

Evidence-Informed Trauma Care:

The potential for Evidence Mapping in Clinical Training

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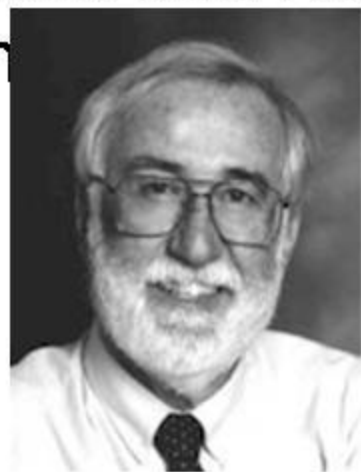


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PUTTING RESEARCH INTO CONTEXT

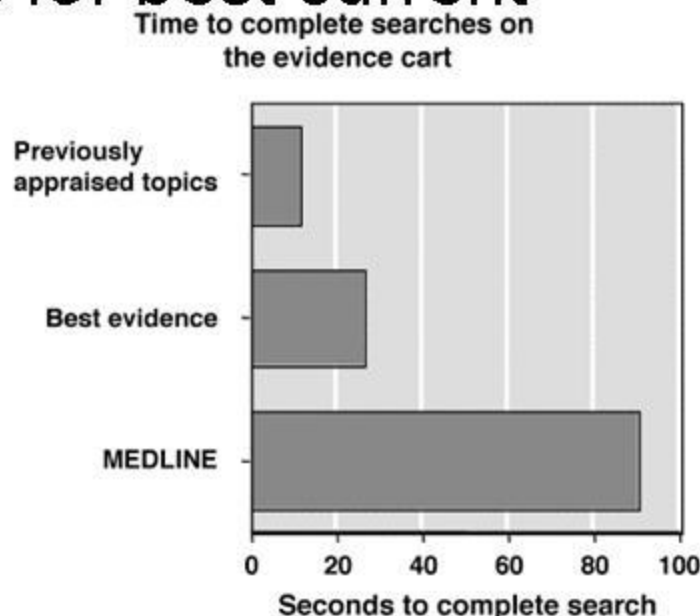
“Just in Time” learning

The EBM Approach to Education

- Shift focus to current patient problems (“just in time” education)
 - Relevant to YOUR practice
 - Memorable – and behaviour changed!
 - Up to date
- Skills and resources for best current an



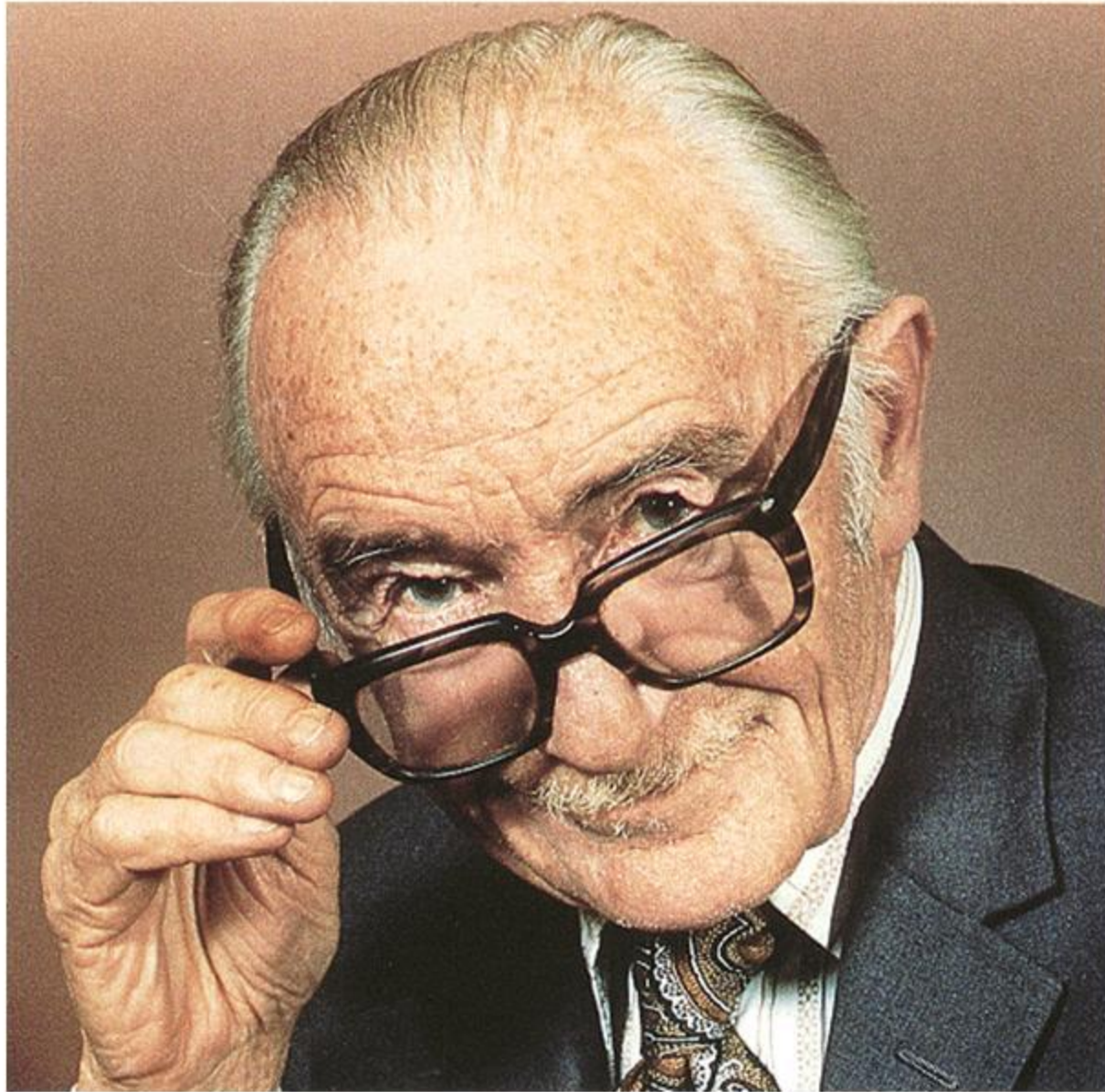
Dave Sackett



Managing Information

- The Airline industry
 - Boeing 777 manuals
 - 24 binders
 - 10 feet shelf space
 - Conversion to CD
 - Reduced search by 60%

- The Health Industry
 - Memorize “the manuals”
 - Exams, audits, etc to check



“It is surely a great criticism of our profession that we have not organised a critical summary, by specialty or subspecialty, of all relevant randomised controlled trials”

-Archie Cochrane



**THE COCHRANE
COLLABORATION®**

Systematic review

- A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review.
 - Cochrane Collaboration (2005) Glossary of Terms



Clinical Practice Guideline

- Systematically-developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances.
- Institute of Medicine 1990



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The 5 steps of EBP



1. Ask an answerable question
2. Find the appropriate evidence
3. Appraise the evidence
4. Apply the evidence to clinical practice
5. Evaluate your practice

Types of clinical questions

- Aetiology or causation
 - *What is the risk that this exposure will cause a given disease?*
- Diagnosis or assessment
 - *What test should I use to investigate this patient's disease? Accuracy?*
- Treatment and prevention
 - *Does this treatment improve this condition in patients like this one?*
- Prognosis
 - *Given the patient demographics, what is the natural history of this condition so I can predict the consequences?*
- Economic evaluation
 - *What is the cost-effectiveness, cost-benefit of various treatments?*

Convert the Question to PICO

PICO stands for

Patient (or **P**opulation / **P**roblem)

Intervention (or **I**ndicator)

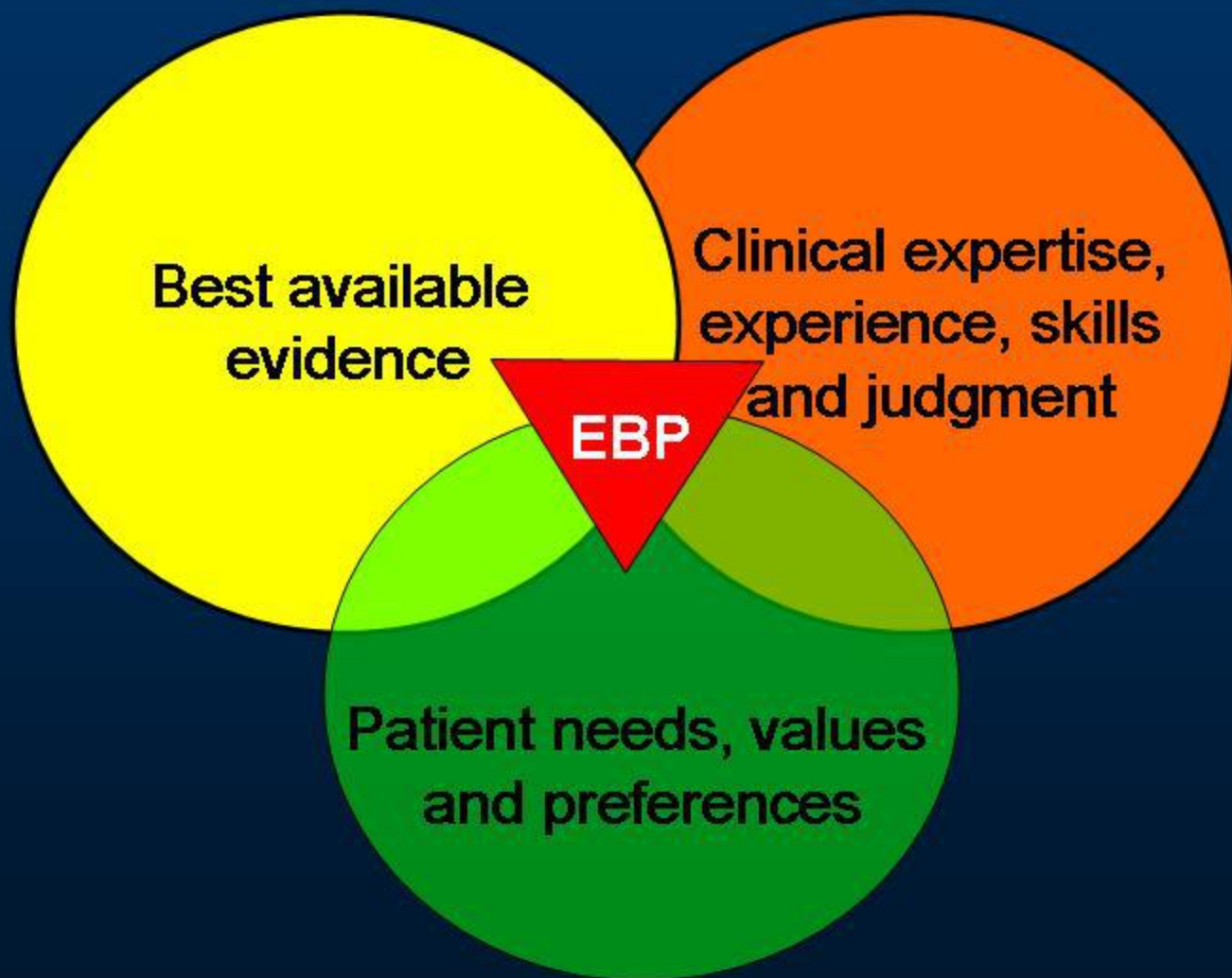
Comparison (or **C**ontrol)

Outcome

Effective information retrieval

- Ask the right question (i.e. PICO)
- Match the study design to the type of question
- Design an appropriate search strategy
- Use sources of highest yield

What is evidence-based practice?



What type of evidence to look for?

Question about...	Best study design
Intervention/Therapy	Randomised controlled trial (or Systematic review of RCTs)
Diagnosis/Screening	Effect on health outcomes: RCT Accuracy: cohort
Prognosis	Longitudinal cohort
Aetiology/Risk factors	Randomised controlled trial (if ethical) Cohort, case control

How to read a paper

THREE CRITICAL APPRAISAL ISSUES

- A. Is the trial valid? (Is this a 'good study'?)
- B. What are the results?
- C. How relevant are the results to me?

Applying the evidence: a balance judgment of benefits vs risks/costs

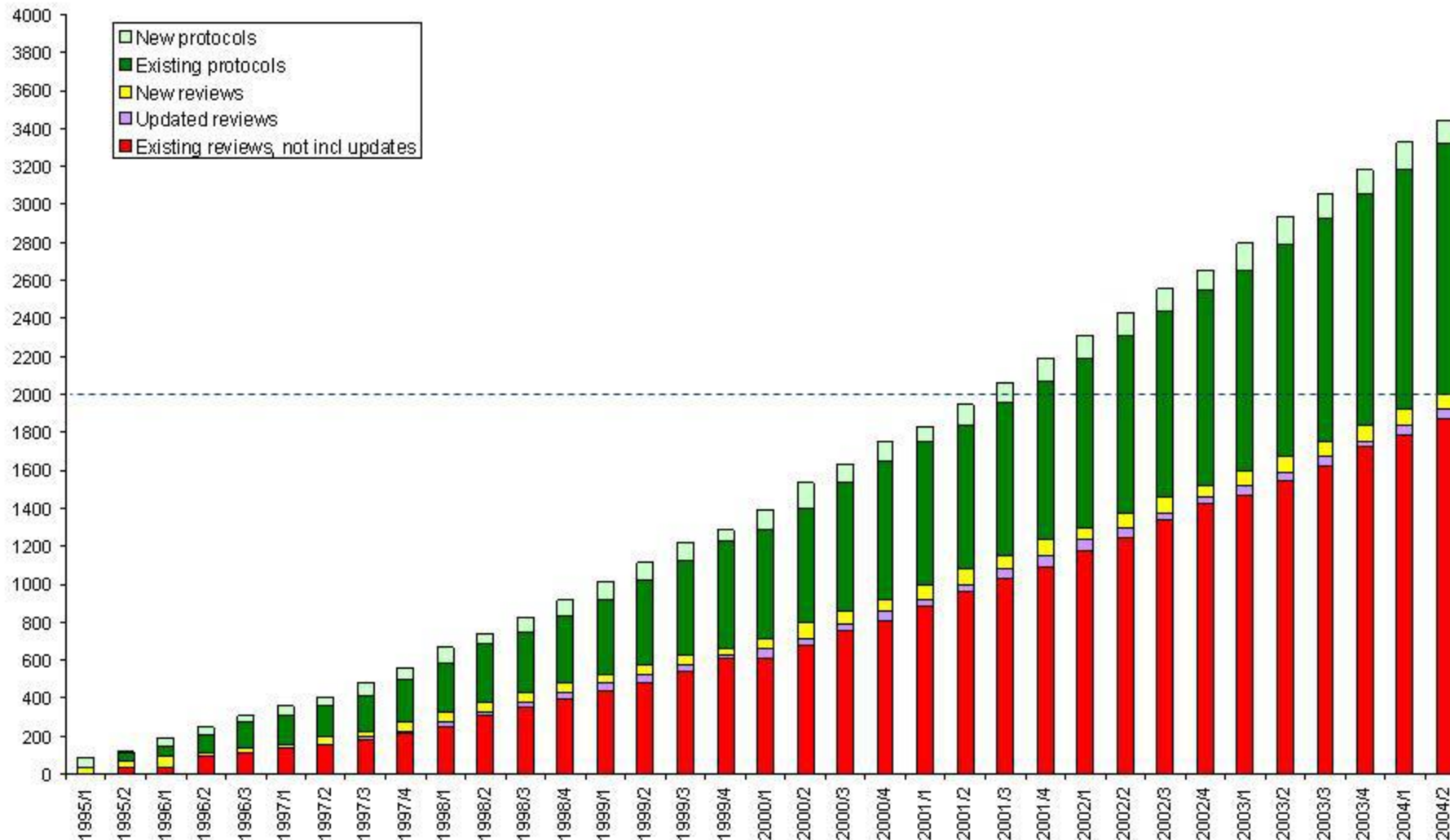
- Magnitude of treatment effect
- Precision of treatment effect
- Risk of target event
- Risk of serious adverse events
- Cost of therapy
- Values
- Generalisability

Organising I:

systematic reviews - 20% done for therapy

Reviews and protocols for reviews on
The Cochrane Database of Systematic Reviews
Issue 1/2005

Alderson, 2005



Mapping Research Evidence in Traumatic Brain Injury & Spinal Cord Injury



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in collaboration with

- Melbourne Health
- Southern Health
- The Australasian Cochrane Centre
- The Cochrane Effective Practice & Organization of Care Group
- Centre for Clinical Effectiveness
- Monash University
- The National Institute of Clinical Studies / NH&MRC
- National ICT Australia



Evidence Map or Scoping Review

- ... gather together existing literature in a specific topic area and categorise it to create a coded database of literature. Experts are consulted at several stages and the literature is sourced and evaluated through complex search strategies and the application of rigorous topic-related inclusion criteria, and follows procedures similar to those conducted for systematic reviews. It allows the diversity of studies and the balance between different study types to be examined before deciding how to proceed with developing the evidence base in specific areas.

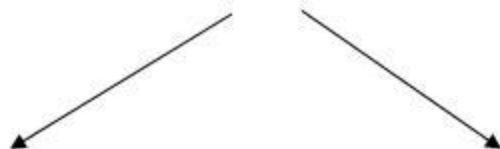
Bates & Coren, 2007



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Evidence Maps



Existing Research



- Evidence-based practice
- Evidence-based policy

Gaps in research evidence



Research Opportunities

- Primary studies
- Systematic reviews



In broad clinical areas maps convey

- what research exists
- where the gaps are
- the strengths and weaknesses of existing research
- its relevance in different patients & contexts



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EBP misconceptions

FALLACY

EBP is useless when there is no good evidence

EBP is algorithms that ignore clinical judgment/expertise

EBP is just numbers and statistics

FACT

EBP means appropriately using the best available evidence to care for patients

Clinical judgment must be used in deciding how to apply the evidence

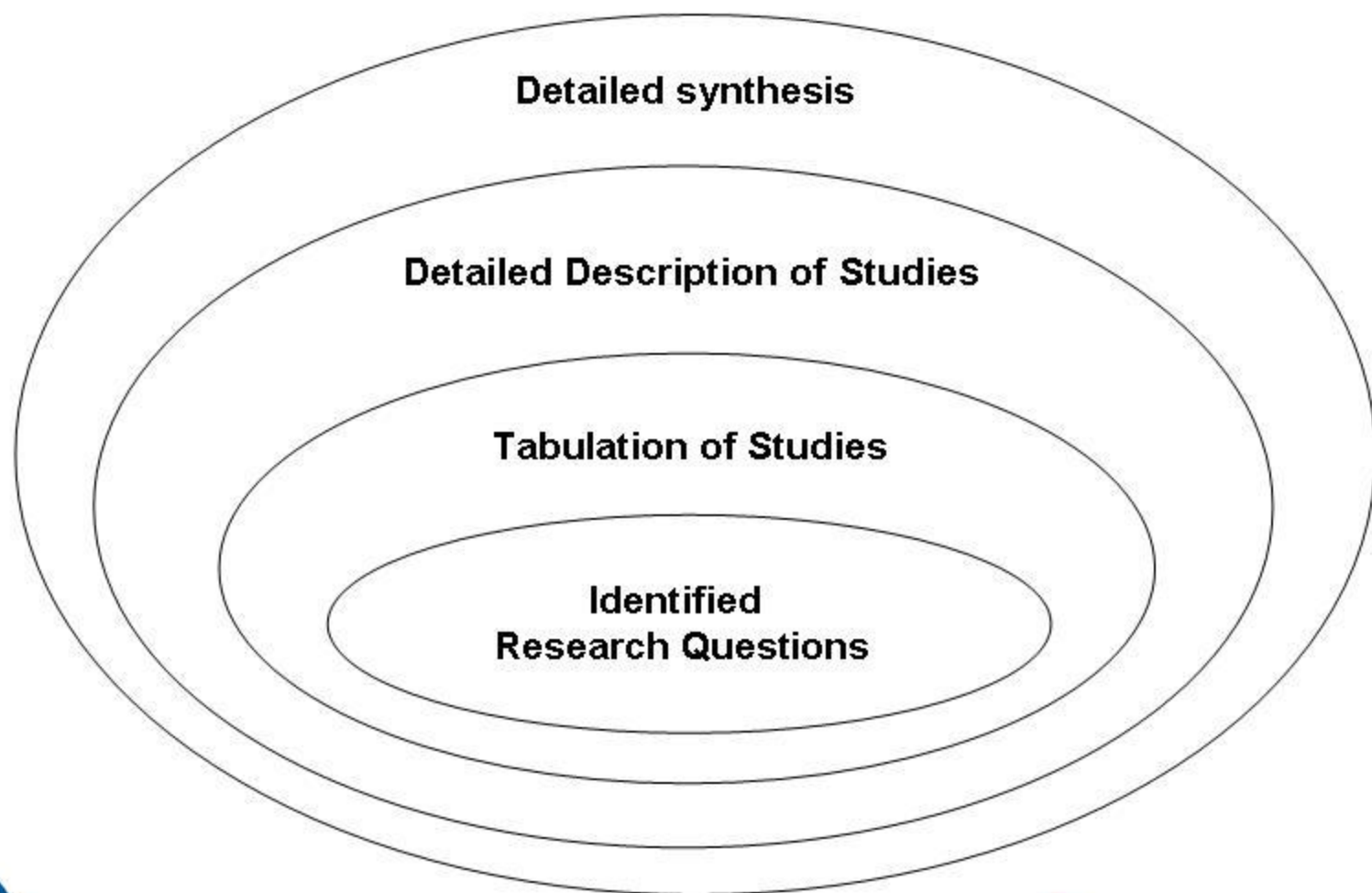
EBP is not numbers in a vacuum - the evidence must be individualised to each patient

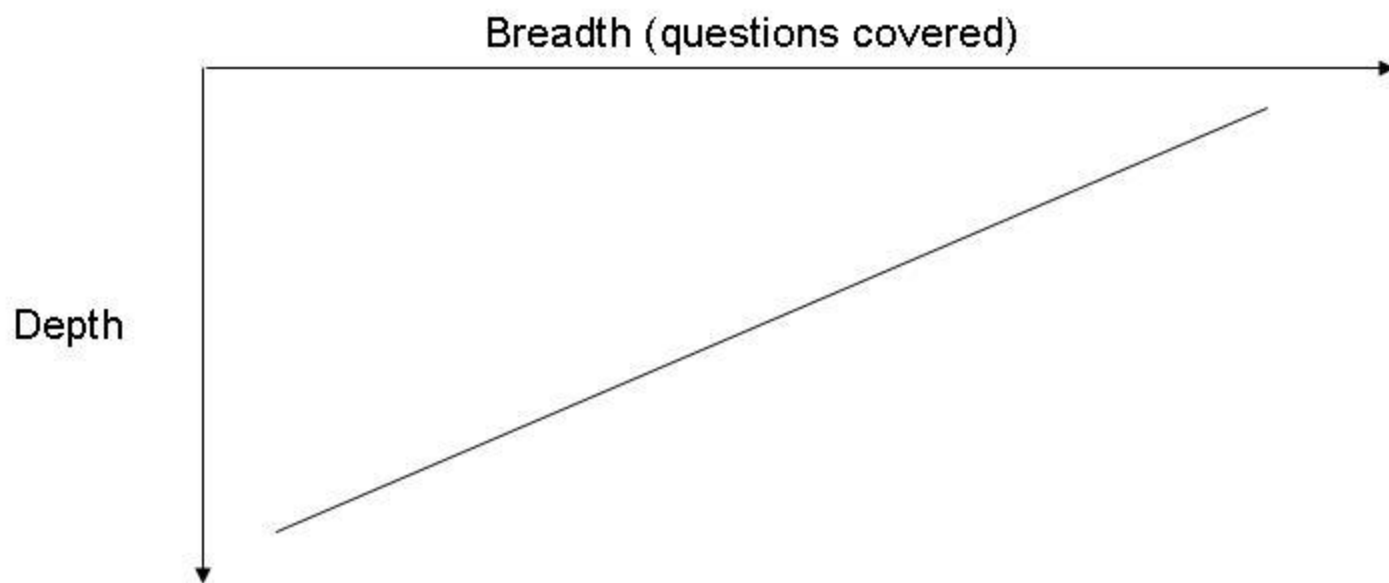
Broad stages in mapping

1. Generating & Prioritising Research Questions
2. Searching for & retrieving studies
3. Appraising what the evidence says, and what the gaps are



The many potential outcomes





The Prehospital Phase



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Mapping Workshop

- Brainstorm & prioritise decisions & questions
- Professional facilitator & nominal group technique
- Pre-hospital Mapping Workshop - Nov 21st, 2007
 - Metropolitan Ambulance Service
 - Rural Ambulance Victoria
 - Major Trauma Services
 - Regional hospitals



Q no.	Question	Criteria 1: Clinical Importance	Criteria 2: Currency / Novelty	Criteria 3: Controversy
Traumatic Brain Injury (TBI)				
1	Effectiveness of intubation	3.55	3.00	3.27
2	Effect of hyperventilation on clinical outcomes	3.18	2.91	2.91
3	Definition of hypotension	2.73	2.45	2.82
4	Effect of delayed versus immediate fluid resuscitation	3.36	2.64	2.82
5	Effect of therapeutic hypothermia	3.00	2.91	2.82
6	Effect of various solutions for fluid therapy resuscitation	3.09	2.55	2.73
7	Influence of length of time in prehospital care on outcome	2.73	2.55	2.82
8	Effect of level of initial receiving hospital on outcome	3.09	2.45	2.00
17	Impact of mode of transport (e.g. aeromedical vs. ground ambulance transport)			
9	Effect of spinal immobilisation	2.91	2.45	2.27
10	Effect of administering mannitol	2.18	1.73	2.18
11	Effect of hypoxemia on morbidity and mortality	3.36	2.36	1.73
12	Diagnostic value of <90% oxygen saturation as the hypoxemia threshold	2.73	2.18	2.27
13	Effect of hypotension on morbidity and mortality	3.18	2.18	2.09
14	Usefulness of the Glasgow Coma Scale	3.09	2.27	1.91
15	Most effective staffing models (e.g. paramedic versus physician based)	2.09	2.09	2.27
16	Criteria that accurately identify spinal injuries and validate the use of spinal immobilisation	3.00	2.45	2.00
Spinal Cord Injury (SCI)				

Search & Retrieval

Search specialist & Reproducible methods

Massive task of searching multiple databases
using complex search strategies, and
searching reference lists

	n (citations reviewed)	n (full text reviewed)	n (studies eligible)
TBI	11390	708	125
SCI	1641	123	5
TOTAL	13031	831	130



Searching & retrieval - TBI

TBI	Question	Priority	n (citations)	n (full text reviewed)	n (studies included)	Study Design	Systematic Review	Rapid Review	RCT	Non RCT	Cohort study	Case Control	Case series	Cross Sectional	Case Report	Unknown	Ongoing
1	Effectiveness of intubation	High	1652	172	28		1	1			19		1	1	3	1	1 (RCT)
2	Effect of hyperventilation on clinical outcomes	High	1318	99	6						6						
3	Definition of hypotension	High	1362 [#]	97 [#]	0												
4	Effect of delayed versus immediate fluid resuscitation	High	1205 [*]	58 [*]	1				1								
5	Effect of therapeutic hypothermia	High	1759	15	0												
6	Effect of various solutions for fluid therapy resuscitation	High	1205 [*]	58 [*]	10				5		3						2 (RCT)
7	Influence of length of time in prehospital care on outcome	High	1629 [*]	104 [*]	8						3		3			2	
8	Effect of level of initial receiving hospital on outcome	High	1629 [*]	104 [*]	16						10		4	1		1	
9	Impact of mode of transport (e.g. aeromedical vs. ground ambulance transport)		1629 [*]	104 [*]	21						13		5			3	
10	Effect of spinal immobilisation		997 [*]	11 [*]	0												
11	Effect of administering mannitol		343	41	1				1								
12	Effect of hypoxemia on morbidity and mortality		1362 [#]	97 [#]	9						3	1	4			1	
13	Diagnostic value of <90% oxygen saturation as the hypoxemia threshold		1362 [#]	97 [#]	0												
14	Effect of hypotension on morbidity and mortality		1362 [#]	97 [#]	12						5	2	4			1	
15	Usefulness of the Glasgow Coma Scale		1160	111	13		1				7		5				
16	Most effective staffing models (e.g. paramedic versus physician based)		PENDING								PENDING						
17	Criteria that accurately identify spinal injuries and validate the use of spinal immobilisation		997 [*]	11 [*]	0												

Citations from the same search strategy ("TBI blood pressure and oxygen saturation")

Citations from the same search strategy ("TBI fluid therapy resuscitation")

Citations from the same search strategy ("TBI Immobilisation")

Citations from the same search strategy ("TBI transport")

Our Database

- Citation details
- Study design & Quality
- Study characteristics
 - patient population
 - context
 - intervention
 - outcome measures
- Results



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Is bed rest ever helpful?

A systematic review of trials*



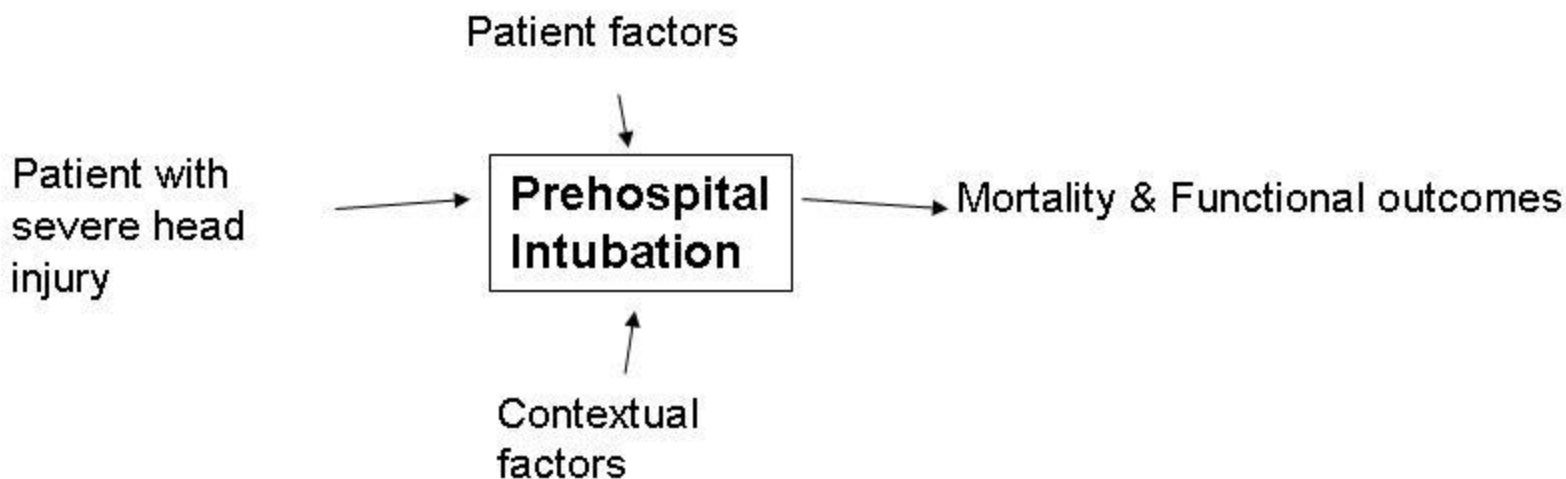
- 10 trials of bed rest after spinal puncture
 - no change in headache with bed rest
 - Increase in back pain
- Protocols in UK neurology units - 80% still recommend bed rest after LP

Serpell M, BMJ 1998;316:1709–10

- ... evidence of harm available for 17 years preceding...

*Allen, Glasziou, Del Mar. Lancet, 1999

Appraisal of evidence & gaps

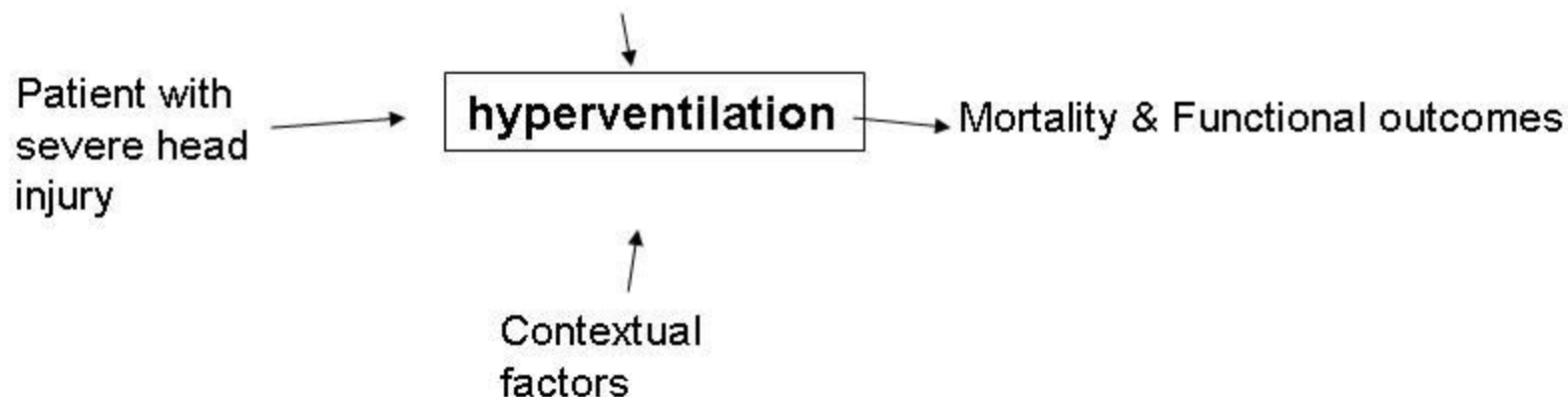


24 observational studies, 2 reviews – intubation may be associated with harm

1 ongoing RCT (Victoria) – what role of contextual factors i.e paramedic experience & training



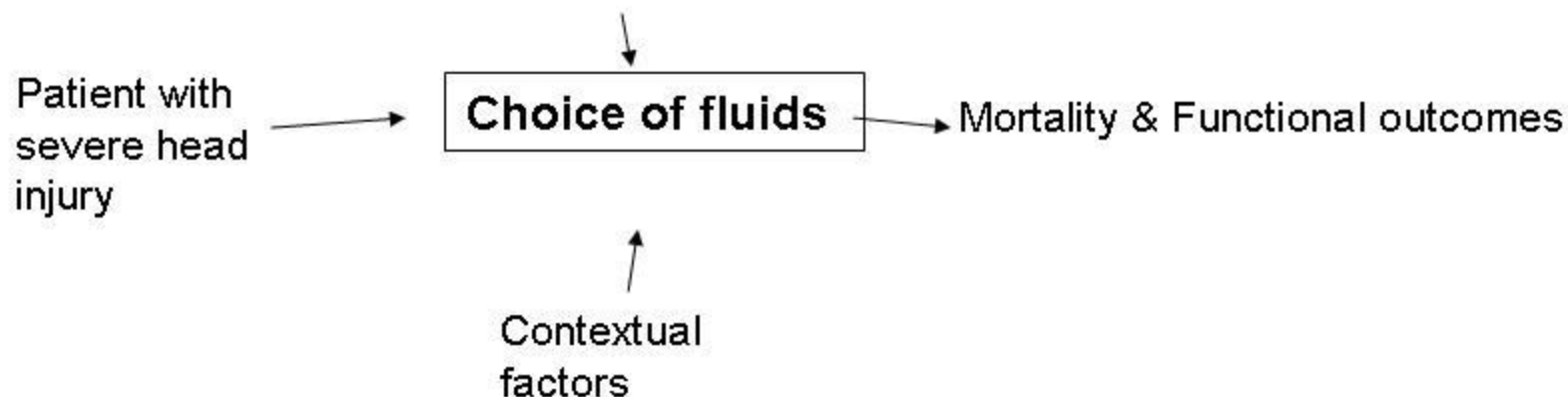
Appraisal of evidence & gaps



6 observational studies – mild hyperventilation possibly beneficial, more significant hyperventilation possibly harmful
No RCT comparing mild hyperventilation with normal PCO₂



Appraisal of evidence & gaps



5 RCTs and 2 cohort studies examining different fluid types,
2 ongoing RCTs – none show benefit of using anything
other than normal saline or Hartmanns solution



Future of Neurotrauma Evidence Maps

- Evidence-based Research
 - Identifying & addressing important research gaps
 - *Knowledge generation & knowledge synthesis*
- Web-development
 - Interactive “living” updated maps
- Evidence-based Practice & Policy
 - Identifying & addressing important evidence-practice gaps
 - *Knowledge Translation*



www.evidencemap.org

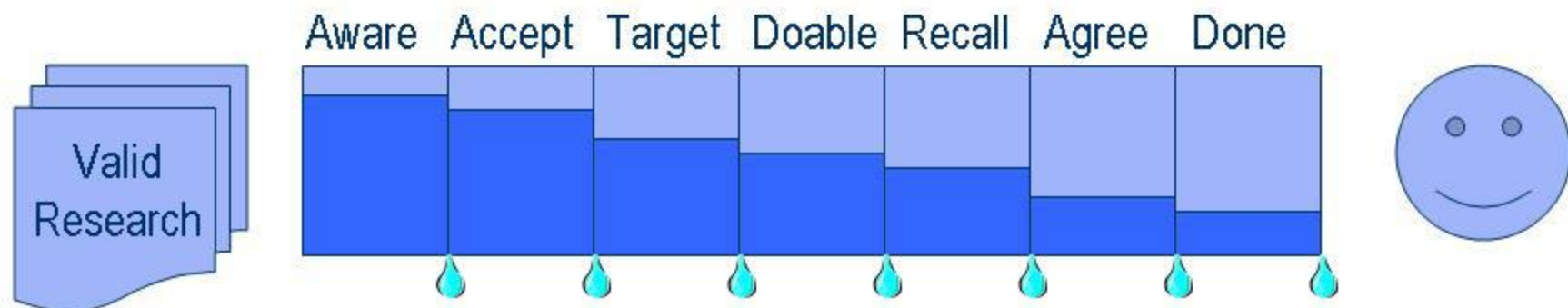


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Many “Leaks” from research & practice



If 80% achieved at each stage then
 $0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 \times 0.8 = 0.21$

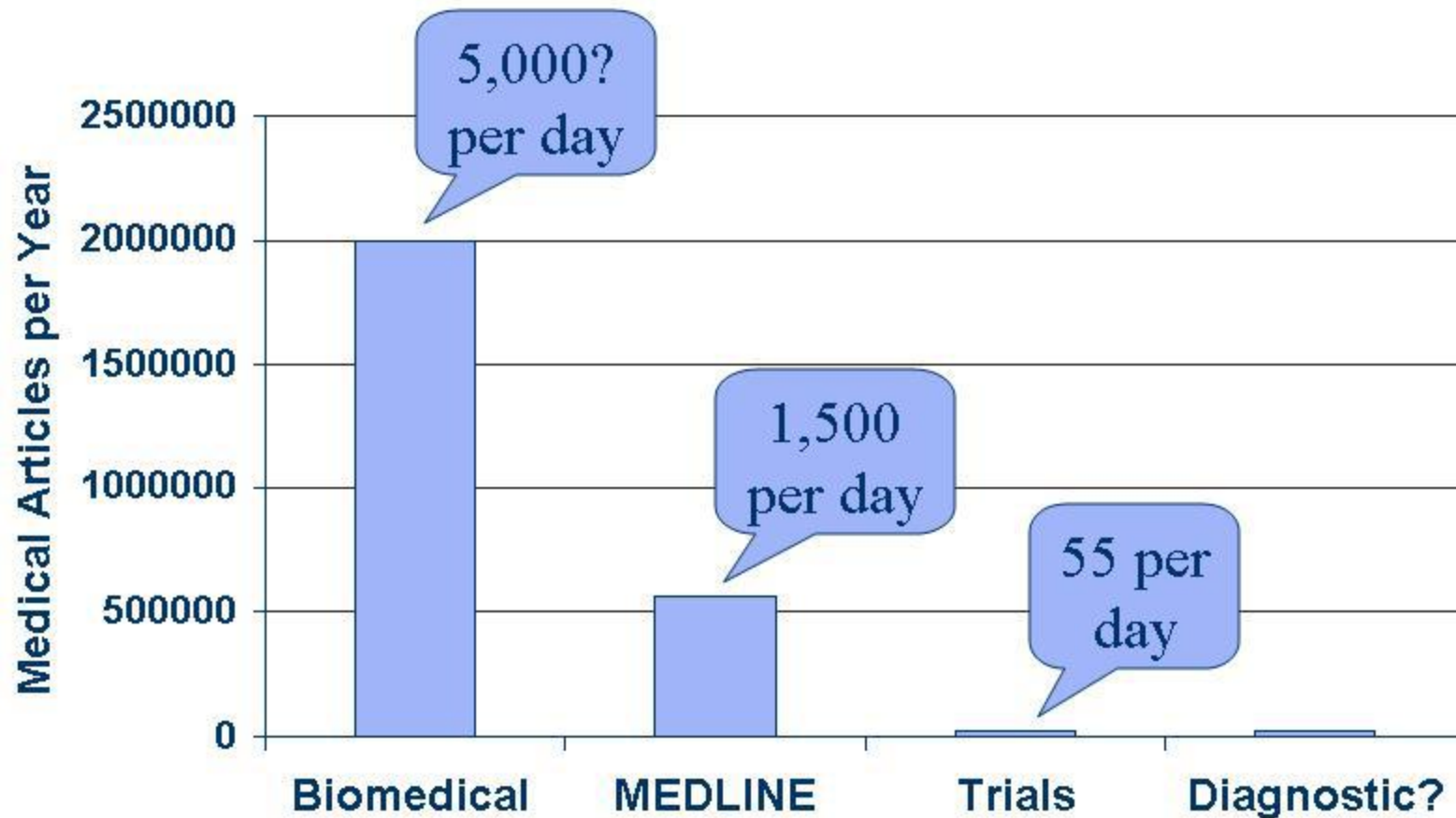
Size of Medical Knowledge

- NLM MetaThesaurus
 - 875,255 concepts
 - 2.14 million concepts
- Diagnosis Pro
 - 9,200 diseases
 - 20,000 abnormalities (symptoms, signs, lab, X-ray,)
 - 3,200 drugs (cf FDAs 18,283 products)

1 per day for
25 years

Rule 31 – Review the World Literature Fortnightly*

***"Kill as Few Patients as Possible" - Oscar London



And the information we need is widely scattered

Studies of BNP in MEDLINE

Natriuretic Peptide 10,110

MeSH BNP 2,204

PubMed: Clinical Queries

broad 799

narrow 82

Our systematic review
Of BNP accuracy for the
Diagnosis of heart failure

20 studies qualified;
Found in 16 journals

Age Ageing

Am J Med

Br Heart J

BMJ 3

Circulation

Clin Cardiol

Clin Chem Acta

Eur J Heart Fail

Hypertension

JAMA

J Card Fail

J Hypertens

Lancet 3

N Engl J Med

Rev Esp Cardiol

Rev Port Cardiol

“Just in Time” learning:

Intern’s information needs

- **Setting:** 64 residents at 2 New Haven hospitals
- **Method:** Interviewed after 401 consultations
- **Questions**
 - Asked 280 questions (2 per 3 patients)
 - Pursued an answer for 80 questions (29%)
 - Not pursued because
 - Lack of time
 - Forgot the question
- **Sources of answers**
 - Textbooks (31%), articles (21%), consultants (17%)