Systematic Review and Meta-analysis

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Study question?

- Selection of population?
- Intervention/exposure?
- Comparator/control?
- Outcomes?

What is systematic review & meta-analysis?

- A literature review that collects and critically analyzes multiple research studies using methods selected a priori, and then analyzes the selected studies.

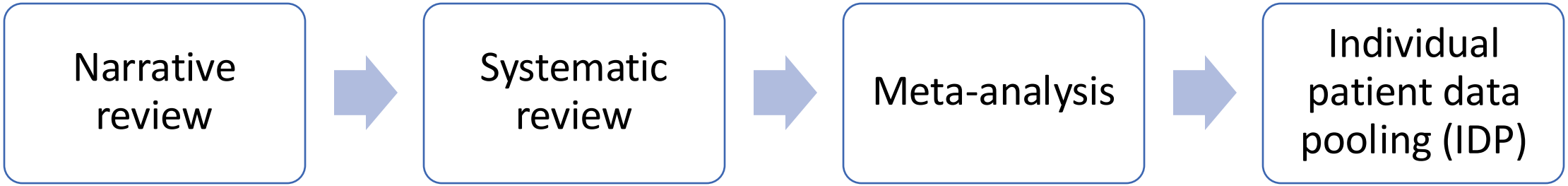
- Meta-analysis is a method for systematically combining pertinent qualitative and quantitative study data to develop a single conclusion that has a greater statistical power.

Review types

- Narrative review-not organized
- Systematic review- organized

1. Scoping review-focused scope
2. Rapid review
3. Meta-analysis

Research synthesis



How to select topics for systematic review?

- Timely topics
- Topics with multiple studies
- Topics with conflicting results

Types of systematic reviews

- Descriptive
- Diagnostic accuracy
- Effects of intervention

Descriptive

Tobacco Induced Diseases

March/2020 vol. 18 Get citation CC-BY 4.0 Stats

EDITORIAL

COVID-19 and smoking: A systematic review of the evidence

Constantine I. Vardavas [1,2], Katerina Nikitara [2]

More details

Tob. Induc. Dis. 2020;18(March):20

DOI: https://doi.org/10.18332/tid/119324

Article (PDF) References (13) Citations (793)

KEYWORDS

tobacco • smoking • COVID-19 • coronavirus

TOPICS

Diseases, due to tobacco

COVID-19 is a coronavirus outbreak that initially appeared in Wuhan, Hubei Province, China, in December 2019, but it has already evolved into a pandemic spreading rapidly worldwide[1,2]. As of 18 March 2020, a total number of 194909 cases of COVID-19 have been reported, including 7876 deaths, the majority of which have been reported in China (3242) and Italy (2505)[3].

However, as the pandemic is still unfortunately under progression, there are limited data with regard to the clinical characteristics of the patients as well as to their prognostic factors[4]. Smoking, to date, has been assumed to be possibly associated with adverse disease prognosis, as extensive evidence has highlighted the negative impact of tobacco use on lung health and its causal association with a plethora of respiratory diseases[5]. Smoking is also detrimental to the immune system

Diagnostic accuracy

Int J Immunopathol Pharmacol. 2022 Jan-Dec; 36: 03946320221115316. PMCID: PMC9289644
Published online 2022 Jul 15. doi: 10.1177/03946320221115316 PMID: 35840546

COVID-19: Clinical laboratory diagnosis and monitoring of novel coronavirus infected patients using molecular, serological and biochemical markers: A review

Ghulam Rasool,[1] Muhammad Riaz,[1] Mazhar Abbas,[2] Hina Fatima,[3,4] Muhammad Mustafa Qamar,[1] Farzana Zafar,[4] and Zahed Mahmood[5]

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Abstract

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COVID-19, a novel coronavirus disease, has provoked a variety of health and safety concerns, and socioeconomic challenges around the globe. The laboratory diagnosis of SARS-CoV-2 was quickly established utilizing nucleic acid amplification techniques (NAAT) after the disease causing virus has been identified, and its genetic sequence has been determined. In addition to NAAT, serological tests based on antibodies testing against SARS-CoV-2 were introduced for diagnostic and epidemiologic studies. Other biochemical investigations include monitoring of peripheral blood cells count, platelets/lymphocyte ratio, coagulation profile, cardiac, and inflammatory markers such as cytokines storm are also crucial in combating COVID-19 pandemic. Further, accurate and reliable laboratory results for SARS-CoV-2 play very important role in the initiation of early treatment and timely management of COVID-19 patients, provide support in clinical decision-making process to control infection, and detection of asymptomatic cases. The Task Force on Coronavirus-19 constituted by International Federation of Clinical

Int J Immunopathol Pharmacol

Effects of intervention

ELSEVIER

International Immunopharmacology

Volume 83, June 2020, 106455

The possible of immunotherapy for COVID-19: A systematic review

Akram AminJafari [a], Sorayya Ghasemi [b c]

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https://doi.org/10.1016/j.intimp.2020.106455

Highlights

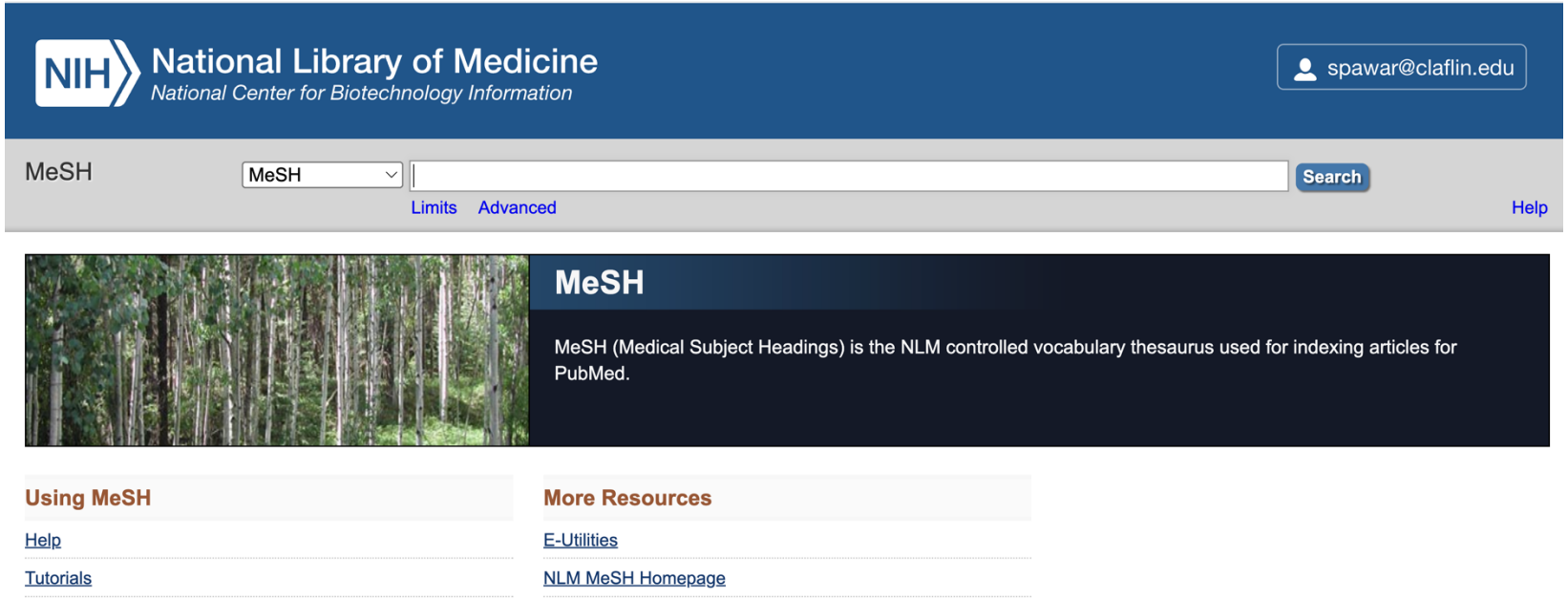
- The immunotherapy is an effective method for SARS-CoV, and MERS-CoV.
- The immunotherapies include vaccines, monoclonal antibody candidates, and etc.
- There is no serious immunotherapy research for COVID-19.
- Similar studies on the coronaviruses showed notable results.
- So immunotherapy for COVID-19 virus can also be a suitable option.

Conducting a systematic review

- Develop a specific research question
- Draft the search strategy: Keywords, inclusion, exclusion criteria's, limits
- Register your reviews: Example Prospero: International prospective register for systematic reviews
- Systematic search for data, check the data and articles sources (PubMed, EMBASE, Google scholar, etc.)

Continued:

- Controlled vocabulary (MeSH Headlines). https://www.ncbi.nlm.nih.gov/mesh/



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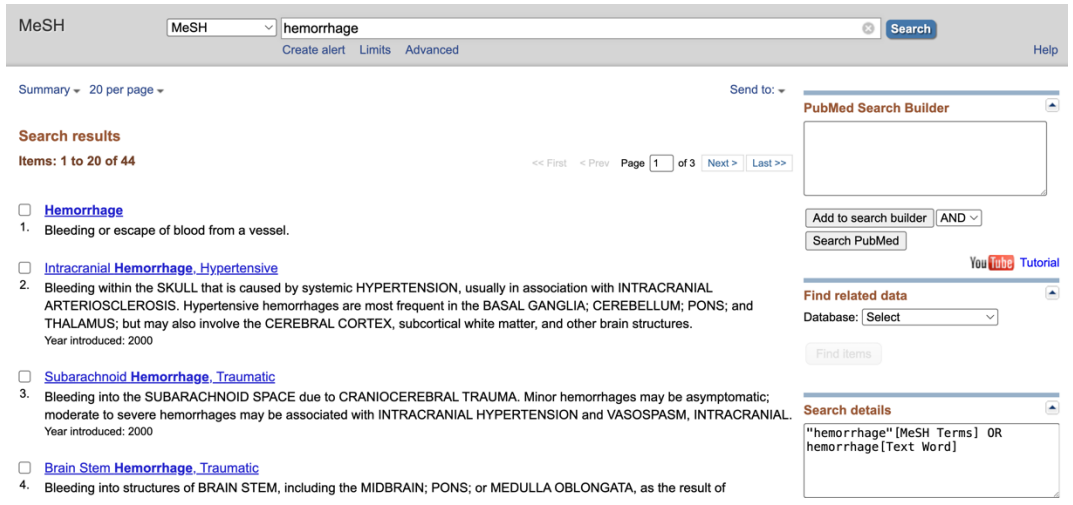
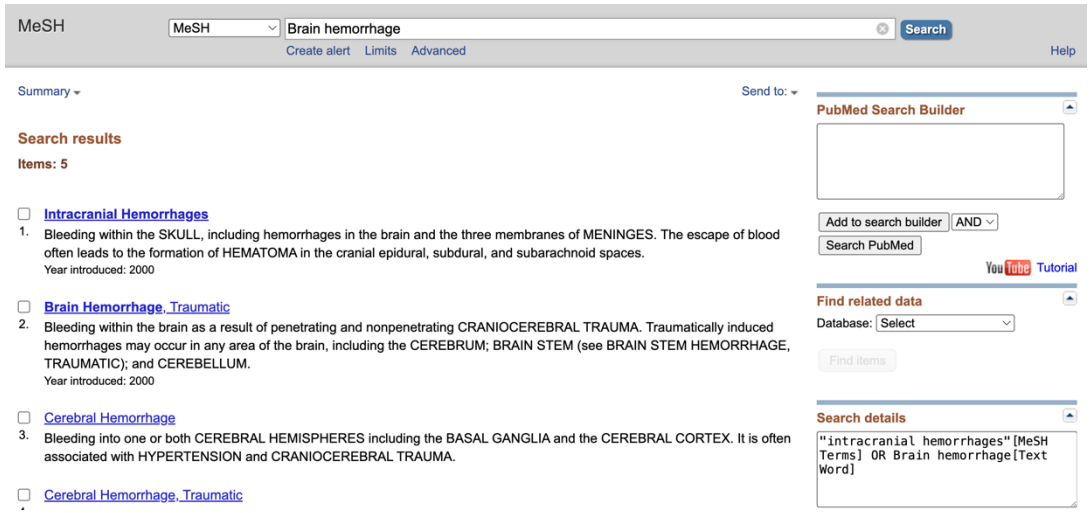
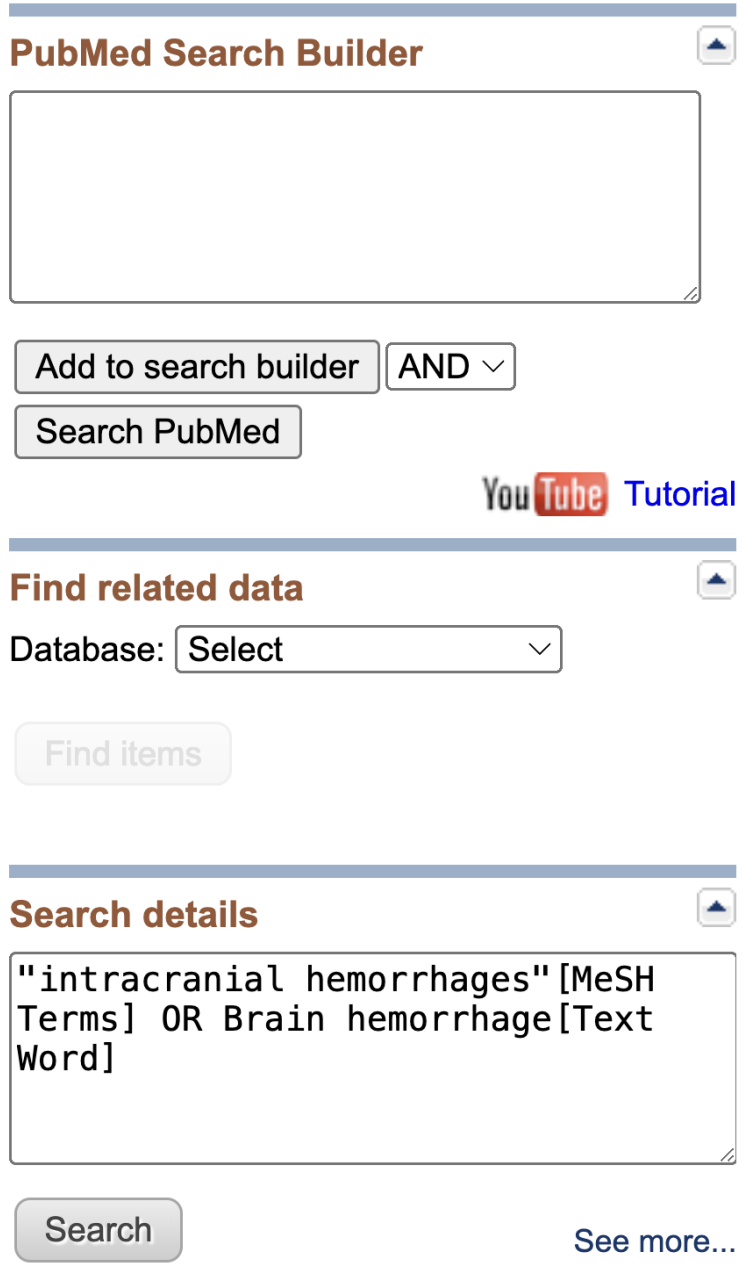
- Example Hemorrhage vs Brain Hemorrhage, check the differences.



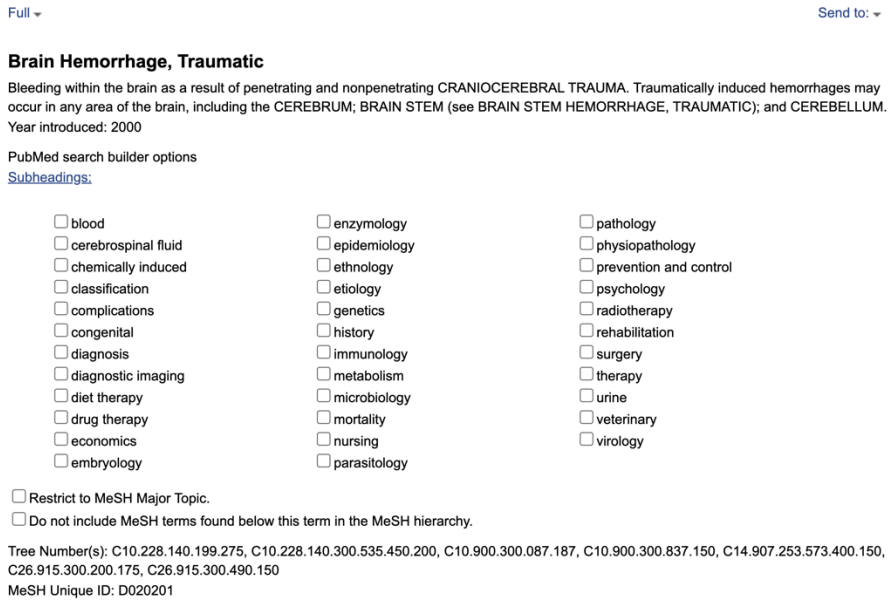


PubMed Search Builder



MeSH disadvantages

- Title
- Authors and affiliations
- Abstract
- MeSH terms
- Try also google scholar



Full ▾ Send to: ▾

Brain Hemorrhage, Traumatic

Bleeding within the brain as a result of penetrating and nonpenetrating CRANIOCEREBRAL TRAUMA. Traumatically induced hemorrhages may occur in any area of the brain, including the CEREBRUM; BRAIN STEM (see BRAIN STEM HEMORRHAGE, TRAUMATIC); and CEREBELLUM.
Year introduced: 2000

PubMed search builder options
Subheadings:

☐ blood	☐ enzymology	☐ pathology
☐ cerebrospinal fluid	☐ epidemiology	☐ physiopathology
☐ chemically induced	☐ ethnology	☐ prevention and control
☐ classification	☐ etiology	☐ psychology
☐ complications	☐ genetics	☐ radiotherapy
☐ congenital	☐ history	☐ rehabilitation
☐ diagnosis	☐ immunology	☐ surgery
☐ diagnostic imaging	☐ metabolism	☐ therapy
☐ diet therapy	☐ microbiology	☐ urine
☐ drug therapy	☐ mortality	☐ veterinary
☐ economics	☐ nursing	☐ virology
☐ embryology	☐ parasitology	

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

Tree Number(s): C10.228.140.199.275, C10.228.140.300.535.450.200, C10.900.300.087.187, C10.900.300.837.150, C14.907.253.573.400.150, C26.915.300.200.175, C26.915.300.490.150
MeSH Unique ID: D020201

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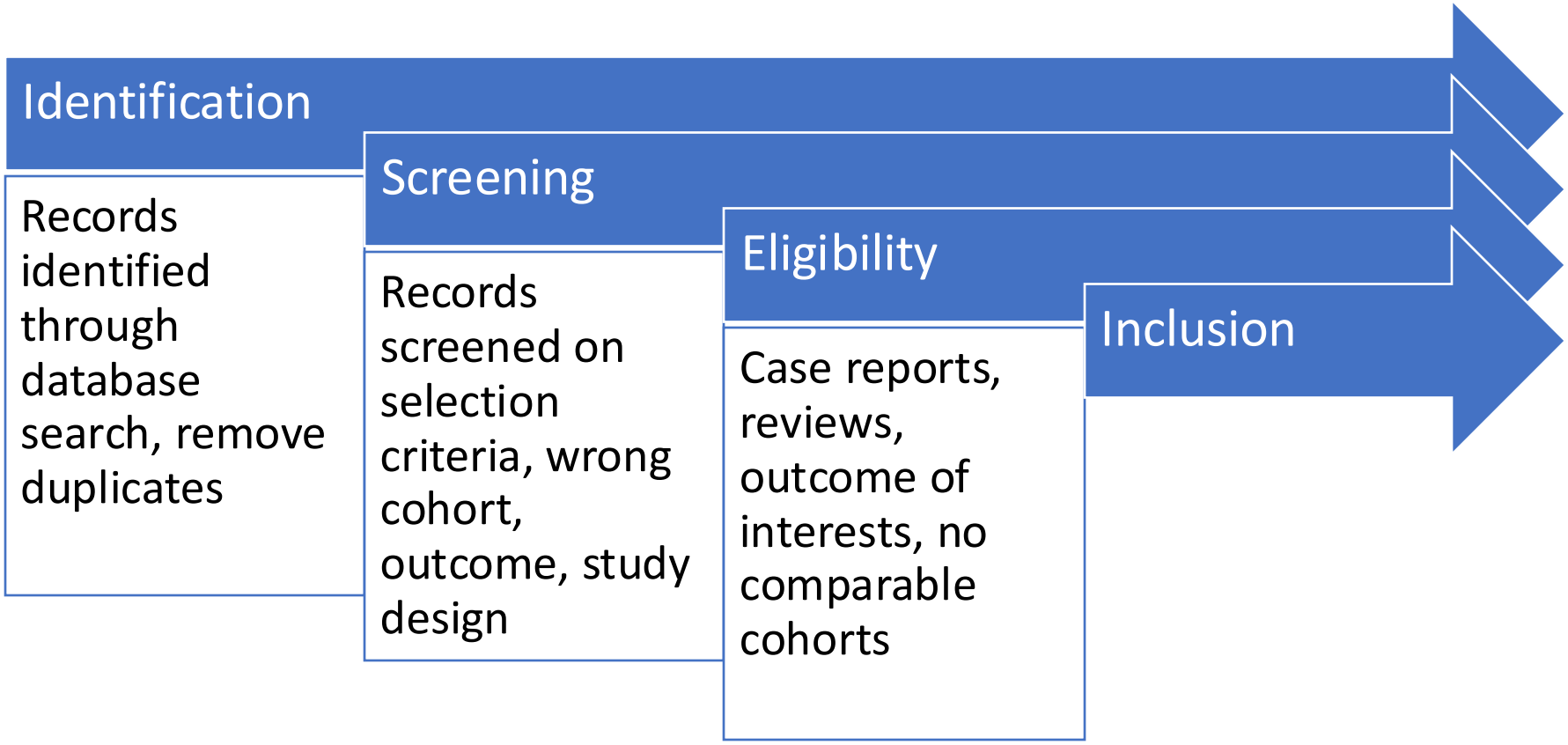
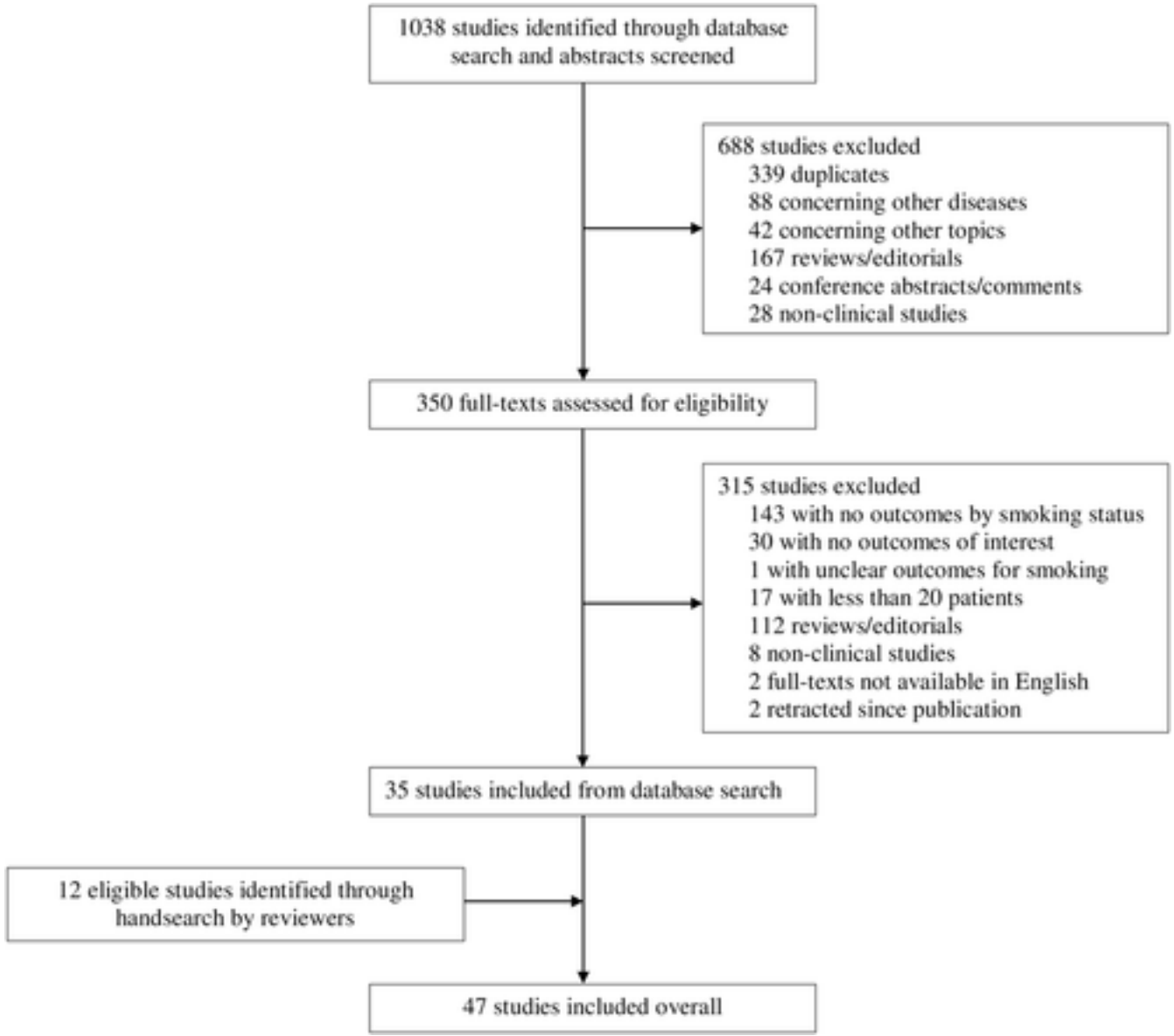
Data collection process:



Example of final inclusion:



Reddy, R. K., Charles, W. N., Sklavounos, A., Dutt, A., Seed, P. T., & Khajuria, A. (2021). The effect of smoking on COVID-19 severity: A systematic review and meta-analysis. Journal of medical virology, 93(2), 1045–1056. https://doi.org/10.1002/jmv.26389

Continued:

Table 1. Characteristics of included studies

	Setting	Study design	Number of centers	Study period	Number of patients, current smokers vs former/never-smokers	Number of patients, any smoking history vs never-smokers	Study quality
Azar et al[22]	United States	Cohort	24	Jan-Apr	10 vs 216	73 vs 153	Fair
Bhargava et al[23]	United States	Cohort	1	Mar-Apr	11 vs 186	⋯	Good
Bi et al[24]	China	Cohort	1	Jan-Mar	8 vs 105	⋯	Good
Brenner et al[25]	International	Cohort	1+	-Apr	11 vs 150	⋯	Poor
Buckner et al[26]	United States	Case series	3	Mar-May	⋯	22 vs 64	Poor
CDC COVID-19 Response	United States	Cohort	1+	Feb-Mar	27 vs 1467	105 vs 1389	Poor

Reddy, R. K., Charles, W. N., Sklavounos, A., Dutt, A., Seed, P. T., & Khajuria, A. (2021). The effect of smoking on COVID-19 severity: A systematic review and meta-analysis. Journal of medical virology, 93(2), 1045–1056. https://doi.org/10.1002/jmv.26389

Meta-analysis

- Systematic review: Qualitative summary

- Meta-analysis: Quantitative summary

When to perform and avoid Meta-analysis?

- Perform: Multiple high-quality studies: similar design, population, control, outcomes.

- Avoid: Heterogeneous studies/too many variable outcomes to compare, too few studies, and low-quality studies (small sample sizes, high variability, missing values)

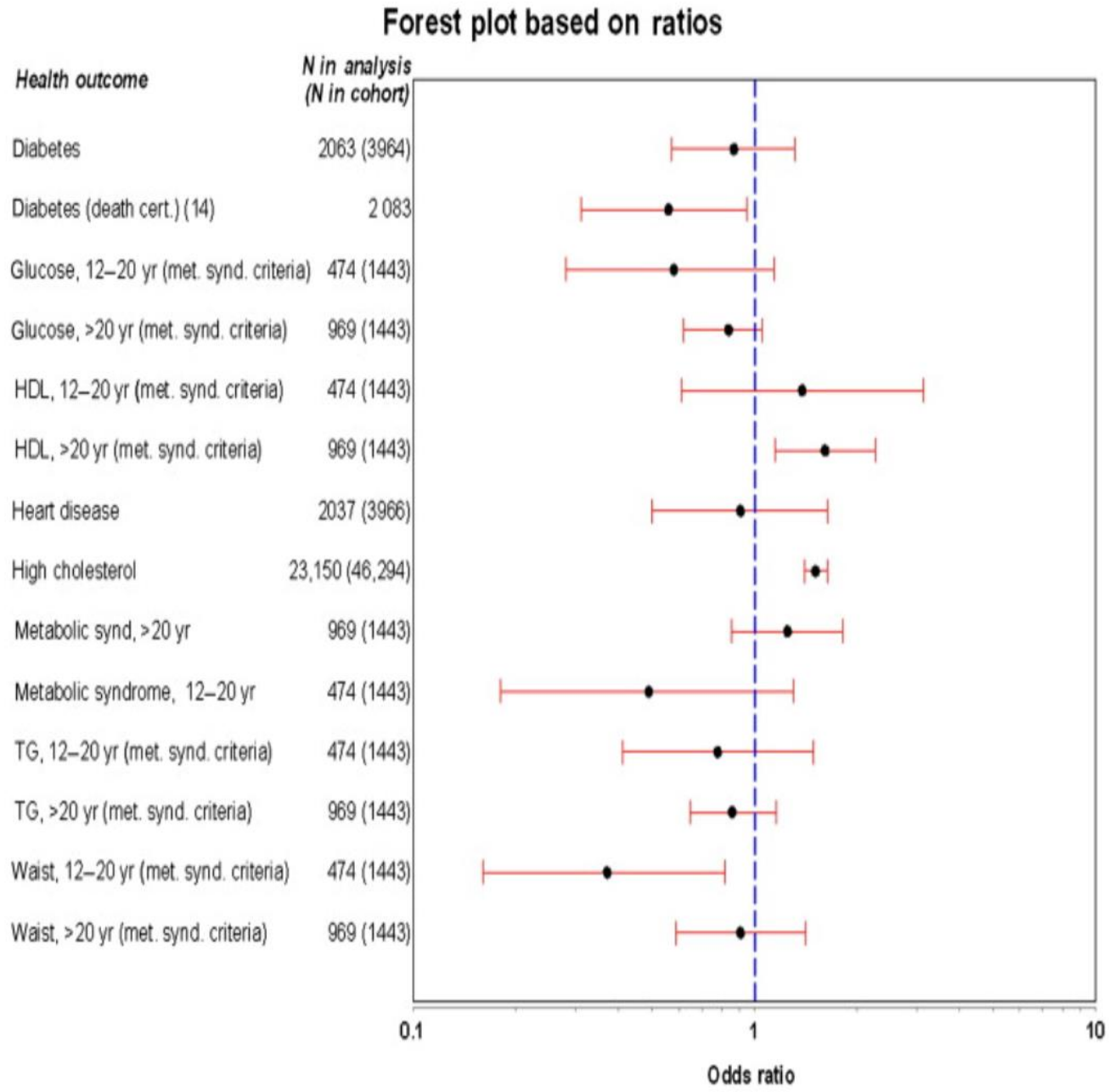
How to visualize meta-analysis results?

- Forest Plots are typically used to display epidemiological data and are often used in subject area reviews to summarize previously published findings. The forest plot is not necessarily a meta-analytic technique but may be used to display the results of a meta-analysis or as a tool to indicate where a more formal meta-analytic evaluation may be useful.

Forest Plot

R Library "*forestploter*" focuses entirely on forest plots, which are treated as a table.

https://cran.r-project.org/web/packages/



Graphical Depictions of Toxicological Data G.M. Woodall, in Encyclopedia of Toxicology (Third Edition), 2014

Meta-analysis steps

- Identify outcomes to be reported
- Identify comparisons to be made
- Determine statistics to use
- Extract data from each study
- Combine results to obtain results summary
- Understand the differences amongst studies

Heterogeneity examples:

- Clinical

1. Participant characteristics
2. Exposures/interventions
3. Outcomes

- Methodological

1. Study design
2. Study quality

- Statistical

Want to collaborate?

- Google scholar: https://scholar.google.com/citations?user=SvcIPSsAAAAJ&hl=en
- Contact: Shrikant.pawar@yale.edu
- Thanks!