

CAN CLINICIANS AND EXAMINERS KEEP UP TO DATE?

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'Errors may lurk in our best theories. It is the responsibility of the professional to search for these errors' – Sir Karl Popper (1902 – 2001)

Discussing and questioning the fundamental concepts, principles and methods is relevant to medicine and medical education.

A helpful way to do this:

- ▣ Exploiting interfaces:
 1. Within the profession (Intra-disciplinary and interdisciplinary)
 2. With other professions (Mathematics, Philosophy, Computer science, engineering etc.)

Exploiting interfaces

Collaborating at the interface

└───▶ Additive effect

Understanding the interface

└───▶ Multiplying effect

Consuming research evidence: Extremes in the clinician's reaction

- ▣ Pig-headed conservatism



- ▣ Naive gullibility

Crucial limiting factors

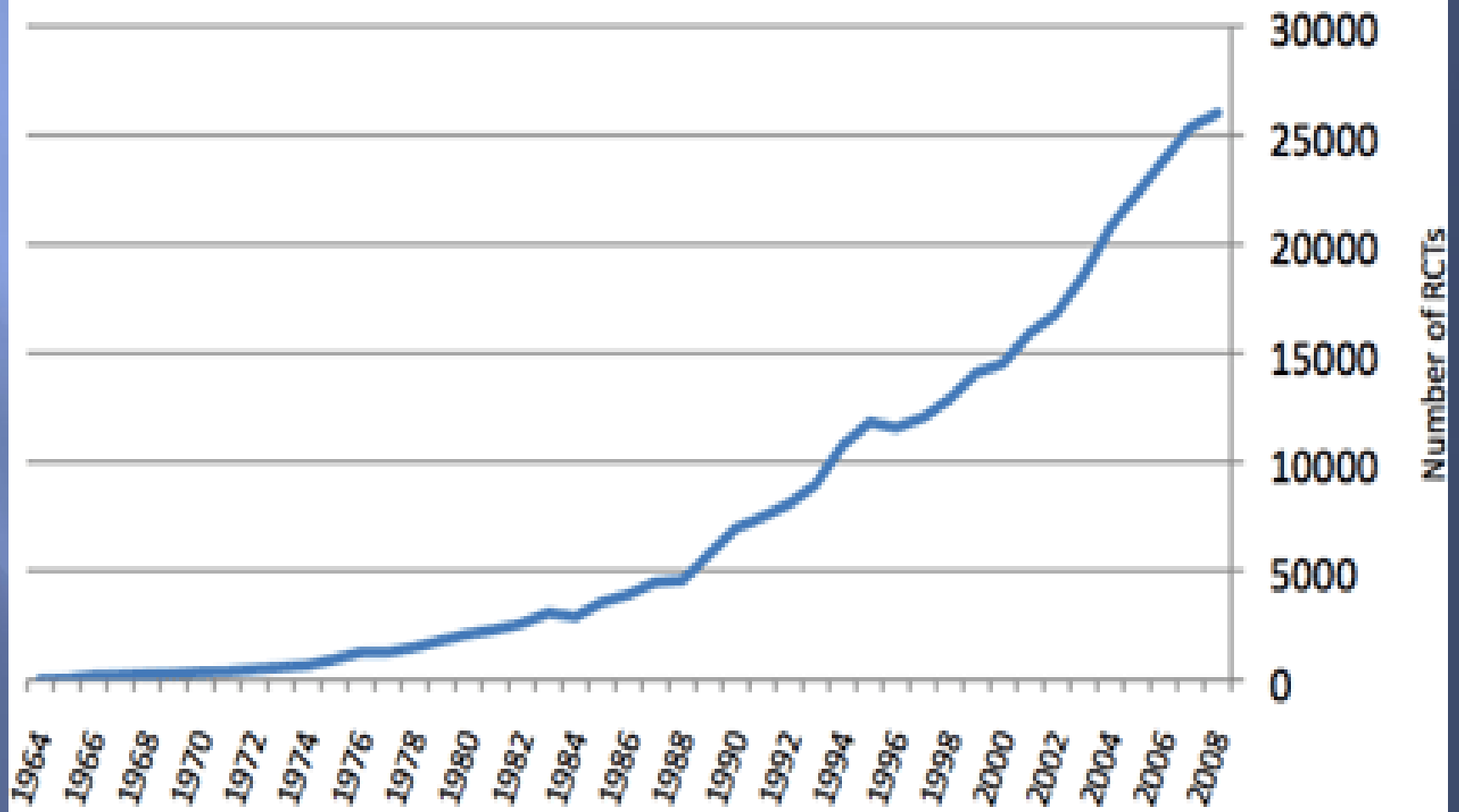
- ▣ Information overload
- ▣ Limited resources



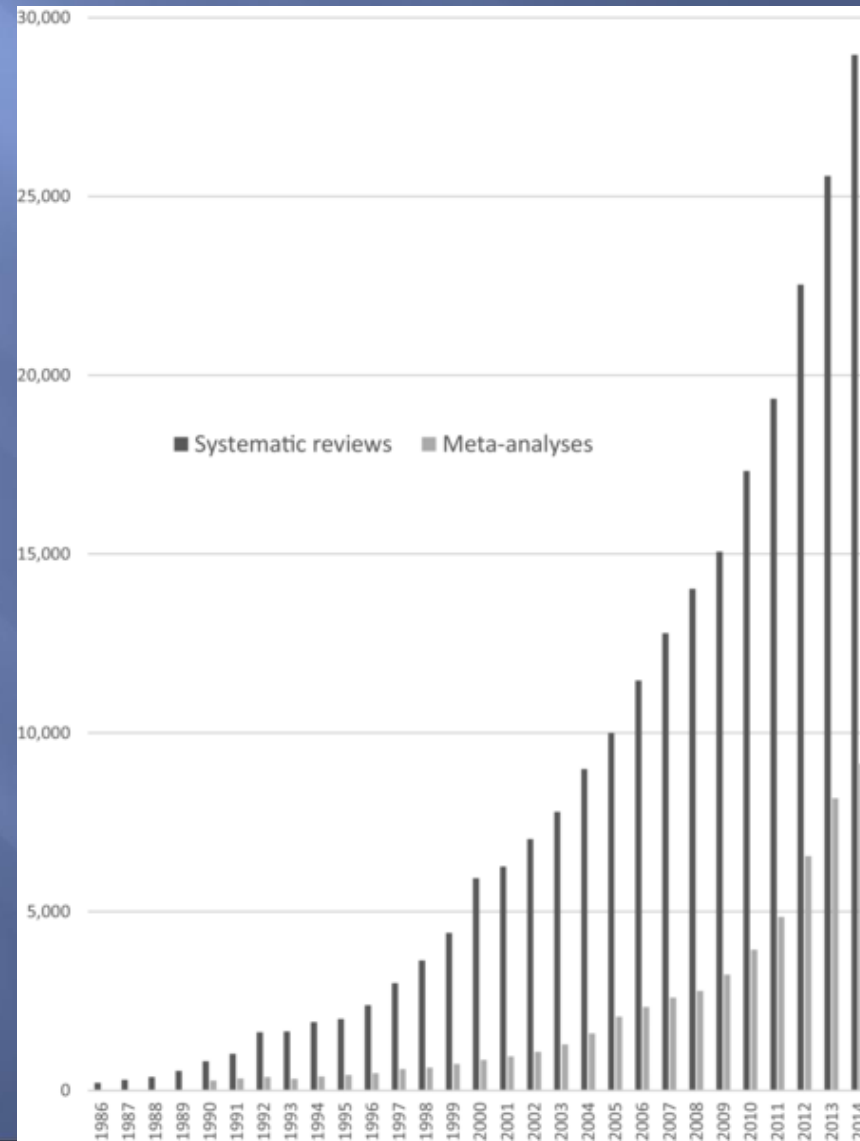
The volume of research information

Medline (PubMed) Statistics

RCTs per year



Epidemic proportions of Systematic Reviews and Meta-analysis in PubMed

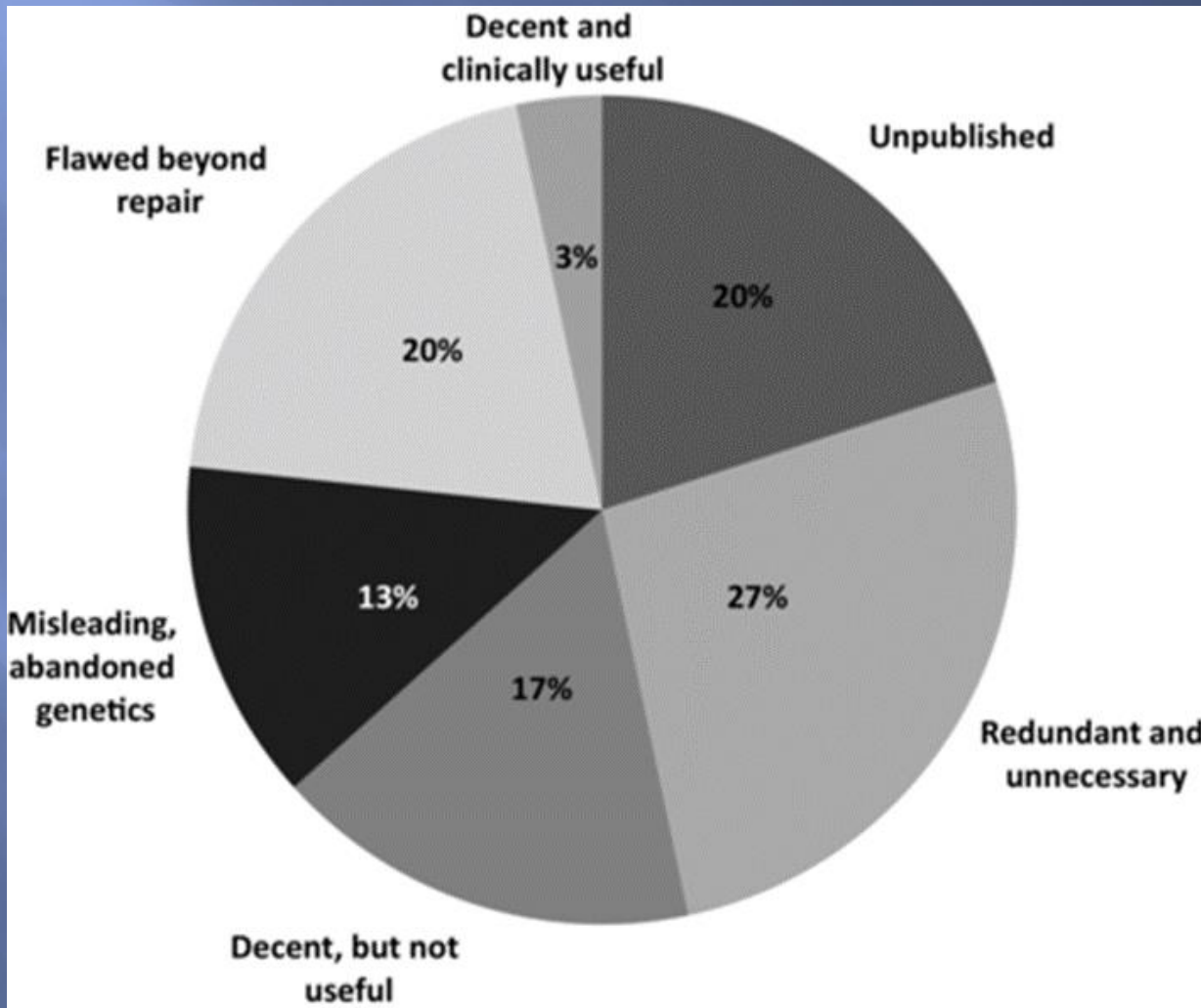


This means:

- ▣ 24,358,442 citations in 2016 in Medline
- ▣ >450,000 / week
- ▣ 67,000 / day
- ▣ Growing by 7% / year
- ▣ Doubling every 10 years
- ▣ To read all the articles published in a day one would require > 2.5 years of continuous reading without sleeping

Usefulness of Currently Produced Meta-analyses

(Ioannidis, JPA: Milbank Quarterly Sept. '16)



Other interesting statistics:

- ❑ Number of facts one can learn and retain – 9 facts per hour
- ❑ When confronted with a problem one can only evaluate and remember up to 7 concepts at any one time
- ❑ The knowledge base of a clinician is >15 million facts and steadily increasing
- ❑ To keep abreast one needs to read about 20 articles/day (*Shanefelt, T*)
- ❑ The average clinician dedicates about 1 hour /week or less for reading research (*de Dombal, FT*)
- ❑ Netprints provide more transparency and openness but increase the information load exponentially
- ❑ Only 6% of drug advertising material is supported by evidence (*Tuffs, A*)
- ❑ Evidence could change clinical decisions in 30 – 60% of cases (*Djulfegovic, B*)
- ❑ Only 10% of global research funding goes towards diseases which account for 90% of the world burden of disease (*Global Forum for Health Research*)

Corporate Influence On Research

Advantages:

- i. Financial backup
- ii. Easier passage from research to market



Corporate Influence on Research

Disadvantages:

- i. Negative effects on objectivity of the researchers
- ii. Negative effects on the value of research to society
- iii. Skewing of research
- iv. Interpretative bias of research results
- v. Spiking of results
- vi. Threatening of researchers
- vii. Interruption of trials
- viii. Blocking of publication
- ix. Distraction of the clinical researcher from his other duties, e.g....
Teaching, clinical work etc...

The Clinician's Reaction

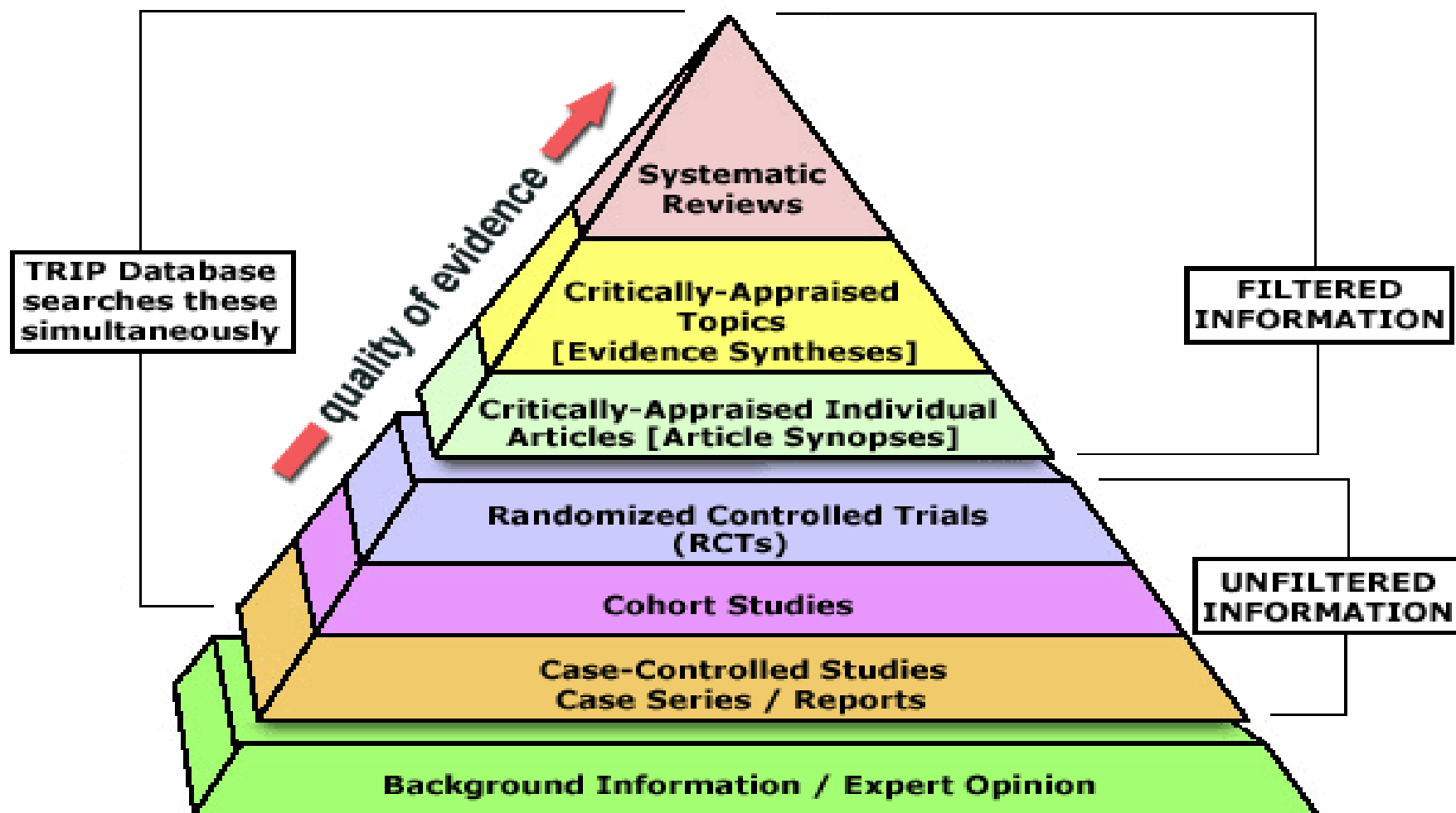
- i. Ignoring new data
- ii. Uncritical acceptance
- iii. Denial
- iv. *Critical evaluation*

Clinical Research Designs

- i. Observational studies

- ii. Experimental studies

Hierarchy of evidence in clinical research designs



Preferential Choice of Design

Therapy	—————>	R.C.T's
Testing of diagnostic aids	—————>	Cross sectional survey
Screening	—————>	Cross sectional survey
Prognosis	—————>	Longitudinal cohort study
Aetiology	—————>	Cohort or case – control study

Deficiencies in Clinical Research

- i. Failures of follow – up
- ii. Failures of definition
- iii. Failures of experimental techniques and assessment

(A) Failures of follow-up



- ▣ Absence
- ▣ Inadequate
- ▣ Inaccurate data

(B) Failures of Definition

- ▣ **Vague diagnosis** e.g. Non-specific abdominal pain
- ▣ **Imprecise symptoms** e.g. Unquantified weight loss or anorexia

(C) Failures of experimental techniques and assessment ****

- ▣ Systematic biases
- ▣ Interpretation biases
- ▣ Fallacies of reasoning

Systematic Bias in R.C.T's

56 described (*Sackett, DL*). The most relevant are:

- i. Selection bias
- ii. Performance bias
- iii. Exclusion bias
- iv. Detection bias
- v. Non – adherence to uncertainty principle
- vi. Gender bias
- vii. Financial bias
- viii. Identity bias
- ix. Bias from omitted research
- x. Statistical errors

Selection Bias

Example of a non-randomised trial with selection bias



Michelangelo Buonarroti
Giudizio 'Universale' on
altar wall of the
Cappella Sistina
(about 1540)

Interpretation (Subjective) biases

Consequent on the subjective element in scientific enquiry:

- ▣ Confirmation bias
- ▣ Rescue bias
- ▣ Auxiliary hypothesis bias
- ▣ Mechanism bias
- ▣ “Time will tell” bias
- ▣ Orientation bias

Fallacies of Reasoning

(Ref. to: Stephen's Guide to **logical fallacies**: www.datanation.com/fallacies/16/09/2004)

At least 15 'Fallacies of Reasoning' are frequently encountered in medical research. Probably the most common are:

- ▣ **Cum / Post hoc ergo propter hoc** - Fallacy of causal relationship: Mistaking subsequence with consequence.
- ▣ **Anecdotal evidence**

“Logical fallacies” is a contradiction in terms

- One should rather say: “Fallacies of reasoning”
- Even great scholars make mistakes.

Why do researchers produce useless material?

- Lack of rigor in design and analysis
- Lack of knowledge of fallacies of reasoning and biases
- Having an excessive and irrational commitment to statistical significance
- A mania for new theory
- A love for novelty
- Tendency to salami slice and produce redundant and incoherent work
- Coercion

Possible solutions to information overload:

▣ (A) Clinician's (personal) measures:

1. Ask: "Is the study worthwhile?"
2. Check list
3. ? Narrowing one's field of competence

▣ (B) Institutional measures:

1. Delivering on priorities
2. Encouraging research with clinical impact

What can one personally do?

- ▣ Ask the relevant questions.....

Is the study worthwhile?

- i. Does it add anything to what is known?
- ii. Is it applicable to one's practice?
- iii. Design?
- iv. Systematic bias?
- v. Was the assessment blind?
- vi. Adequate sample size?
- vii. Duration and completeness of follow - up?

and.....

Checklists for assessing evidence

Several available e.g. one published by the Centre for Evidence Based Medicine – University of Oxford

This involves:

1. Checking the various sections of the structure of a study
2. Checking the particular type of study

If the answer to any of the questions is “no”, you can save yourself the trouble of reading the rest of it.

Institutional measures:

- ▣ Delivery on priorities (different prioritisation approaches not just top-down):
 1. Implementing collaboration amongst stakeholders including patient – professional partnership
 2. Using practice guidelines to review priorities
 3. Promoting evidence-based health care
- ▣ Encouraging *research with clinical impact*
- ▣ **Select** researchers
- ▣ Exploiting interfaces

Intentionally controversial: Selecting researchers

- ❑ Mandatory production of clinical research is inefficient and wasteful: Good clinicians or examiners may not have the aptitude.
- ❑ The mandatory nature results in increasing the already unmanageable volume of evidence further.
- ❑ The general quality of the research published will inevitably be adversely affected.
- ❑ Other priorities e.g. clinical skills may be lost
- ❑ Only those with the right attitude and abilities should be selected and encouraged to do medical research
- ❑ **It is critical appraisal of research evidence which should be mandatory.**

Can we keep up to date?

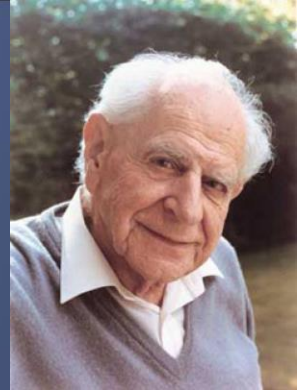
Yes, with some difficulty and help:

- ▣ Personal and institutional measures
- ▣ Publishers of scientific journals and learned societies should adopt efficient filters to contain volume fairly
- ▣ Ensure a firewall between commercial interest and medical evidence
- ▣ Industry should be more socially conscious and honest
- ▣ Doctors, patients and the general public should be made aware of the uncertain nature of scientific hypothesis

Conclusion



Aristotle (384 BC-322 BC)



Sir Karl Popper (1902-2001)



Any Questions?



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Thank you!