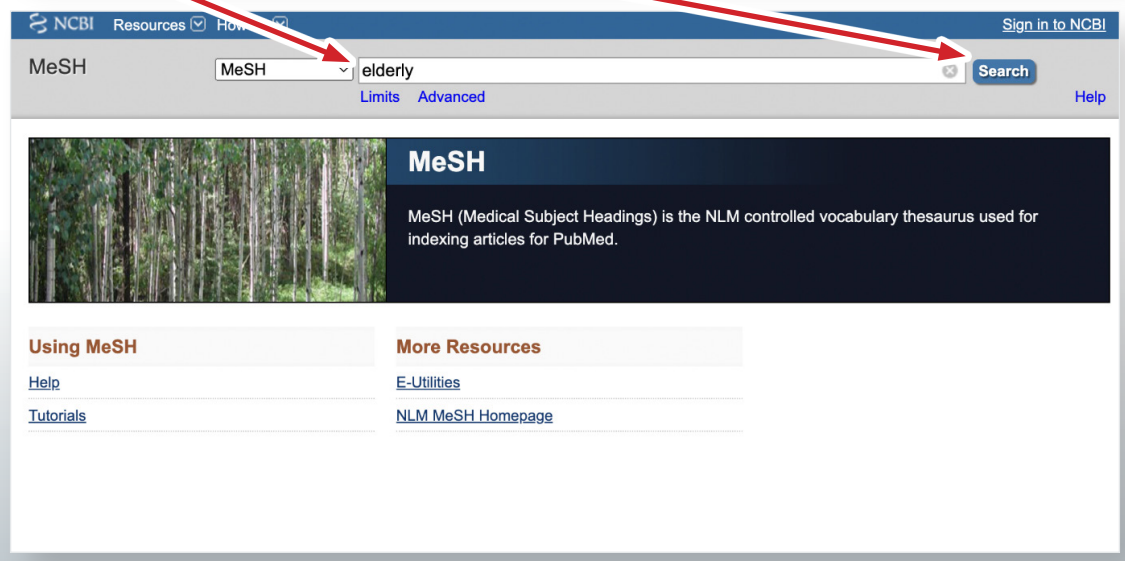
Go to http://pubmed.ncbi.nlm.nih.gov/ It is advised that you create an account and login to enable you to save your searches.

We will start by searching for the appropriate subject headings [MeSH] for our population.

1 Click the MeSH database

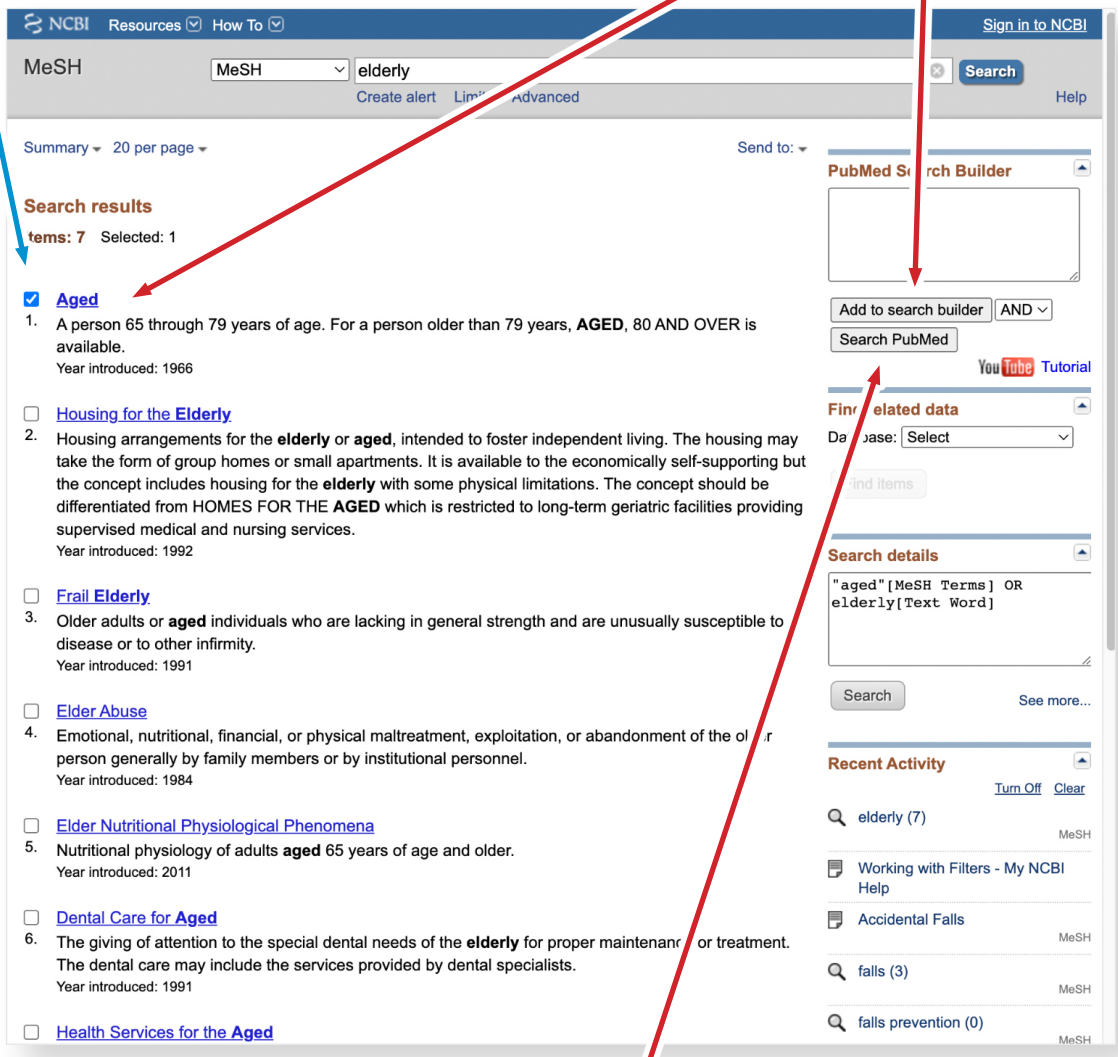


2 Type 'elderly' into the search box and click on 'search'.



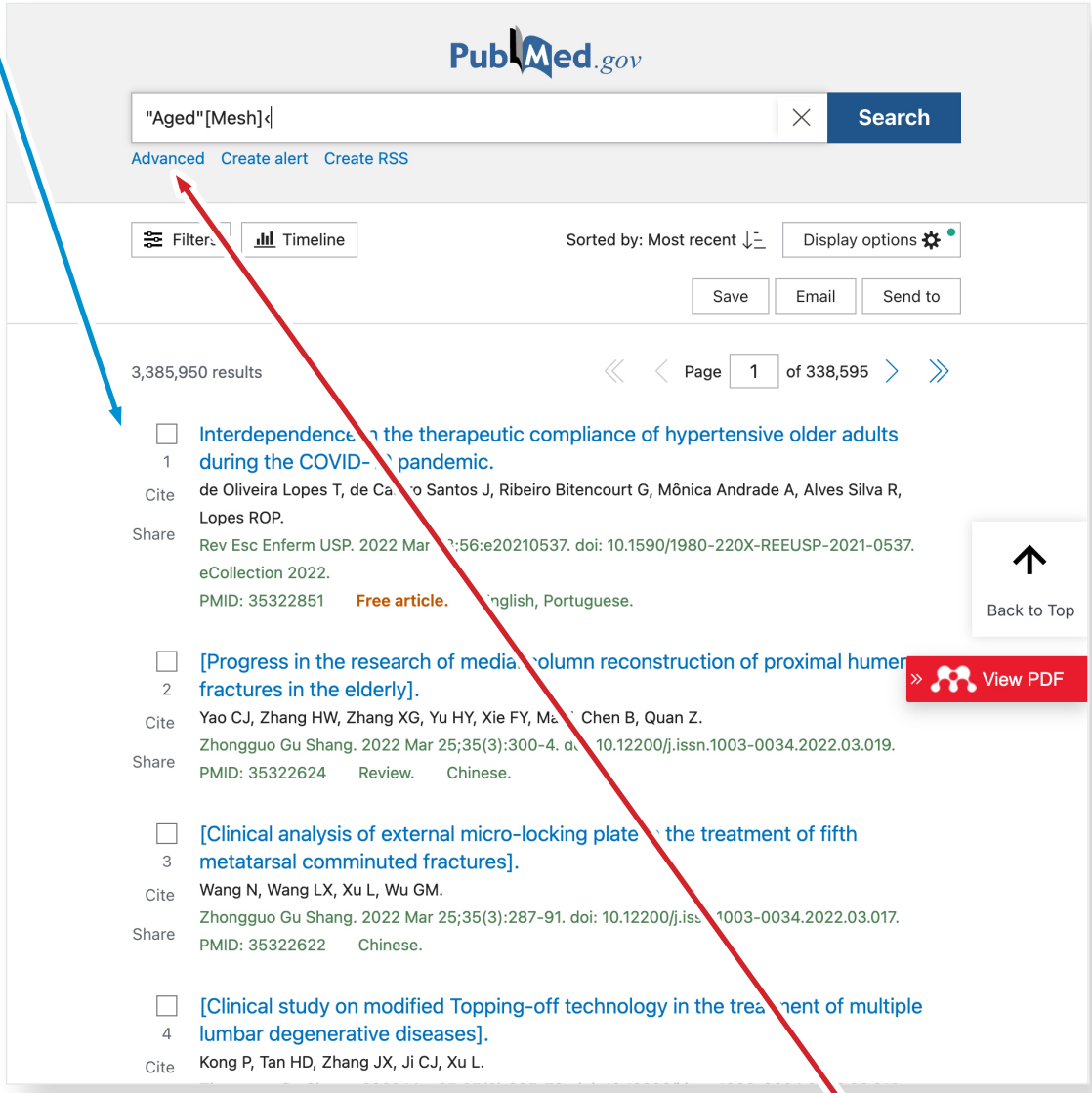
A list of subject headings matching what you have typed will be displayed.
You may not always get an exact match.
Maybe re-consider the term you are using

1 Select the appropriate subject heading and click on 'Add to search builder'



2 Search for articles tagged with the subject heading by clicking 'Search PubMed'

A list of articles tagged with the subject heading ‘aged’ will be displayed.

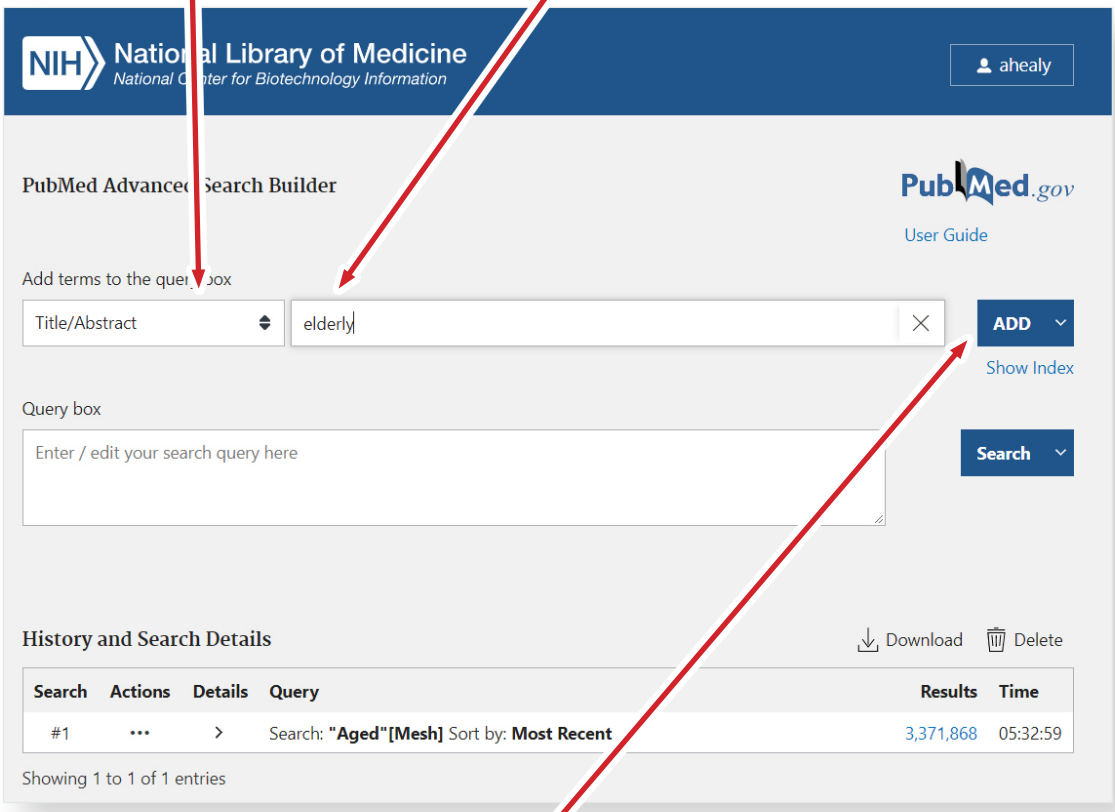


1 The next step is to start searching for keywords/free text in the title and abstract. To do this click on ‘Advanced’.

1 Choose 'Title/Abstract' from the drop down menu.

2 Type the term to search. You can use truncation if needed. This is a method in which symbols are used in place of letters or words to help you broaden your search. In PubMed, the asterisk (*) is used at the end of the root of your term (minimum of at least four characters). For example, toxic* will search for toxic, toxicity, toxicology, etc.

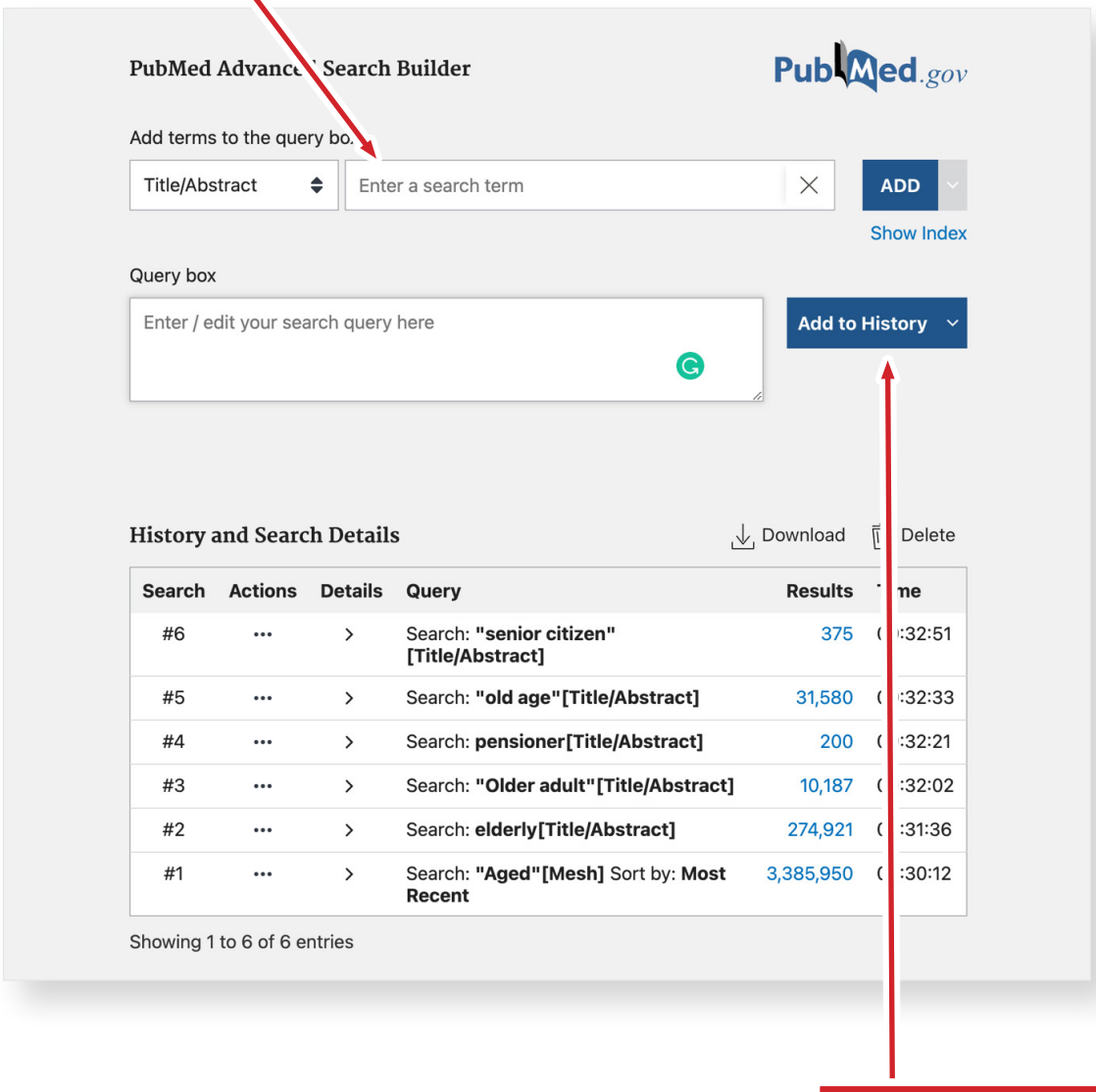
American English or British English (e.g., anemia or anaemia). Searches will retrieve the same citations regardless of whether the American or British spelling is used.



3 Click 'ADD' and the term is added to the Query box.

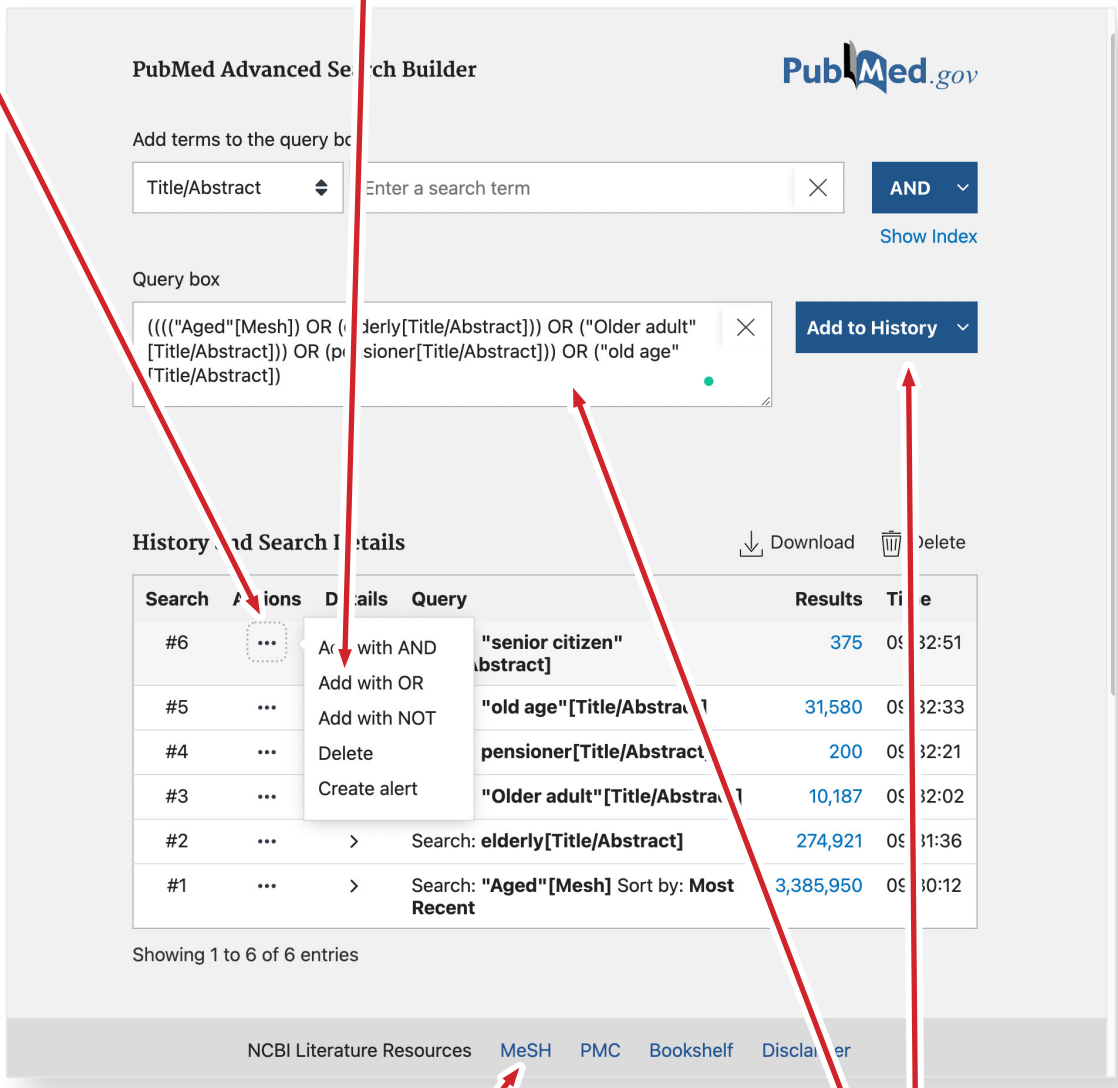
1 Enter your next search term.

"Older adult" is an example of phrase searching where quotation marks are used to search for the exact phrase.



2 When you add a search item you must click 'ADD' and then 'Add to History' and then repeat the process for each search item.

1 Once all MeSH terms and free text have been added to the search build you will need to combine them. Click the 3 dots next to the first term (#1) and choose 'add query'. Then add the next term choosing 'Add with OR', do this for all the terms in this category.

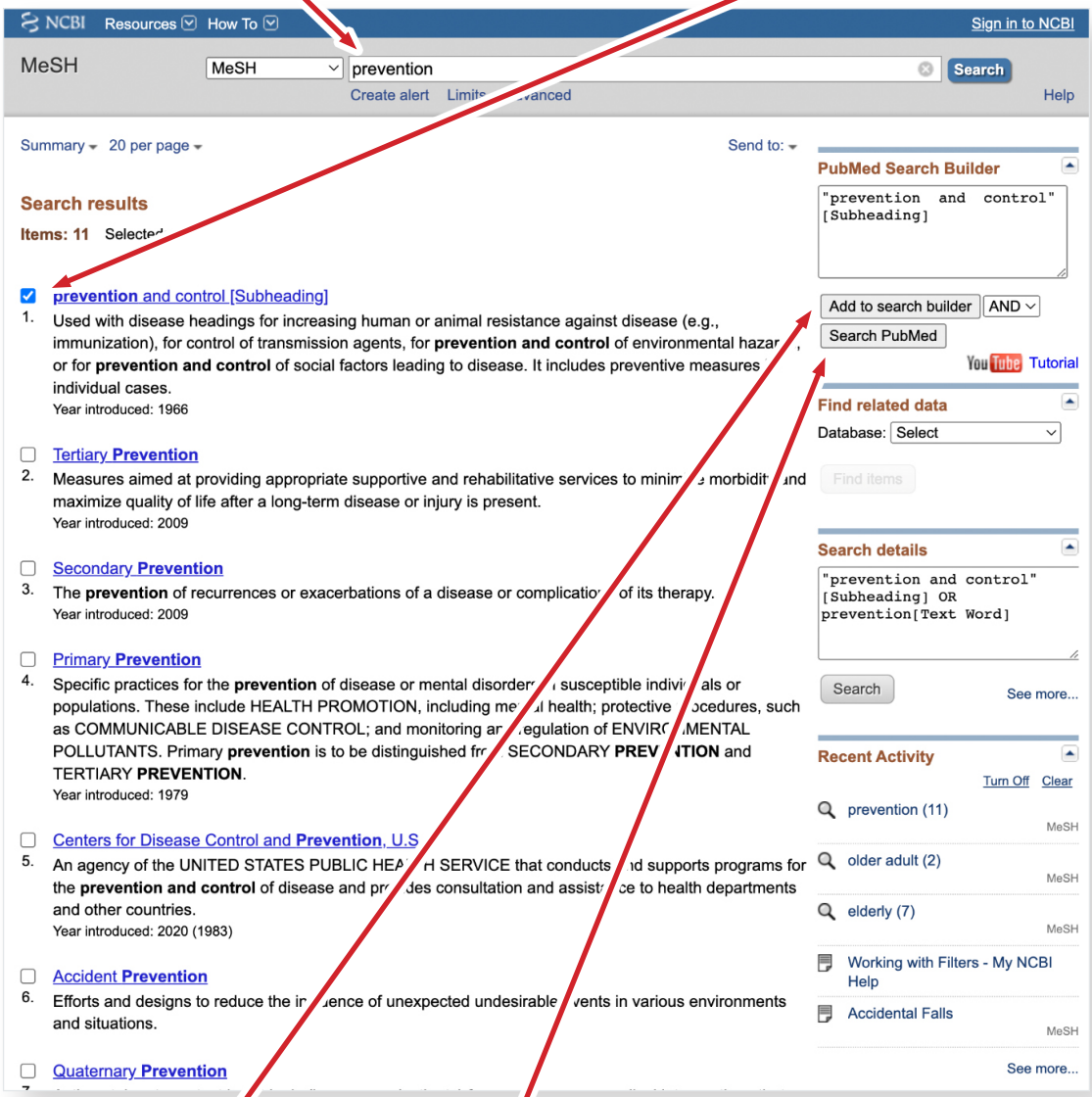


2 All the terms will appear in the Query box. Click 'Add to History'.

3 Click 'MeSH' to search the next term

1 You now need to search for the second term ‘Prevention’.

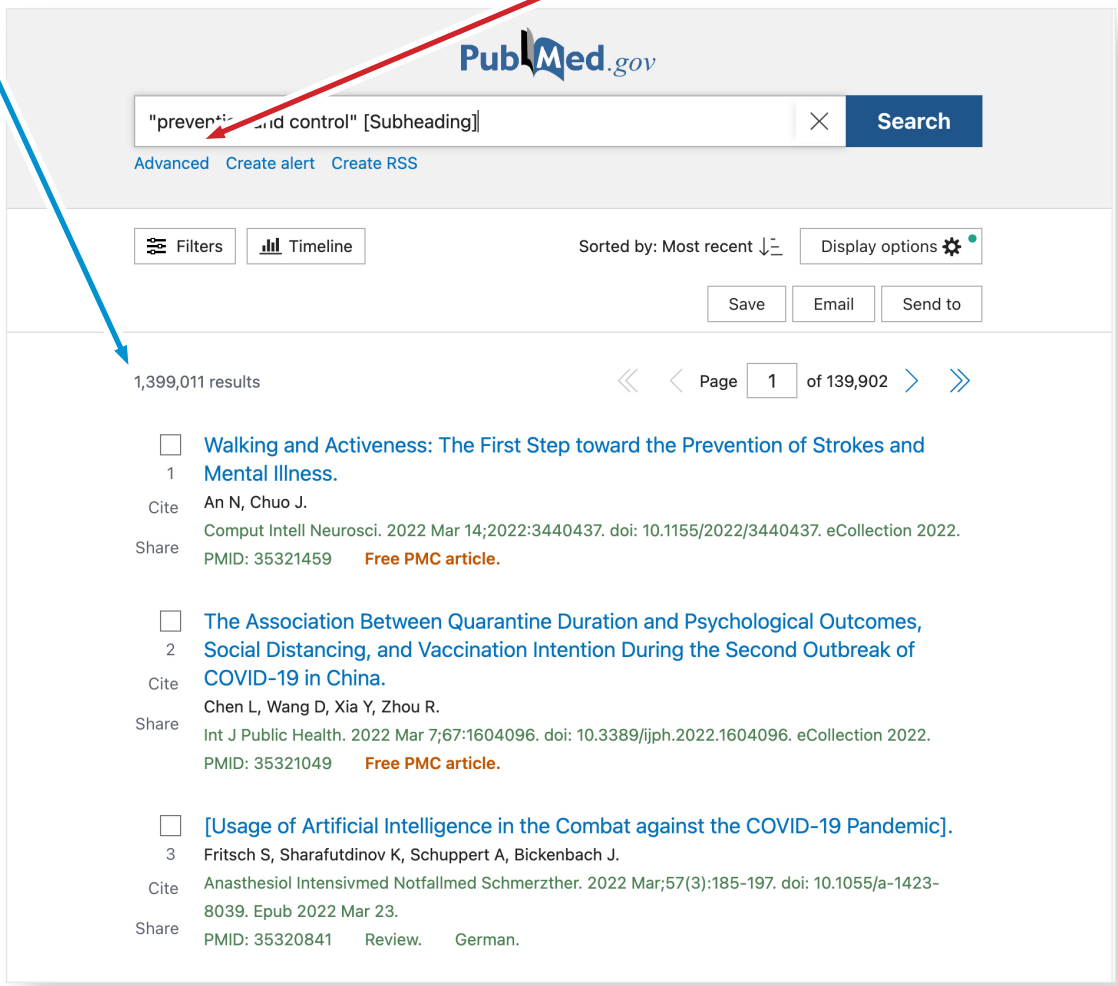
2 Choose a term that best matches ‘prevention’ in this context



3 Click ‘Add to search builder’ and click ‘Search PubMed’.

The number of articles is huge…
but you're not finished yet…

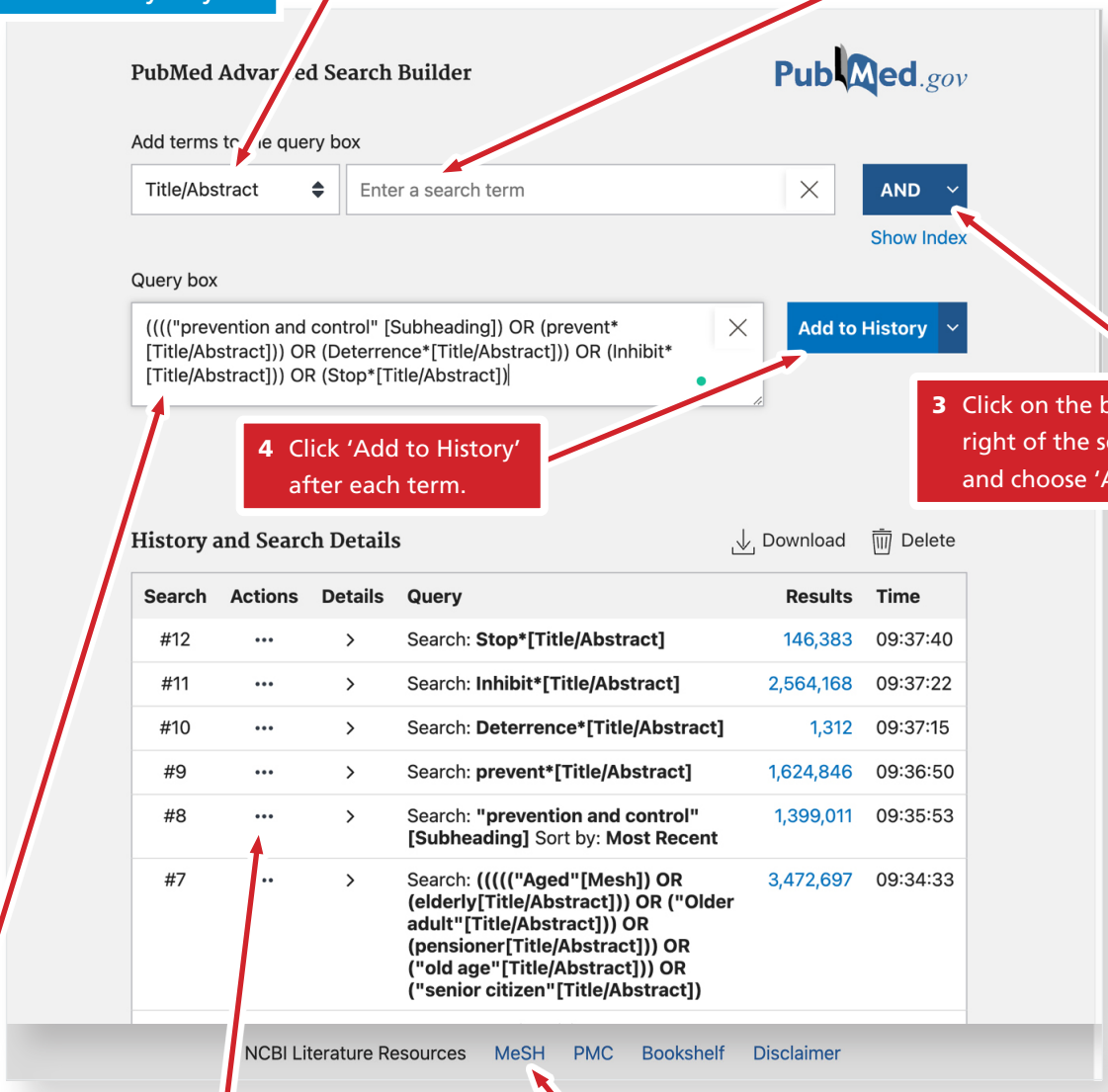
1 Click 'Advanced' to search for free text/synonyms



Repeat the steps you took to search for free text/synonyms for "elderly" but this time search synonyms for prevention. You must repeat the whole process as before for each set of synonyms.

1 Choose 'Title/Abstract' from drop down menu.

2 Type the terms or synonyms.



3 Click on the box to the right of the search box and choose 'Add'.

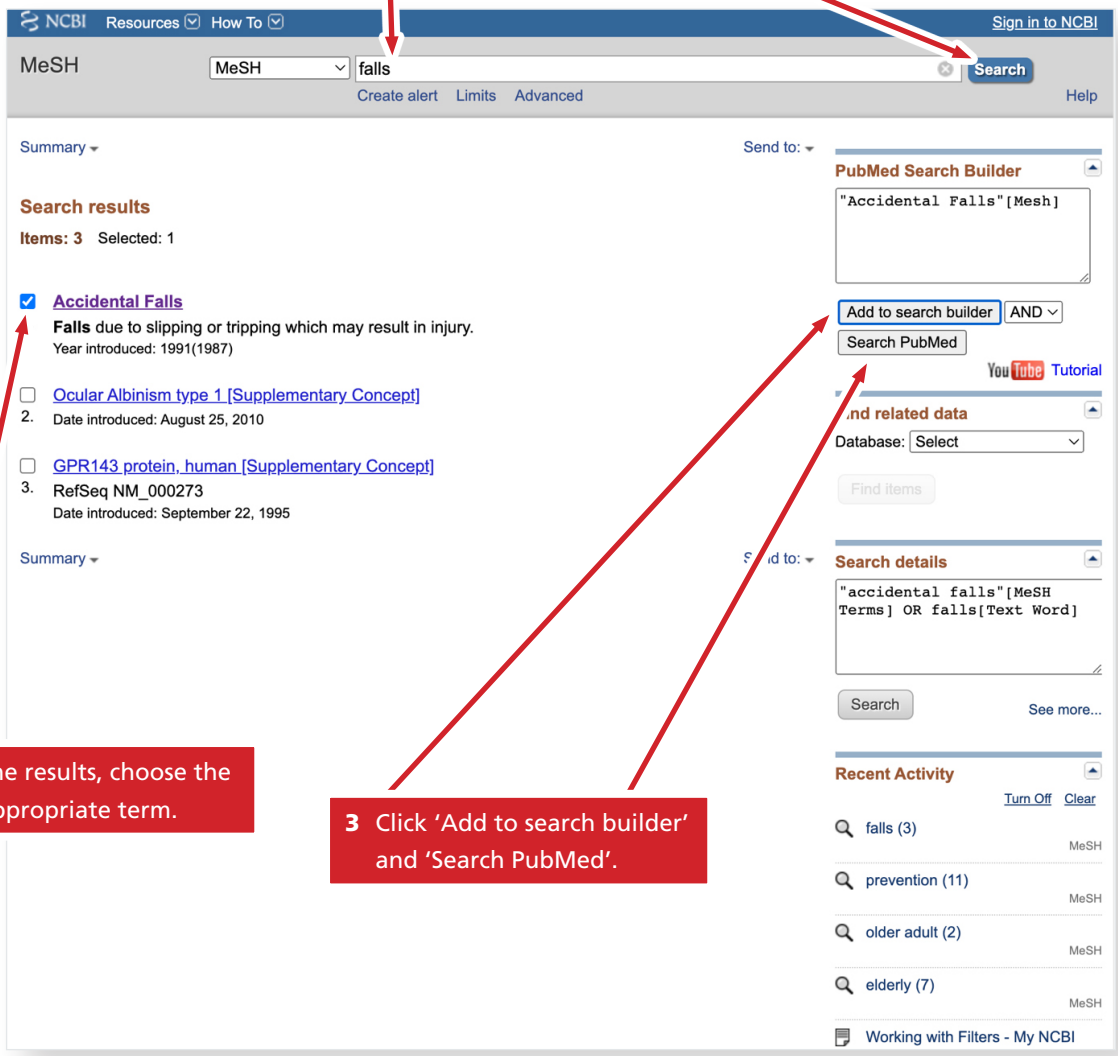
4 Click 'Add to History' after each term.

5 You will need to combine the terms for this search as you did for the previous search by clicking on the three dots starting with #8 and choosing 'Add to query' then #3 and choose 'Add with OR'. Complete this for each term and then clink 'Add to History'.

6 Click 'MeSH' to search the next term.

Now you need to search the MeSH terms for the next term "Falls".

1 Type the term in the search box and click 'Search'.

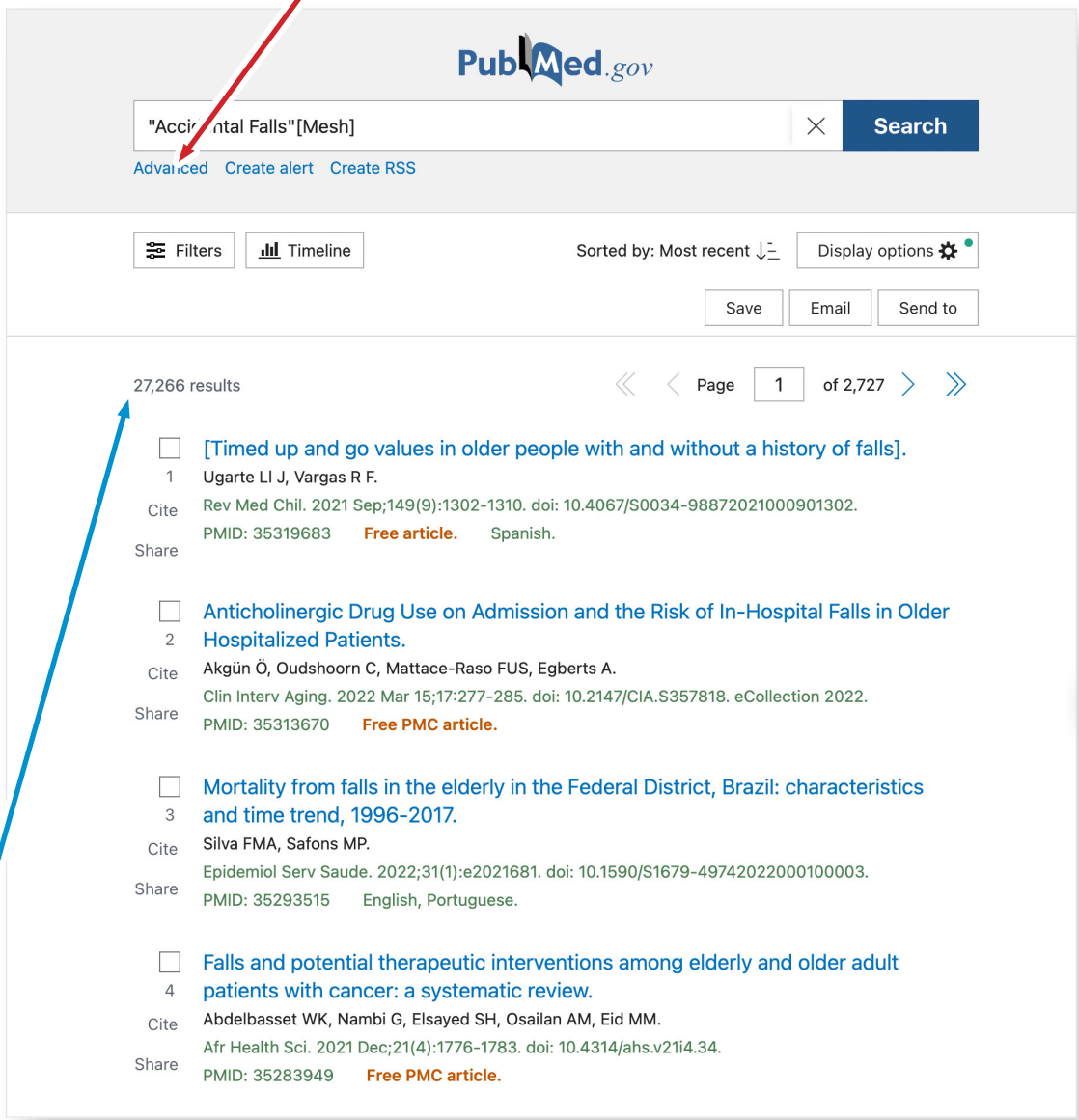


2 From the results, choose the most appropriate term.

3 Click 'Add to search builder' and 'Search PubMed'.

Now it's time to search the free text/synonyms for the term "Falls"

1 Click 'Advanced'.



Lots more results...

Repeat the steps you took to search for free text/synonyms for "Prevention", this time searching for synonyms for "falls"

1 After adding each term to the search builder, click on the three dots and combine them with "OR" as you did in the previous search.

Search	Actions	Detail	Query	Results	Time
#17	•••		Search: **(("Accidental Falls"[Mesh]) OR (Falling*[Title/Abstract])) OR (Trip*[Title/Abstract])**	327,220	09:40:14
#16	•••	›	Search: **Trip*[Title/Abstra]**	274,188	09:39:50
#15	•••	›	Search: **Falling*[Title/Abstr :t]**	31,886	09:39:32
#14	•••	›	Search: **"Accidental Falls"[M sh]** Sort by: **Most Recent**	27,266	09:38:33
#13	•••	›	Search: **((("prevention and co rol" [Subheading]) OR (prevent* [Title/Abstract])) OR (Deterrenc * [Title/Abstract])) OR (Inhibit* [Title/Abstract])) OR (Stop* [Title/Abstract])**	4,927,168	09:38:17
#12	•••	›	Search: **Stop*[Title/Abstract]**	146,383	09:37:40
#11	•••	›	Search: **Inhibit*[Title/Abstract]**	2,564,168	09:37:22
#10	•••	›	Search: **Deterrence*[Title/Abstract]**	1,312	09:37:15
#9	•••	›	Search: **prevent*[Title/Abstract]**	624,846	09:36:50
#8	•••	›	Search: **"prevention and control" [Subheading]** Sort by: **Most Recent**	399,011	09:35:53
#7	•••	›	Search: **(((((("Aged"[Mesh]) OR (elderly[Title/Abstract])) OR ("Older adult"[Title/Abstract])) OR (pensioner[Title/Abstract])) OR ("old age"[Title/Abstract])) OR ("senior citizen"[Title/Abstract])**	3,4 ,697	09:34:33
#6	•••	›	Search: **"senior citizen" [Title/Abstract]**	37	09:32:51
#5	•••	›	Search: **"old age"[Title/Abstract]**	31,580	09:32:33
#4	•••	›	Search: **pensioner[Title/Abstract]**	200	9:32:21
#3	•••	›	Search: **"Older adult"[Title/Abstract]**	10,187	:32:02
#2	•••	›	Search: **elderly[Title/Abstract]**	274,921	09 1:36

2 The combined search will appear at the top.

Now you have completed the MeSH and free text searches for the main terms (Prevention, Elderley, Falls), you now need to carry out a search which includes all the terms you have in the search build.

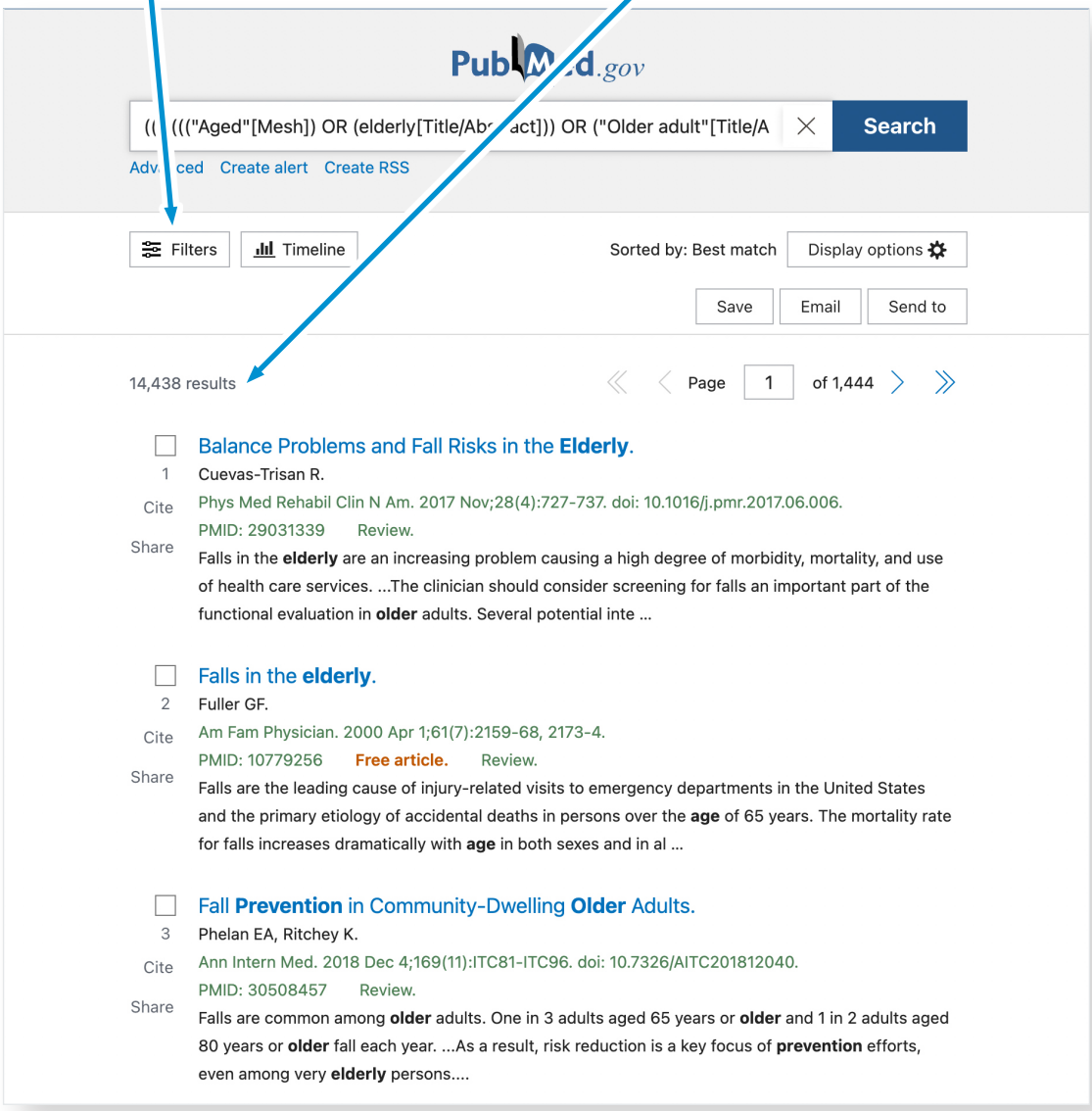
There are a huge number of articles returned for these searches. Combing the searches will reduce this.

Search	Actions	Details	Query	Results	Time
#17	•••	›	Search: **(("Accidental Falls"[Mesh]) OR (Falling*[Title/Abstract])) OR (Trip*[Title/Abstract])**	327,220	09:40:14
#16	•••	›	Search: **Trip*[Title/Abstract]**	274,188	09:39:50
#15	•••	›	Search: **Falling*[Title/Abstract]**	31,886	09:39:32
#14	•••	›	Search: **"Accidental Falls"[Mesh]** Sort by: **Most Recent**	27,266	09:38:33
#13	•••	›	Search: **((((("prevention and control"[Subheading]) OR (prevent*[Title/Abstract])) OR (Deterrence*[Title/Abstract])) OR (Inhibit*[Title/Abstract])) OR (Stop*[Title/Abstract])**	4,927,168	09:38:17
#12	•••	›	Search: **Stop*[Title/Abstract]**	146,383	09:37:40
#11	•••	›	Search: **Inhibit*[Title/Abstract]**	2,564,168	09:37:22
#10	•••	›	Search: **Deterrence*[Title/Abstract]**	1,312	09:37:15
#9	•••	›	Search: **prevent*[Title/Abstract]**	1,624,846	09:36:50
#8	•••	›	Search: **"prevention and control"[Subheading]** Sort by: **Most Recent**	1,399,011	09:35:53
#7	•••		Add query / Delete / Create alert — **(((((("Aged"[Mesh]) OR [Title/Abstract])) OR ("Older [Title/Abstract])) OR [ner[Title/Abstract])) OR [ge"[Title/Abstract])) OR ("senior citizen"[Title/Abstract])**	3,472,697	09:34:33
[illegible]	•••	›	Search: **"senior citizen"[Title/Abstract]**	375	09:32:51
#5	•••	›	Search: **"old age"[Title/Abstract]**	31,580	09:32:33
#4	•••	›	Search: **pensioner[Title/Abstract]**	200	09:32:21
#3	•••	›	Search: **"Older adult"[Title/Abstract]**	10,187	09:32:02
#2	•••	›	Search: **elderly[Title/Abstract]**	274,921	09:31:36

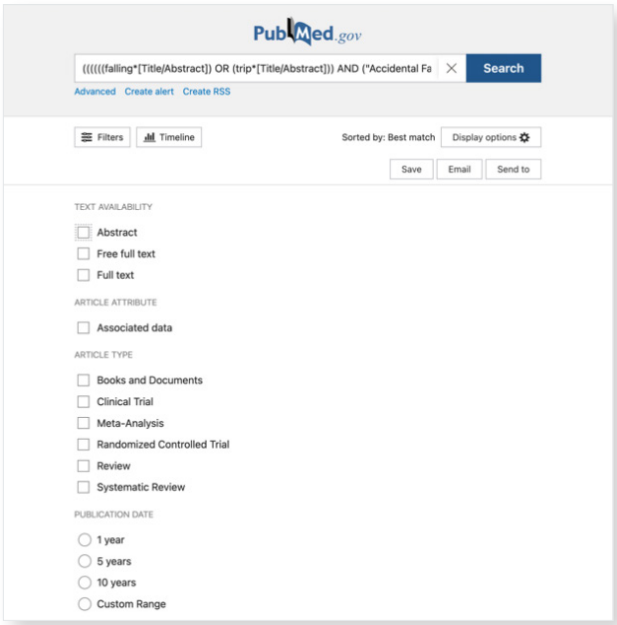
1 Now you need to add all the searches in the 'search builder' to the search field. Click the three dots next to each combined search and click 'add with AND'. In this search you have three combined searches (#7, #13 and #17) which need to be added to create the final search.

You can use the filter tab to define the search further.

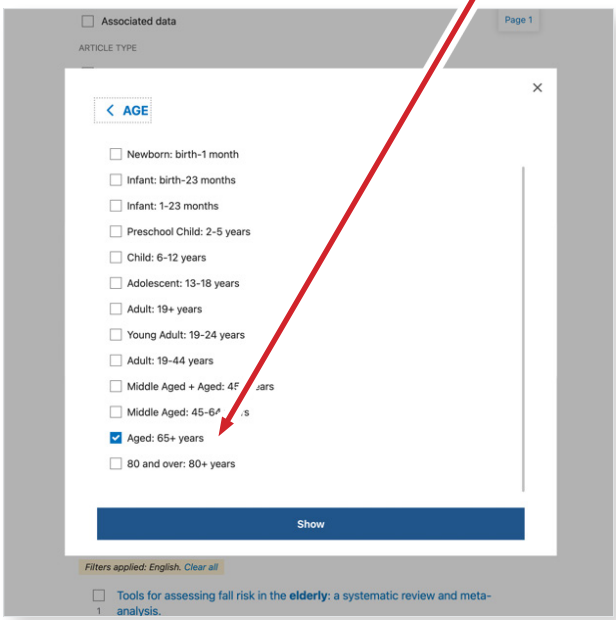
This is the result of all the combined searches; it has reduced the number of articles significantly! But it is still a large number.

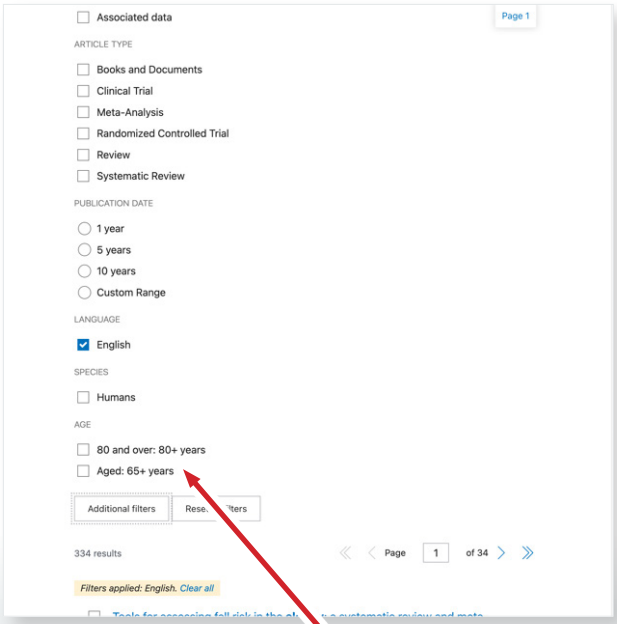


1 Clicking the ‘Filters’ tab brings up a range of fields which you can choose to limit your search to. If the correct option isn’t visible choose ‘custom range’.

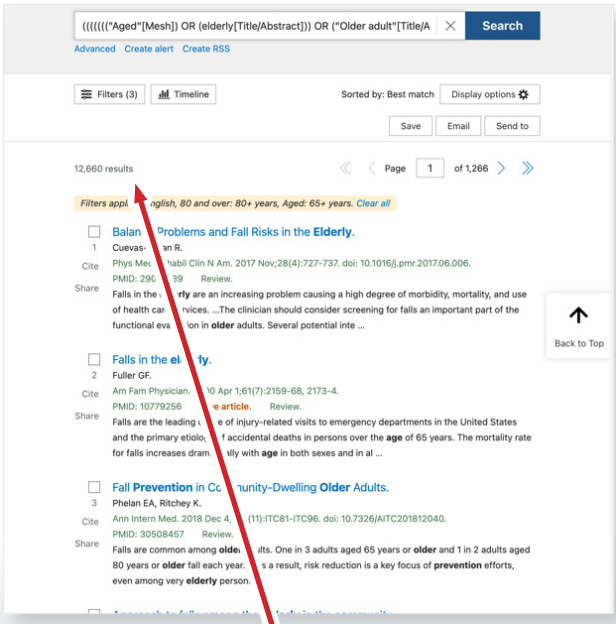


2 Choosing ‘custom range’ for age brings up these options.You can see that ‘80 and over 80 hasn’t been included. You can add this to the search by clicking it.



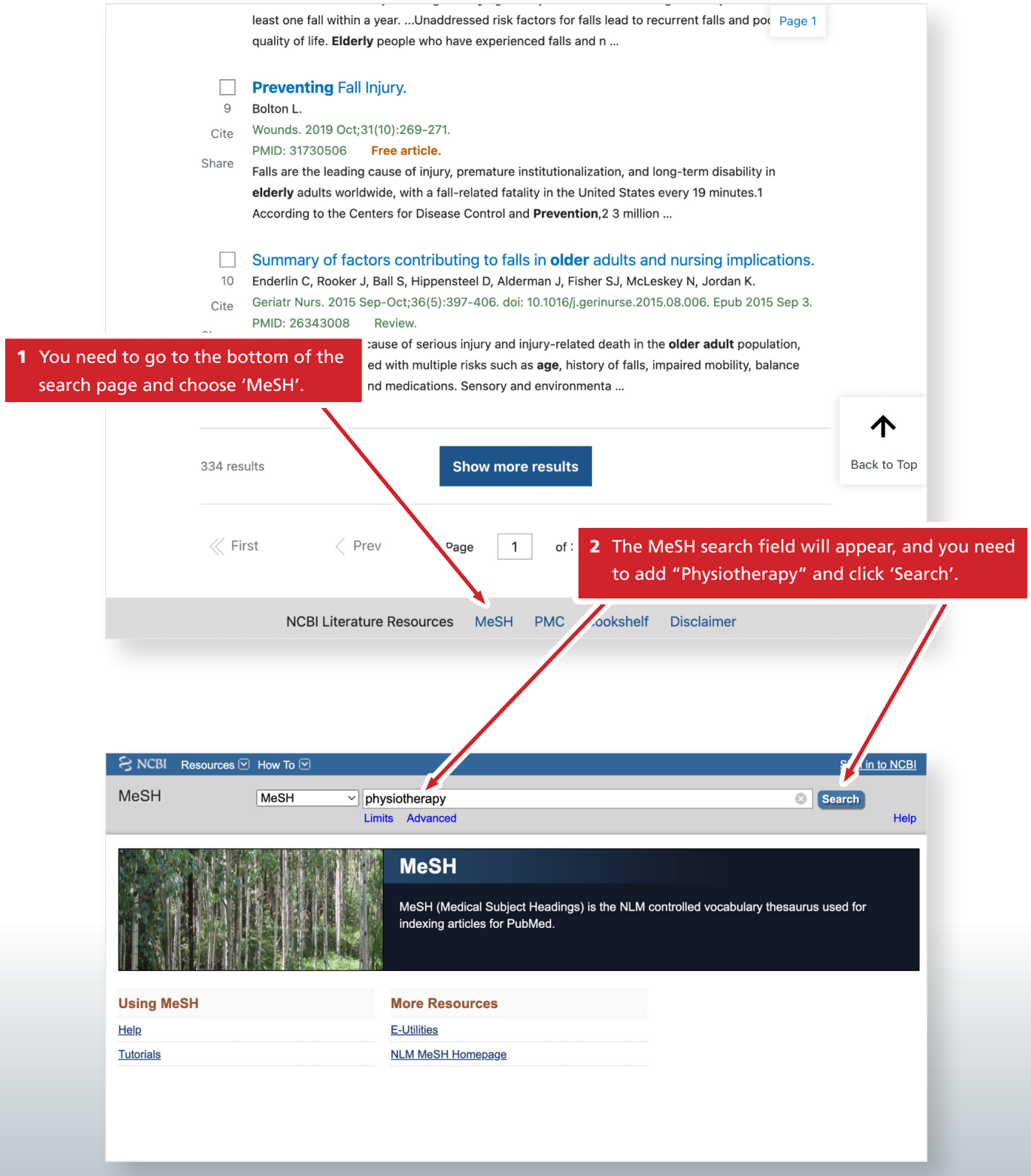


3 Now the age options will appear in the filter fields. Make sure you click them to add them to the search.



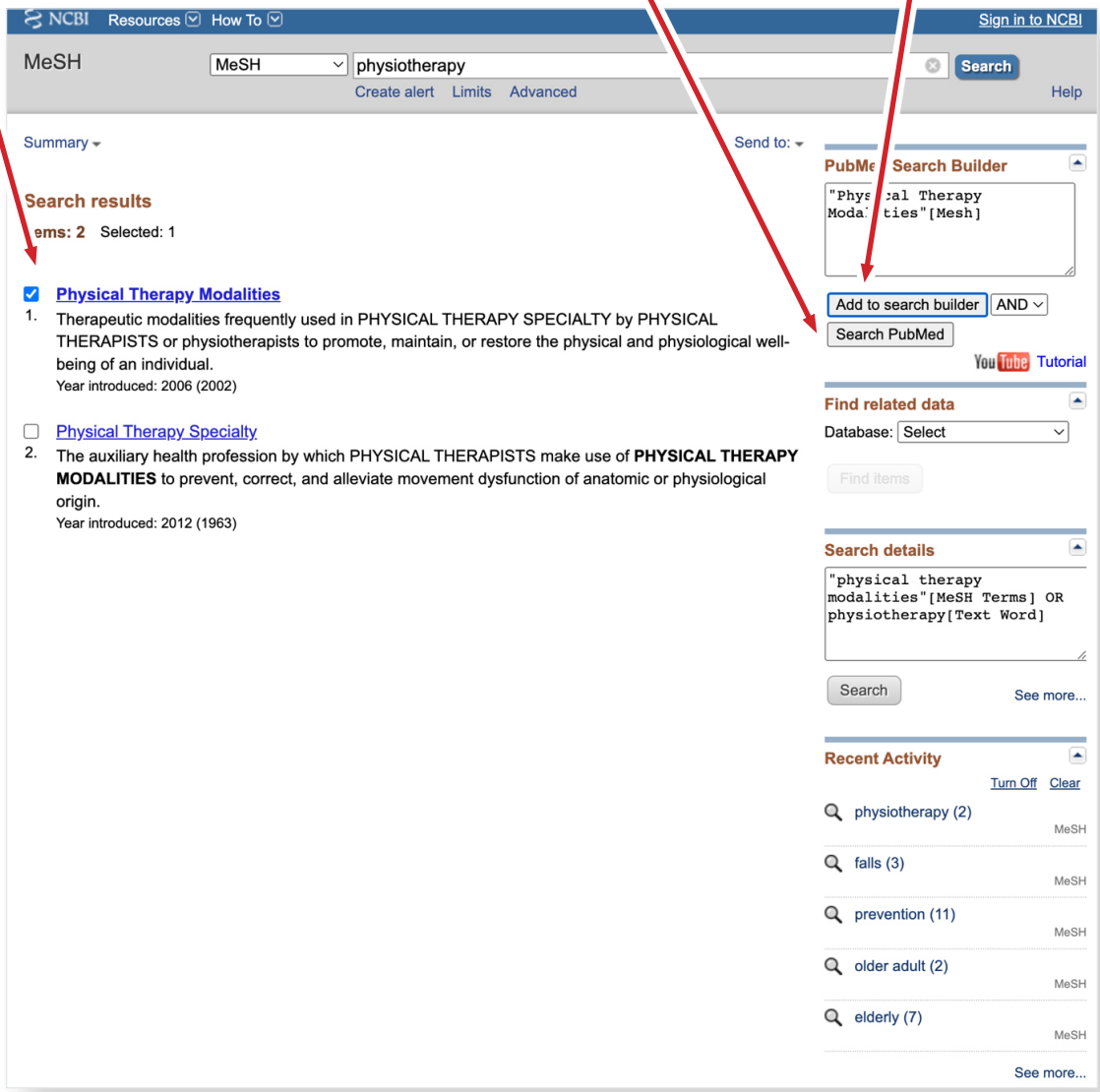
4 The filters have reduced the number of articles.

Now you need to decide whether the search strategy (the MeSH and free text terms you used) is too broad or too sensitive… Let's assume you decide it is too broad and what you really need to know is the impact of "Physiotherapy" on falls prevention in the elderly with Parkinson's disease. You can go back and add this term to the search by searching "Physiotherapy" and "Parkinson's" in MeSH database and then searching the related synonyms… like you did previously. Let's repeat the steps.

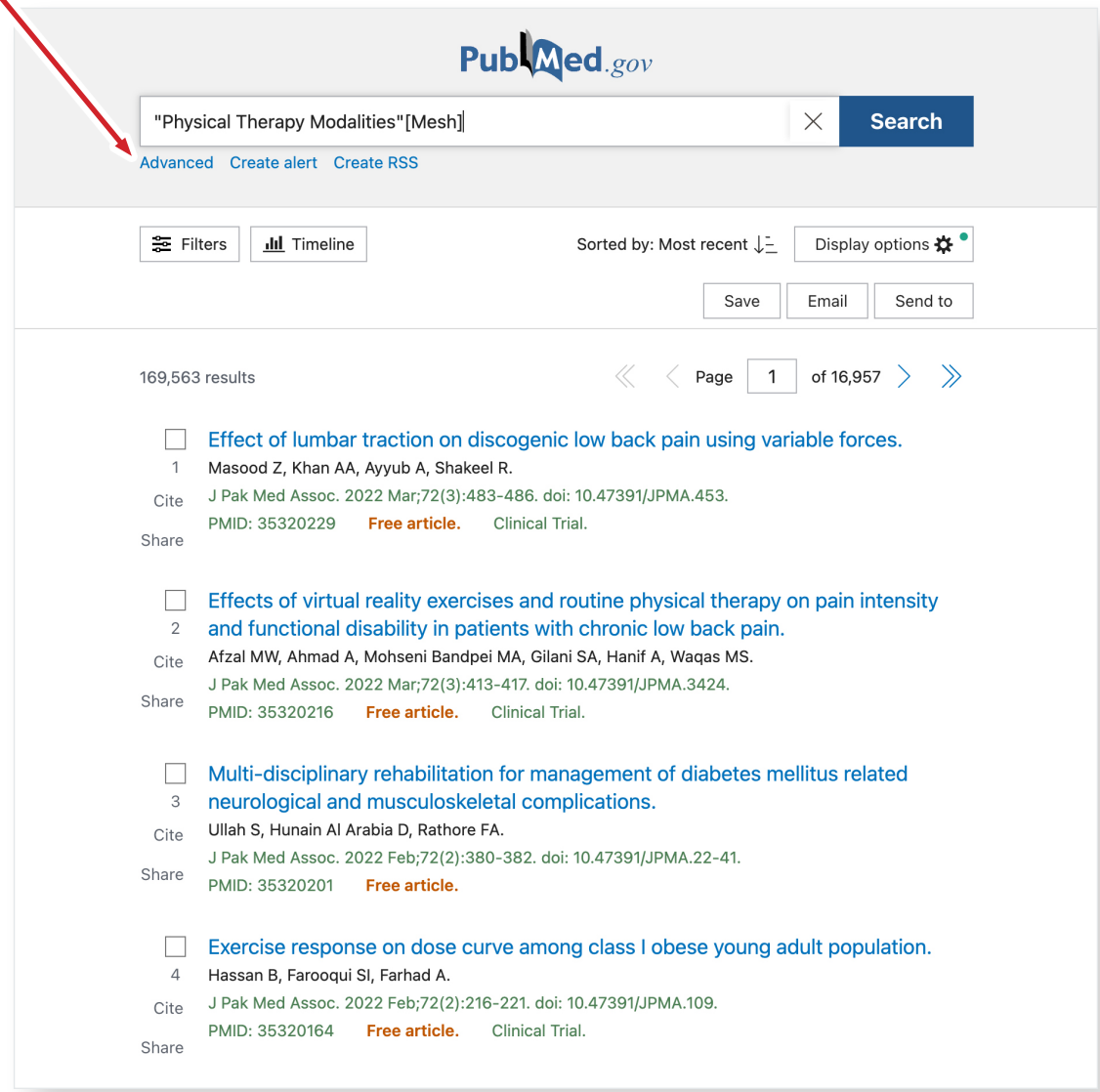


1 Choose the term which best represents the term you are searching.

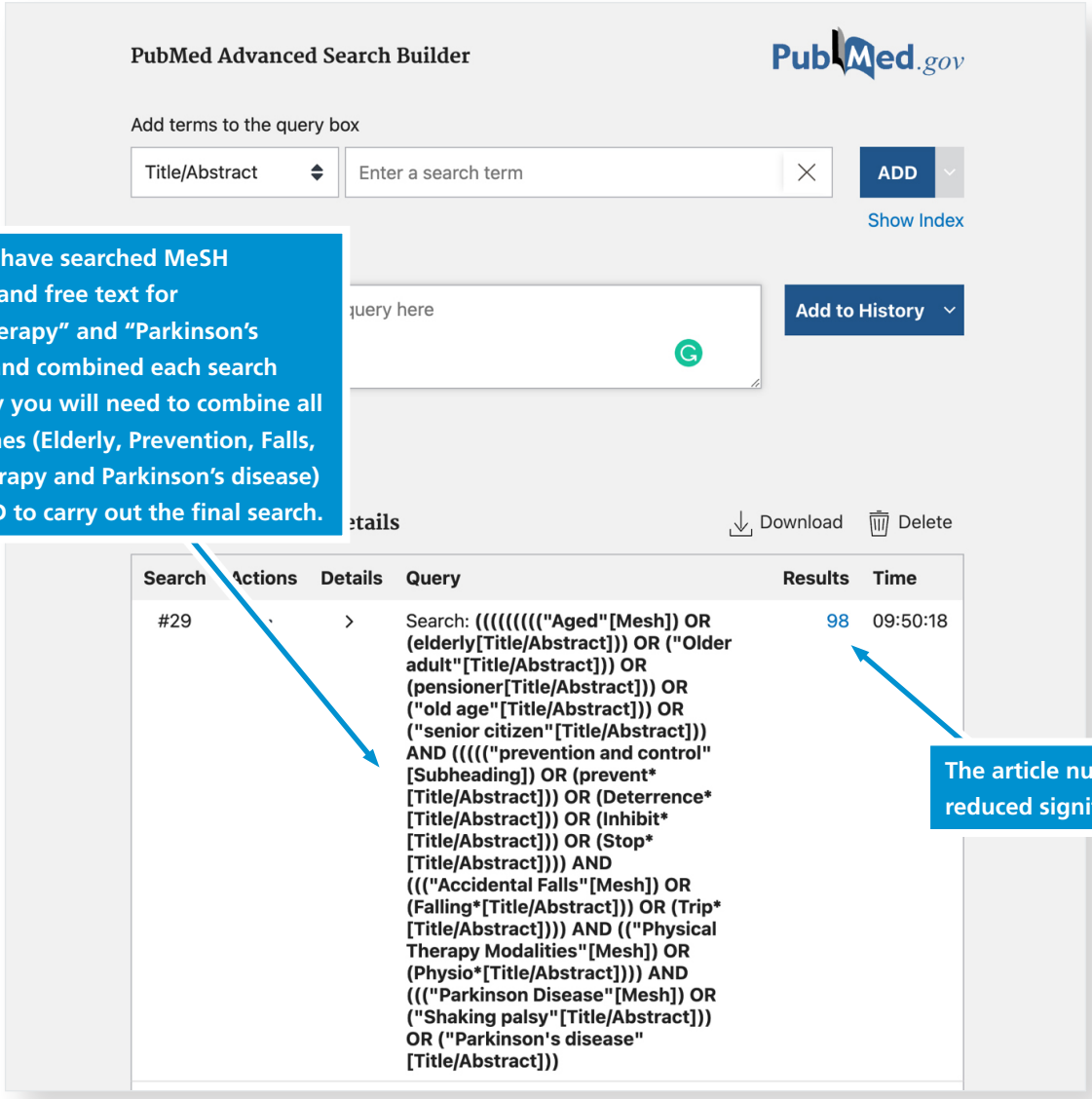
2 Click 'Add to search builder' and 'Search PubMed'.



1 Click 'Advanced' so you can now search for free text/synonyms.



Repeat the steps you took to search for free text/synonyms for "Prevention", "Falls" and "Elderly", this time searching for synonyms of "physiotherapy" remember to combine the search for the MeSH and free terms. Repeat the same steps for "Parkinson's disease".



Once you have searched MeSH headings and free text for "Physiotherapy" and "Parkinson's disease" and combined each search separately you will need to combine all the searches (Elderly, Prevention, Falls, Physiotherapy and Parkinson's disease) using AND to carry out the final search.

The article number has reduced significantly.

We can see that the combination of additional MeSH terms and free text has reduced the number of articles to just 98. You now need to decide whether the search strategy is too specific...

The search started looking for articles on the prevention of falls in the elderly. The search evolved to be more specific, to include Physiotherapy and Parkinson's disease. This was a demonstration of how a search might start and evolve and how you apply the search to PubMed.

Additional notes

This guide is to demonstrate how to search in PubMed. It is not a demonstration for a suitable search strategy for "The prevention of falls in the elderly". You might need to consider accessing training on on "how to conduct a systematic review" to learn more about search strategies.

Once you have finalised your search strategy for one database, you will need to adapt it for the other sources you have chosen to search. You may need to adapt the controlled vocabulary, field codes, truncation, and/or wildcards.

In order to identify as many relevant results as possible the search strategy should comprise a combination of free text terms and controlled vocabulary.

- If you use free text terms only you could miss articles that do not use your precise terms.
- If you use controlled vocabulary only you could miss articles that have not been indexed yet or have older indexing.

Free text (also known as key words)

Identify the terms you want to search for considering synonyms, alternative spelling variants, acronyms, abbreviations, medical terms, and laymen's terms. Relevant articles might be missed if not all relevant alternative terms are included in the search.

Remember to consider if it is appropriate to use wildcards and/or truncation for your free text terms within your search strategy.

Controlled vocabulary

A controlled vocabulary is a list of standardised subject headings used by database indexers to describe the subject of a source (e.g., an article or book). Each database has its own controlled vocabulary.

Examples of controlled vocabularies include:

- ERIC (education database) uses Thesaurus of ERIC descriptors
- PsycInfo uses American Psychological Association Thesaurus
- Medline used MeSH (Medical Subject Headings)
- CINAHL uses CINAHL Subject Headings

Truncation and Wildcards

Most databases use the symbol * or # or ?

Truncation - diabet* will return diabetic and diabetes; *glycemia will match hyperglycemia or hypoglycemia

Wildcard – leuk?mia will match both leukemia and leukaemia; wom?n will return women and woman; randomi?ed will return randomised and randomized

Boolean phrases

AND = both terms
OR = either term
NOT = not this term
(ADJacent, NEAR, … = AND + close)

Phrase searching

Use quotes to find exact phrases e.g., climate AND change versus "climate change"

Setting up an account with PubMed

It is suggested that you set up a free account with PubMed. This will allow you to save results, create bibliographics, and set up alerts. Please go to the following website to create an account https://www.ncbi.nlm.nih.gov/pmc/

References

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Registered address:
Clyde Offices, 2/3 48 West George Street, Glasgow G2 1BP
Tel: 0141 561 7217 E-mail: enquiries@bapo.com
www.bapo.com