



# Evidence-based prosthodontics

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*What can be  
considered as  
truths in  
prosthodontics?*



# *What can be considered as truths in prosthodontics?*

*Who says so?*

*How can they say?!*



# *What are truths in prosthodontics?*

*Who says so? How can they say?!*

I.e. A reflection of the three basic questions posed in Philosophy:

1. What is there? (ontology)
2. How do we know? (epistemology)
3. Why should I? (ethical decisions)



# *What are truths in prosthodontics?*

*Who says so? How can they say?!*

I.e. A reflection of the three basic questions posed in Philosophy:

1. What is there? (ontology)
2. How do we know? (epistemology)
3. Why should I? (ethical **treatment** decisions)



# *What are truths in prosthodontics?*

*Who says so? How can they say?!*

1. What is there in prosthodontics? (ontology)
2. How do we know? (epistemology)
3. Why should I? (ethical treatment decisions)

Why do the theories and practices taught in different school undergraduate & prosthodontic graduate programs differ so much?



Scientific studies can be graded  
according to the  
theoretical possibility  
of an  
incorrect conclusion.

This is reflected by the  
design of the study.

...we will never know exact answers in science....

Oxford Centre for Evidence-based Medicine Levels of Evidence (May 2001)

Level	Therapy/Prevention, Aetiology/Harm	Prognosis	Diagnosis	Differential diagnosis/symptom prevalence study	Economic and decision analyses
1a	SR (with <u>homogeneity*</u> ) of RCTs	SR (with <u>homogeneity*</u> ) of inception cohort studies; CDR† validated in different populations	SR (with <u>homogeneity*</u> ) of Level 1 diagnostic studies; CDR† with 1b studies from different clinical centres	SR (with <u>homogeneity*</u> ) of prospective cohort studies	SR (with <u>homogeneity*</u> ) of Level 1 economic studies
1b	Individual RCT (with narrow <u>Confidence Interval†</u> )	Individual inception cohort study with ≥ 80% follow-up; CDR† validated in a single population	Validating** cohort study with <u>good†††</u> reference standards; or CDR† tested within one clinical centre	Prospective cohort study with good follow-up****	Analysis based on clinically sensible costs or alternatives; systematic review(s) of the evidence; and including multi-way sensitivity analyses
1c	<u>All or none§</u>	All or none case-series	Absolute SpPins and SnNouts††	All or none case-series	Absolute better-value or worse-value analyses ††††
2a	SR (with <u>homogeneity*</u> ) of cohort studies	SR (with <u>homogeneity*</u> ) of either retrospective cohort studies or untreated control groups in RCTs	SR (with <u>homogeneity*</u> ) of Level >2 diagnostic studies	SR (with <u>homogeneity*</u> ) of 2b and better studies	SR (with <u>homogeneity*</u> ) of Level >2 economic studies
2b	Individual cohort study (including low quality RCT; e.g., <80% follow-up)	Retrospective cohort study or follow-up of untreated control patients in an RCT; Derivation of CDR† or validated on split-sample§§§ only	Exploratory** cohort study with <u>good†††</u> reference standards; CDR† after derivation, or validated only on split-sample§§§ or databases	Retrospective cohort study, or poor follow-up	Analysis based on clinically sensible costs or alternatives; limited review(s) of the evidence, or single studies; and including multi-way sensitivity analyses
2c	"Outcomes" Research; Ecological studies	"Outcomes" Research		Ecological studies	Audit or outcomes research
3a	SR (with <u>homogeneity*</u> ) of case-control studies		SR (with <u>homogeneity*</u> ) of 3b and better studies	SR (with <u>homogeneity*</u> ) of 3b and better studies	SR (with <u>homogeneity*</u> ) of 3b and better studies
3b	Individual Case-Control Study		Non-consecutive study, or without consistently applied reference standards	Non-consecutive cohort study, or very limited population	Analysis based on limited alternatives or costs, poor quality estimates of data, but including sensitivity analyses incorporating clinically sensible variations.
4	Case-series (and <u>poor quality cohort and case-control studies§§</u> )	Case-series (and <u>poor quality prognostic cohort studies***</u> )	Case-control study, poor or non-independent reference standard	Case-series or superseded reference standards	Analysis with no sensitivity analysis
5	Expert opinion without explicit critical appraisal, or based on physiology.	Expert opinion without explicit critical appraisal, or based on physiology, bench research or "first principles"	Expert opinion without explicit critical appraisal, or based on physiology, bench research or "first principles"	Expert opinion without explicit critical appraisal, or based on physiology, bench research or "first principles"	Expert opinion without explicit critical appraisal, or based on economic theory or "first principles"





*"Doubt is not a pleasant condition, but certainty is an absurd one"*



Voltaire (1694-1778)



# Therapy/ Prevention/ Education

- Which implant design / surgical technique / maintenance regime / education strategy provides the *best result*?\*

\* *Clinical, patient-centred, surrogate or economic outcomes*





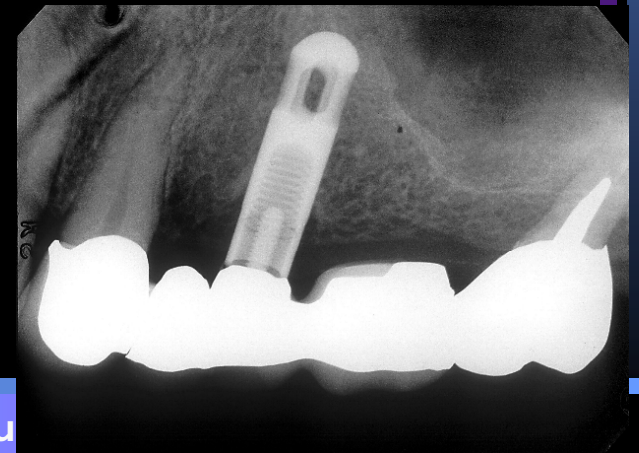
# Therapy/ Prevention/ Education

1. Random allocation of the participants to the different interventions
2. Outcome measures of importance for at least 80 per cent of participants who entered the investigation
3. A statistical analysis consistent with the study design



# Prognosis

- How predictable is the performance of the implant "Speedy Fantastico" in the upper posterior jaw?
- What is the risk that patients will experience a fractured screw, abutment or implant?





# Prognosis

1. A cohort of persons, all initially free of the outcome of interest
2. Follow-up of at least 80 per cent of patients until the occurrence of either a major study criteria or the end of the study
3. A statistical analysis consistent with the study design.



# Diagnostic tests

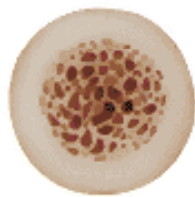
- Does the use of RFA or the Periotest to predict loading strategy have any merits?
- What is the validity of the Zarb and Lekholm bone quality classification?



**Type I -**  
Uniform, high density bone



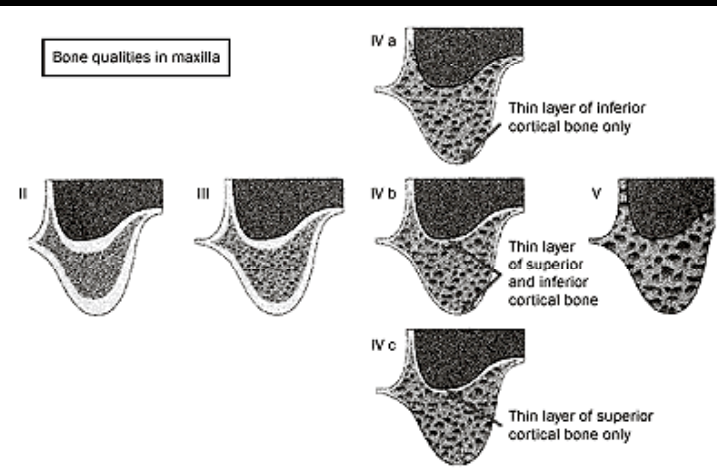
**Type II -**  
Thick layer of high density bone with marrow cavity



**Type III -**  
Thin layer of high density bone, more porous core of good strength



**Type IV -**  
Very thin layer of high density bone, porous core of poor strength





# Diagnostic tests

1. Clearly identified comparison groups, at least one of which is free of the target disorder
2. Either an objective diagnostic standard or a contemporary clinical diagnostic standard with reproducible criteria
3. Interpretation of the test without knowledge of the diagnostic standard result
4. Interpretation of the diagnostic standard without knowledge of the test result
5. A statistical analysis consistent with study design



# Etiology – Harm

- Does trace elements from implants cause adverse general effects?
- Has a certain batch of implants been contaminated during the production process?





# Etiology – Harm - Causality

- Randomised controlled trial > clinical controlled trial > cohort > case -control > cross-sectional > single case
- A statistical analysis consistent with the study design.

Note:

*These are purely probabilistic considerations*



## Views /beliefs /perceptions

- How does implant prostheses impact on the patient's daily life?
- Why are colleagues hesitant to implement implant prosthetics in their practices?

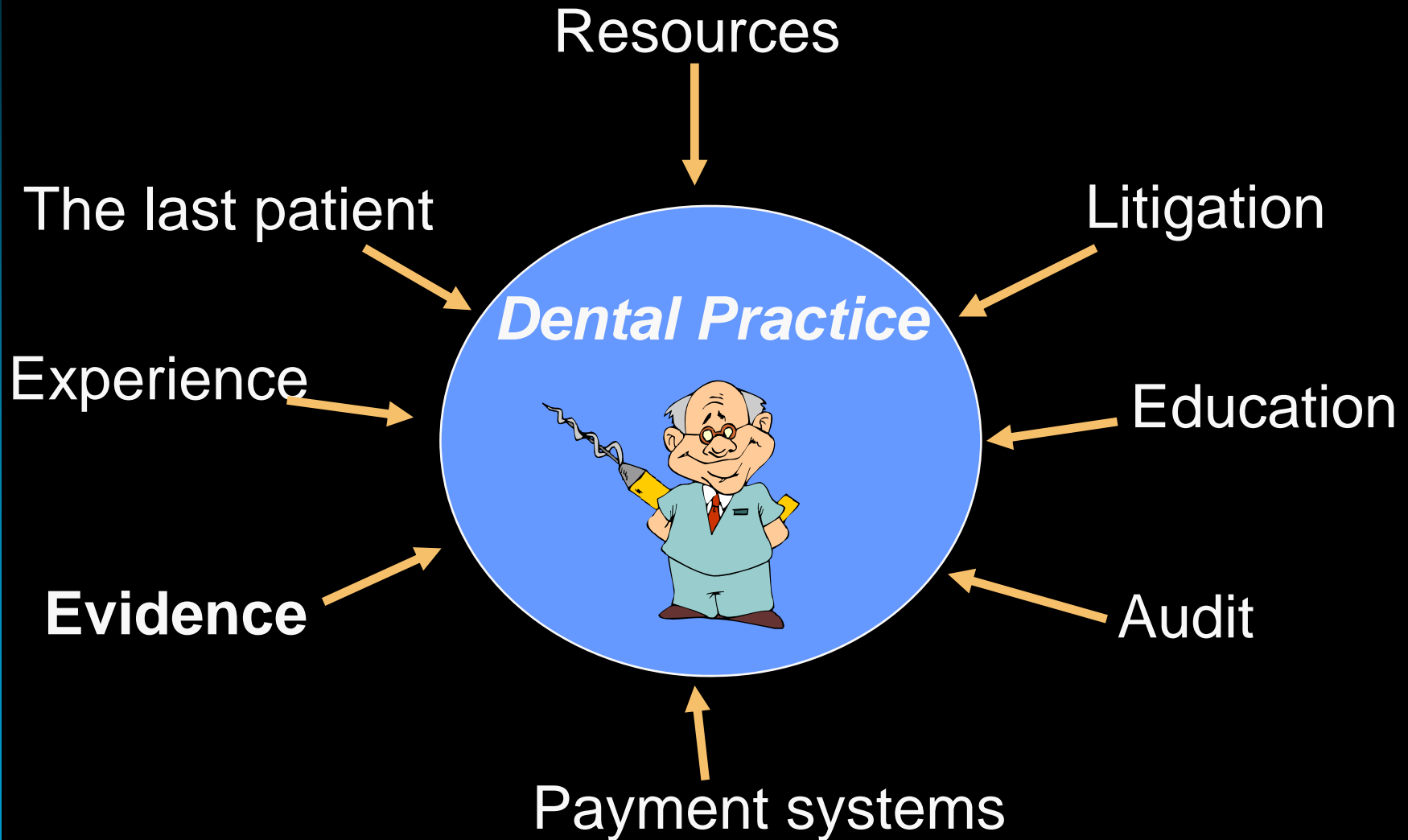


# Appropriate Study Designs to address implementation of interventions

	Qualitative research	Survey	Case Control	Cohort	RCT	Non-experimental	Systematic review
<b>Effectiveness:</b> Does it work?				★	★★	★	★★★
<b>Process of intervention/delivery:</b> How does it work?	★★	★				★	★★★
<b>Salience:</b> Does it matter?	★★	★★					★★★
<b>Safety:</b> Will it do more good than harm?	★		★	★	★★	★	★★★
<b>Acceptability:</b> Will the patient accept the intervention?	★★	★			★	★	★★★
<b>Cost effectiveness:</b> Is it worth paying for the intervention?					★★		★★★
<b>Appropriateness:</b> Is this the right intervention for this patient?	★★	★★					★★
<b>Satisfaction with the intervention:</b> Are users, providers and other stakeholders satisfied?	★★	★★	★	★			★



# Influences on treatment decisions





# Correct treatment decision



## Survival estimates



## Risk factors – odds ratios

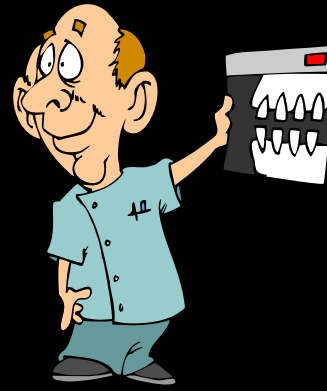
Independent variables	Bi-variate odds ratios	significance	Confidence intervals bivariate odds ratios	odds ratios	significance	Confidence intervals for multivariate odds ratios
Age group						
20-30	-	-	-	-	-	-
30-40	2.32	**	1.15 - 3.13	2.52	**	1.35 - 3.33
+40	2.63	****	1.43 - 3.08	2.63	****	1.83 - 3.8
Gender						
Male	-	-	-	-	-	-
Female	2.42	**				
Material						
Amalgam	-	-	-	-	-	-
Composites	1.12	NS				
Glass ionom.	3.12	****				
Dentists						
#1	-	-	-	-	-	-
#2	1.34	NS				
Location						
Mandible	-	-	-	-	-	-
Maxilla	1.55	*				



## Outcome probabilities



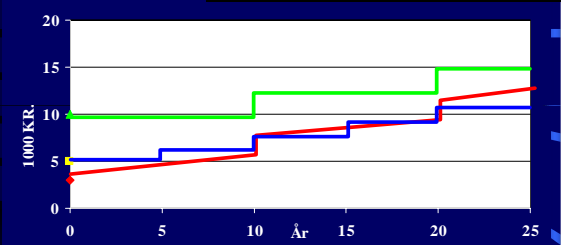
Dentist:patient relationship  
Two-way communication



## Patient values & preferences



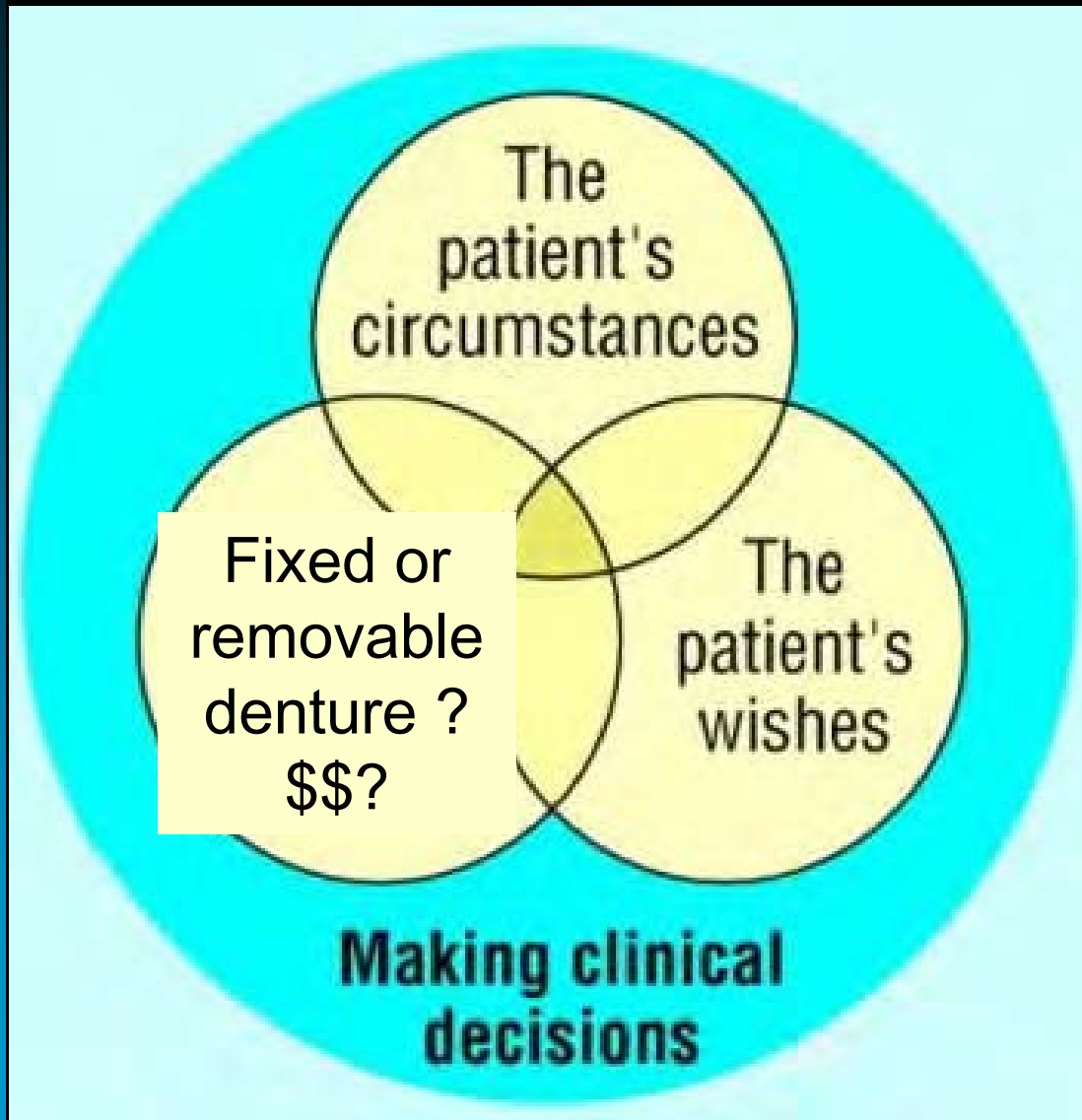
## % worst case scenarios



## Cost increments



# Decision making in prosthodontics



Historically, prosthodontic decision making has always been influenced by:

1. a narrow range of technical solutions (limited by biology) and
2. the patient finances.



*" Doctors prescribe medicine of which they know little, to cure diseases of which they know less, in human beings of which they know nothing"*

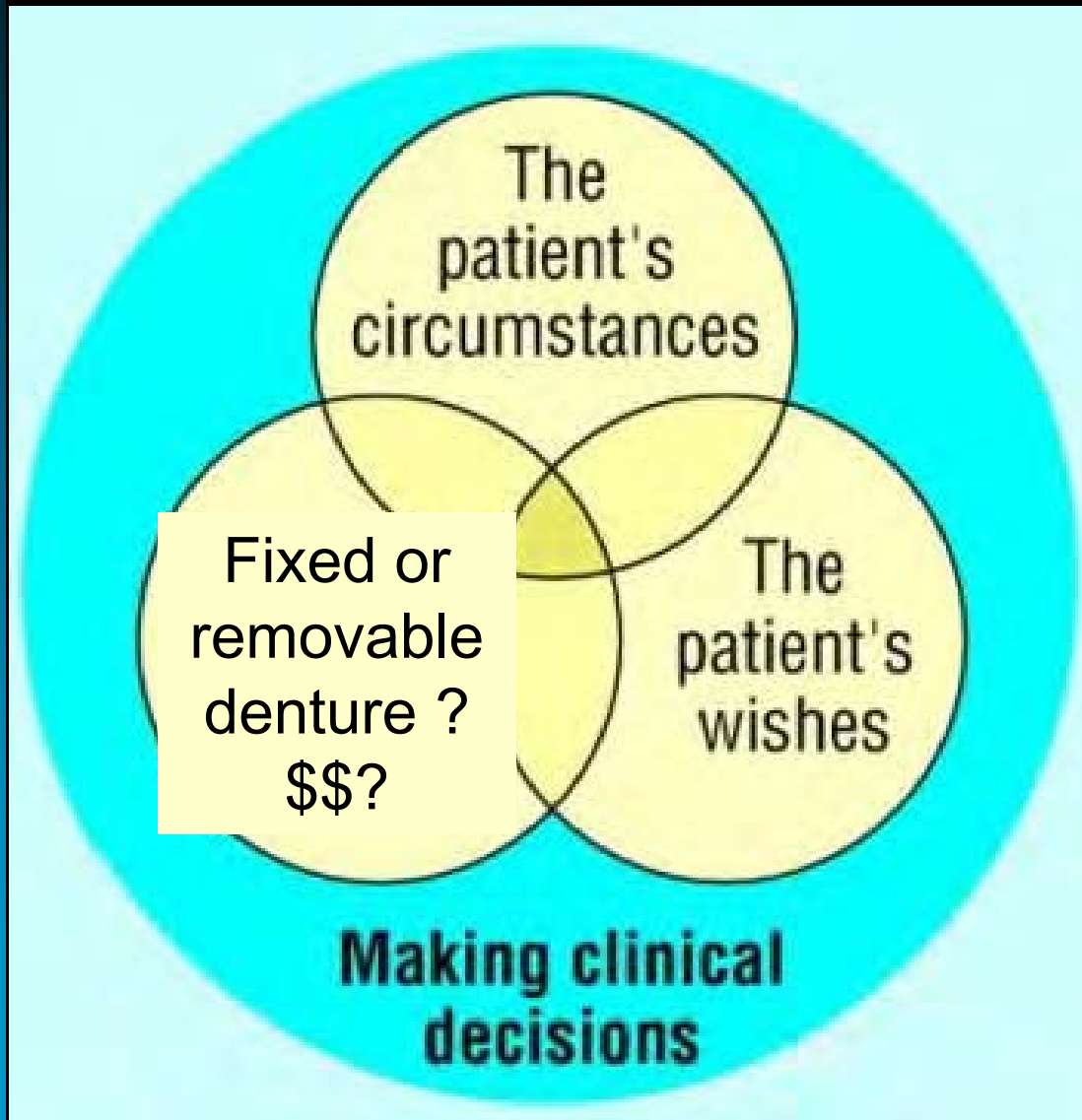
Voltaire

French Philosopher (1694-1778)





# Decision making in prosthodontics



Traditional prosthodontic decision making is equivalent to

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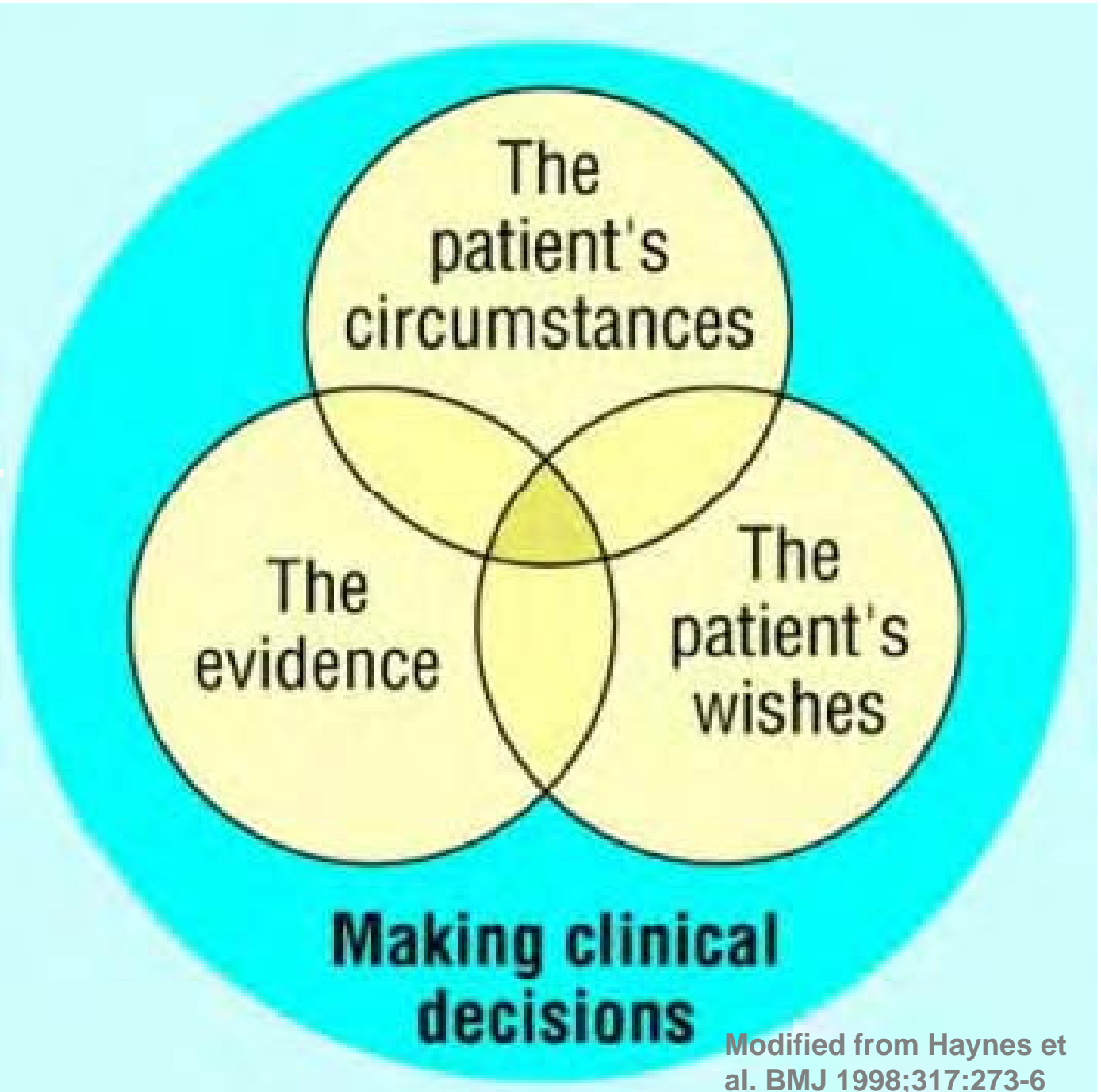
how evidence-based medicine is meant to be practiced

From: Haynes et al. Br Med J 1998; 317:273-6





# Evidence-Based Practice:



Modified from Haynes et al. BMJ 1998;317:273-6



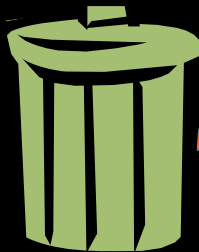
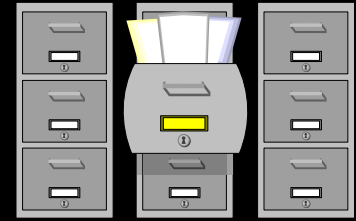
# Evidence-based Practice

Recognition of need of evidence

Search for Evidence

Make Sense of Evidence

Act on Evidence





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# HARD FACTS

**DANGEROUS HALF-TRUTHS  
& TOTAL NONSENSE**

**PROFITING FROM  
EVIDENCE-BASED  
MANAGEMENT**

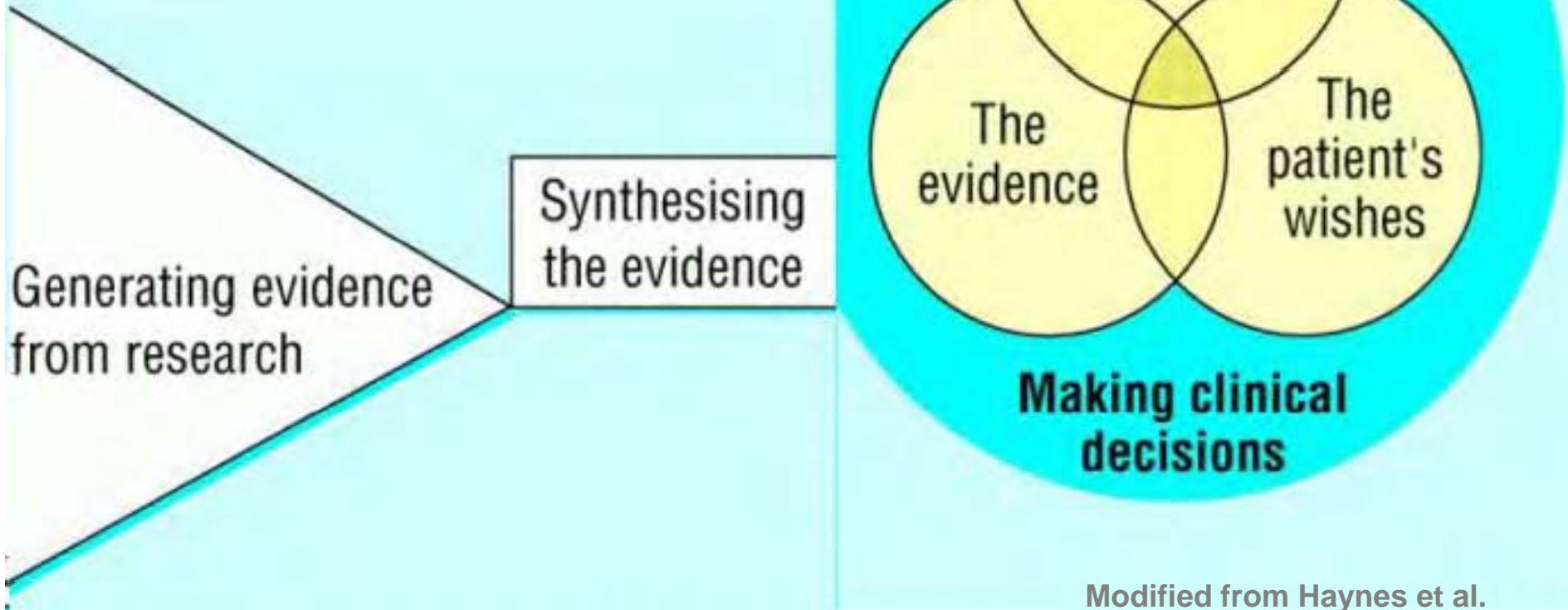
**Jeffrey Pfeffer  
Robert I. Sutton**

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# Primary research papers



Modified from Haynes et al.  
BMJ 1998;317:273-6



How many in the audience here can comfortably state that they were adequately trained to critically appraise primary research papers?



# The new graduate



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- colleagues

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Demonstrator-  
filtered**

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**“The Classic  
literature”**

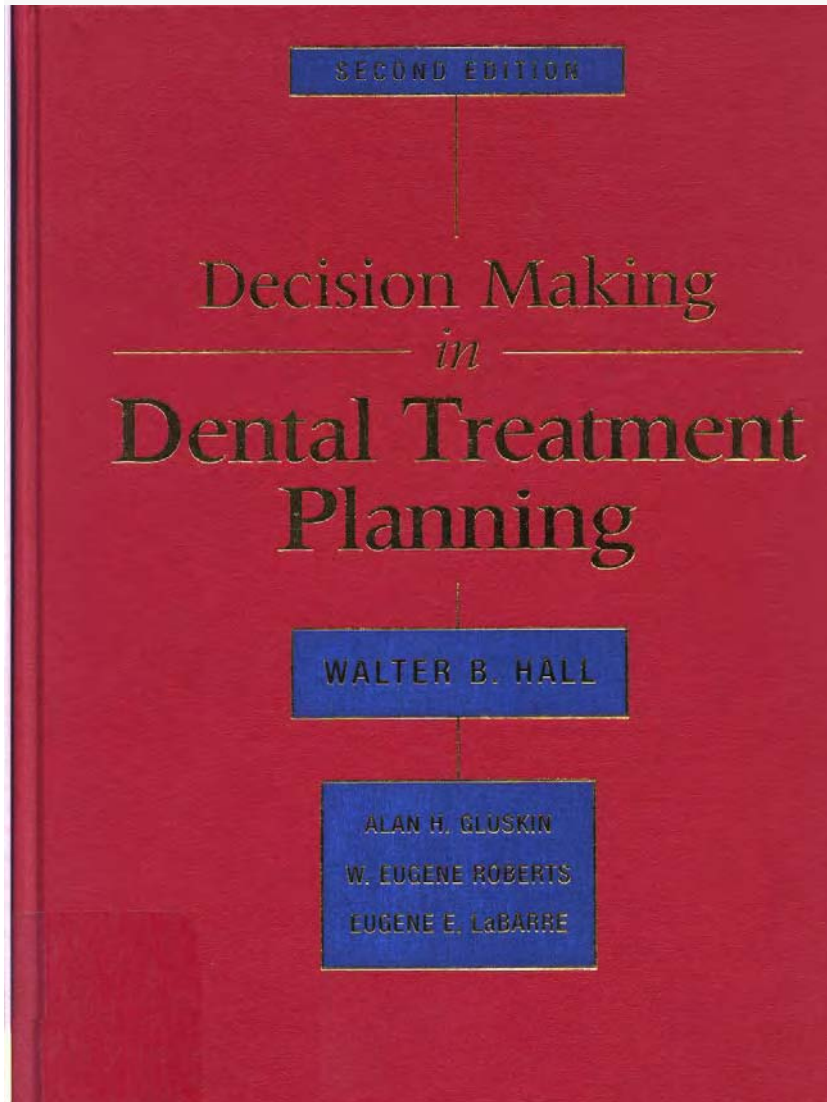
**Publications  
in prosthodontics**

Truth  
Relative  
Damn I





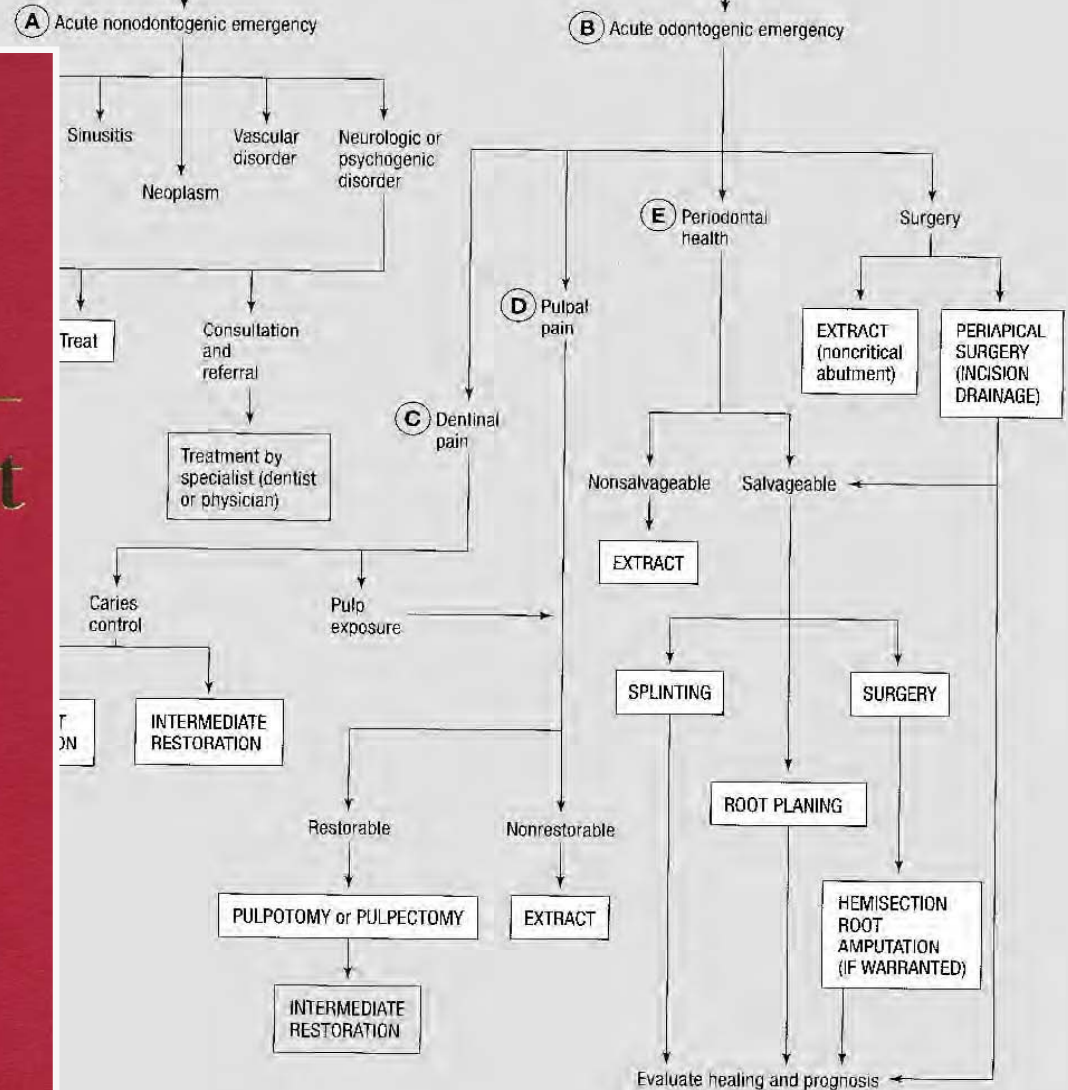
# Cookbook dentistry?



Patient with a **COMPLEX DENTAL PROBLEM** who is **SYMPTOMATIC** or in **ACUTE PAIN**

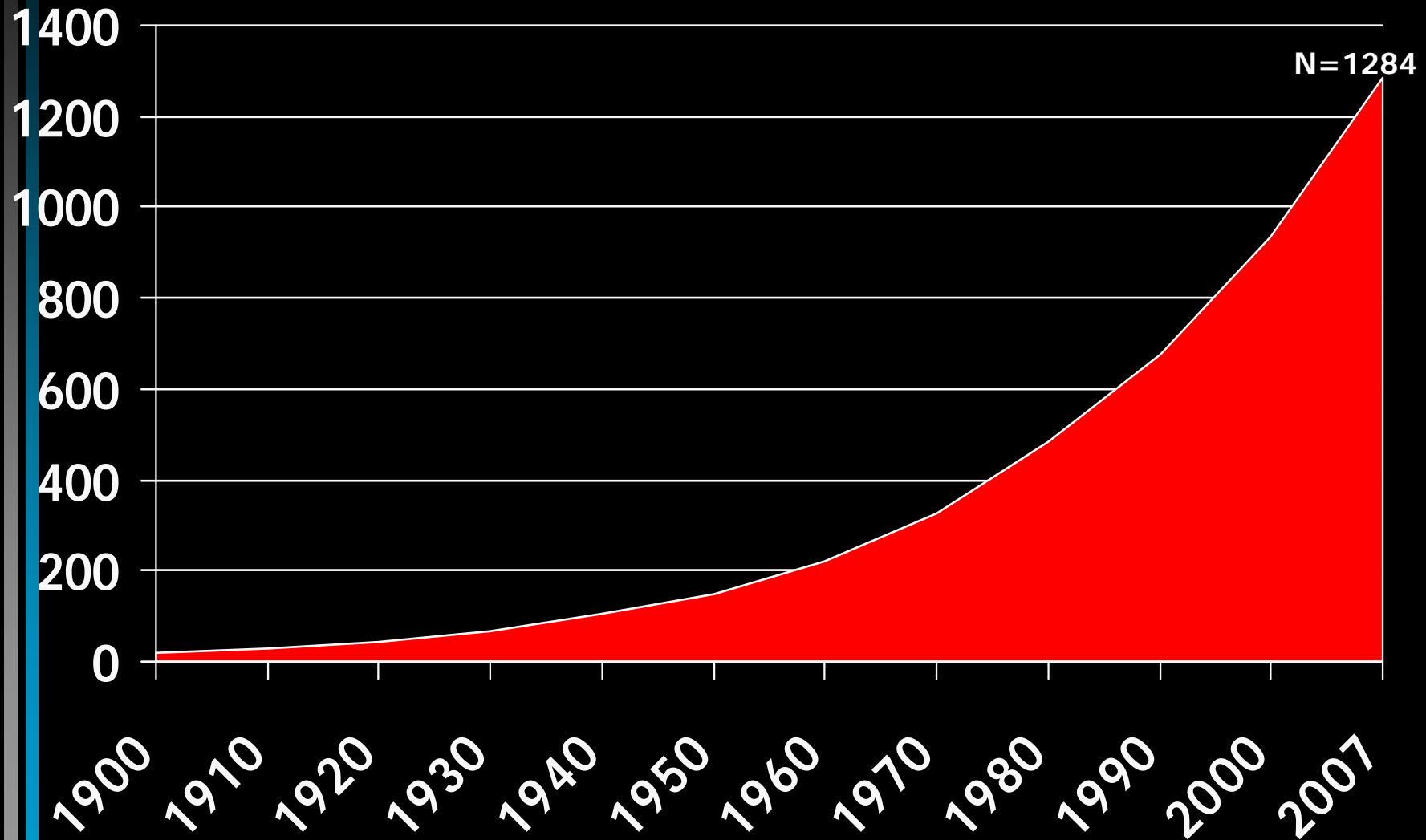
Radiographs, clinical tests, laboratory tests

Determine:  
Is etiology odontogenic?





# Publications in Dentistry



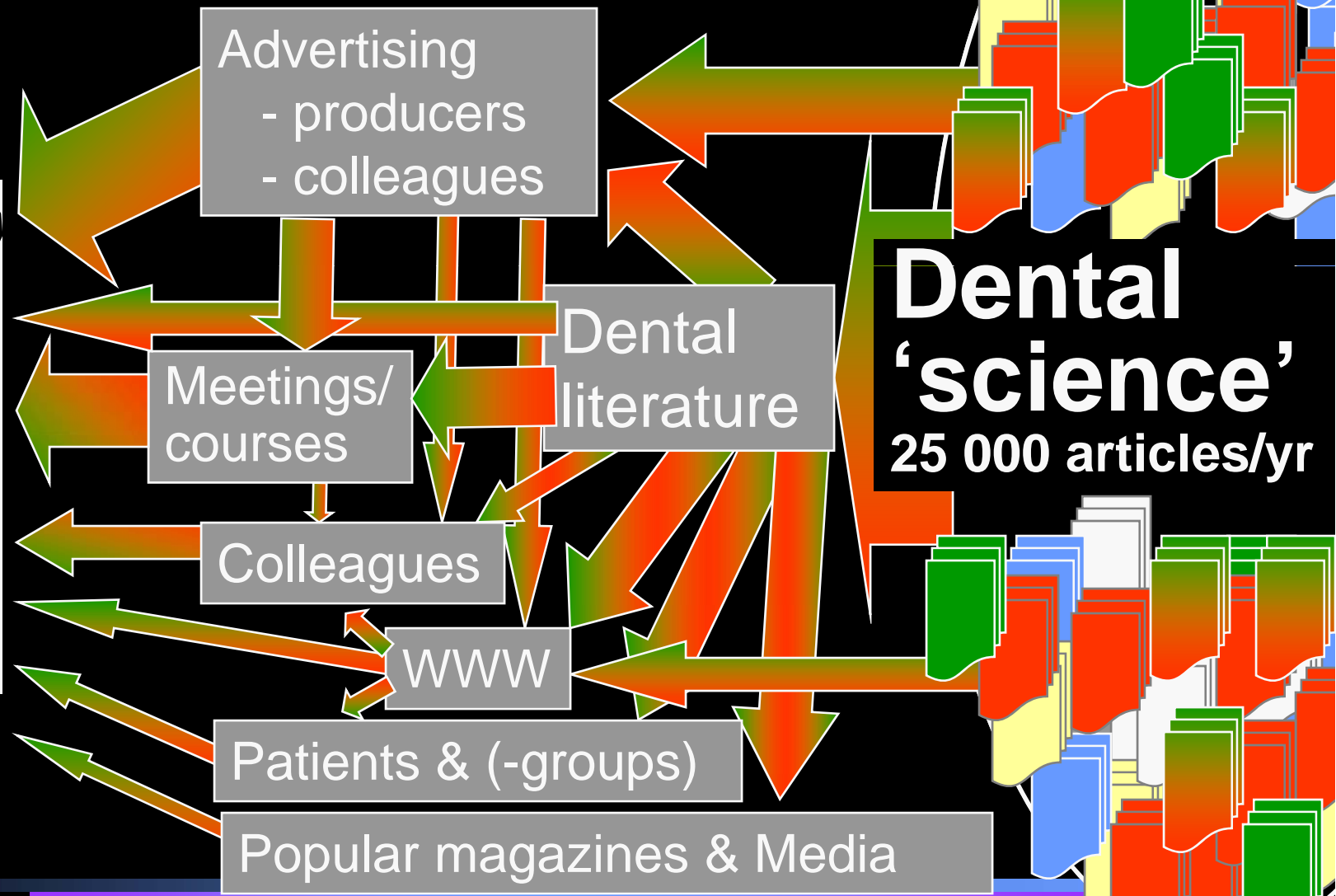
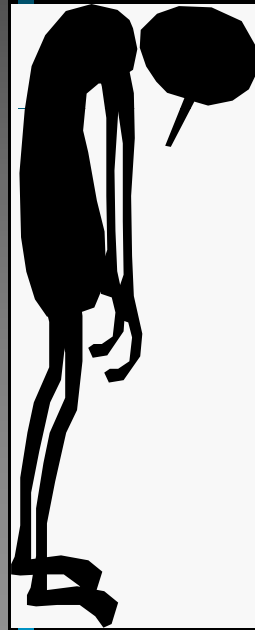
Source: Ulrich's International Periodicals Directory

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# The Information Overload

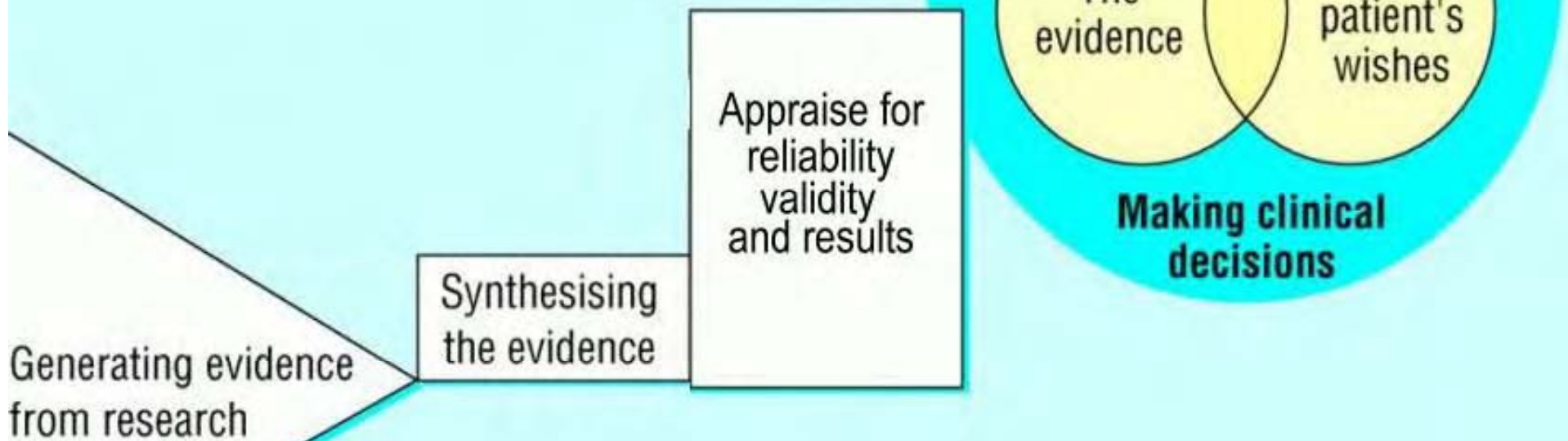




Because of the volume and time constraint....

Perhaps we can stick to read only review papers?

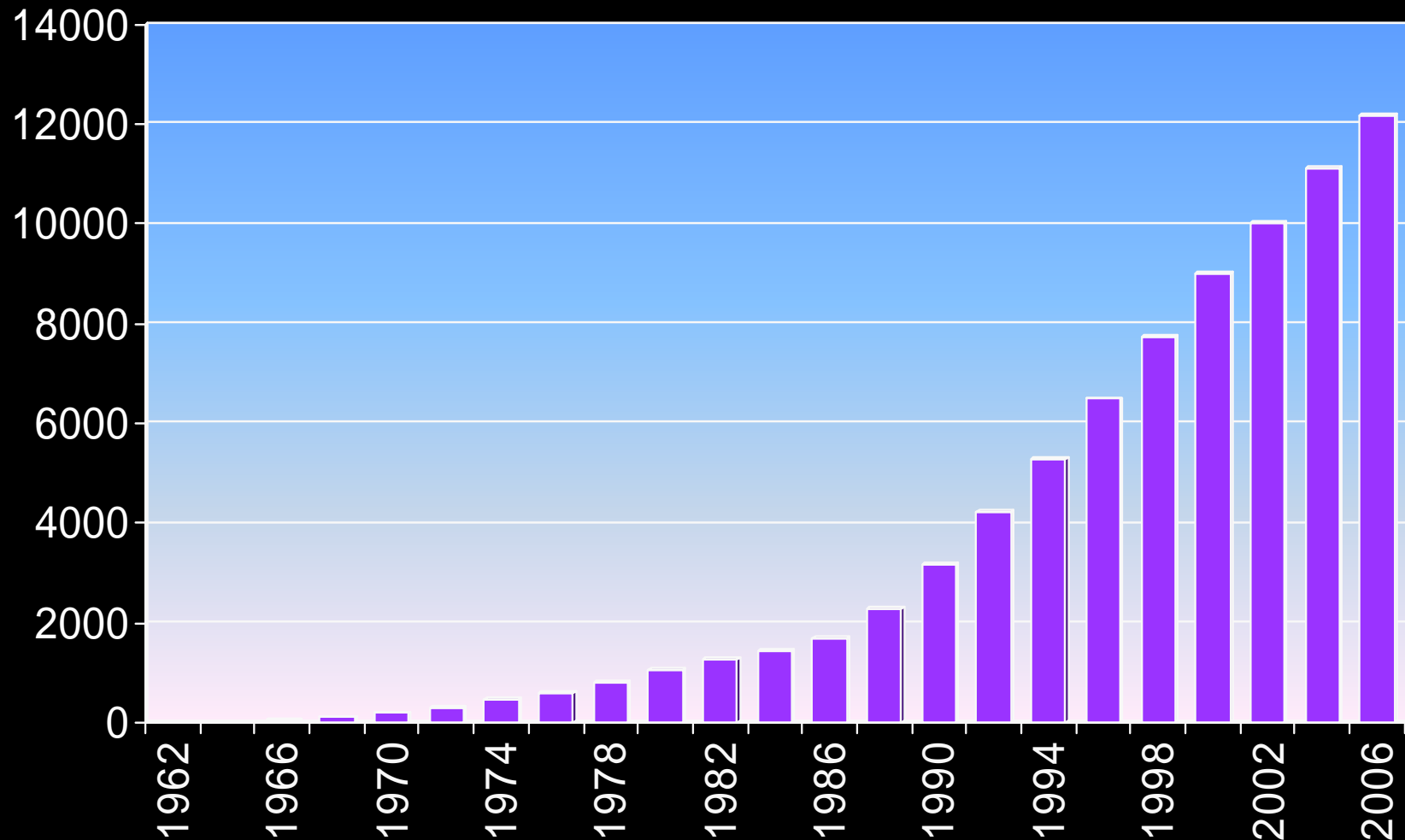
# Secondary research papers



Modified from Haynes et al.  
BMJ 1998;317:273-6



# Reviews in Dentistry (n=12.367) (2007: 191)



(Source: Medline. OVID search strategy: review.pt + exp dentistry)



# Reviews - problems

Usually:

- written by a single topic expert
- based on their understanding of the literature
- no methodology is given
- a broad based subject is addressed
- the conclusions and advises differ



Example: Are splints an efficacious intervention for patients with TMD?





CRITICAL REVIEWS IN  
ORAL BIOLOGY & MEDICINE

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Critical Reviews in Oral Biology & Medicine, Vol 9, 345-361, Copyright © 1998 by International & American Associations for Dental Research

## ARTICLES

### Oral splints: the crutches for temporomandibular disorders and bruxism?

199 refs

T. T. Dao and G. J. Lavigne

Faculty of Dentistry, University of Toronto, Ontario, Canada.

Despite the extensive use of oral splints in the treatment of temporomandibular disorders (TMD) and bruxism, their mechanisms of action remain controversial. Various hypotheses have been proposed to explain their apparent efficacy (i.e., true therapeutic value), including the repositioning of condyle and/or the articular disc, reduction in the electromyographic activity of the masticatory muscles, modification of the patient's "harmful" oral behavior, and changes in the patient's occlusion. Following a comprehensive review of the literature, it is concluded that any of these theories is either poor or inconsistent, while the issue of true efficacy for oral splints remains unsettled. However, the results of a controlled clinical trial lend support to the effectiveness (i.e., the patient's appreciation of the positive changes which are perceived to have occurred during the trial) of the stabilizing splint in the control of myofascial pain. In light of the data supporting their effectiveness but not their efficacy, oral splints should be used as an adjunct for pain management rather than a definitive treatment. For sleep bruxism, it is prudent to limit their use as a habit management aid and to prevent/limit dental damage potentially induced by the disorder. Future research should study the natural history and etiologies of TMD and bruxism, so that specific treatments for these disorders can be developed.

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[Dao, T. T.](#) || [Lavigne, G. J.](#)
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..the true efficacy for oral splints remains unsettled.

Gainesville, University of Florida, February 2008



Pain 83 (1999) 549–560

**PAIN**

www.elsevier.nl/locate/pain

## Occlusal treatments in temporomandibular disorders: a qualitative systematic review of randomized controlled trials

Heli Forssell<sup>a,\*</sup>, Eija Kalso<sup>b</sup>, Pirkko Koskela<sup>c</sup>, Raili Vehmanen<sup>d</sup>, Pauli Puukka<sup>e</sup>, Pentti Alanen<sup>f</sup>

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<sup>b</sup>Department of Anaesthesia, Helsinki University Central Hospital, Haartmaninkatu 4, FIN-00290 Helsinki, Finland

<sup>c</sup>Department for Oral Health, Centre of Health and Social Services, City of Jyväskylä, Hannikaisenkatu 11-13, FIN-40100 Jyväskylä, Finland

<sup>d</sup>Health Center of Tampere, Satamakatu 17 B, FIN-33200 Tampere, Finland

<sup>e</sup>Social Insurance Institution, Research and Development Center, Peltolantie 3, FIN-20720 Turku, Finland

<sup>f</sup>Institute of Dentistry, University of Turku, Lemminkäisenkatu 2, FIN-20520 Turku, Finland

Received 22 January 1999; received in revised form 17 June 1999; accepted 25 June 1999

54 refs

temporomandibular disorders (TMD). To investigate whether studies are in agreement with current clinical practices, a systematic review of randomized controlled trials (RCTs) of occlusal treatment studies from the period 1966 to March 1999 was undertaken. Eighteen studies met the inclusion criteria, 14 on splint therapy, and 4 on occlusal adjustment. The trials were scored using the quality scale presented by Antczak et al., 1986a (A.A. Antczak, J. Tang, T.C. Chalmers, Quality assessment of randomized control trials in dental research. I. Methods, J. Periodontal Res. 1986a;21:305–314). The overall quality of the trials was fairly low, the mean quality score was 0.43/1.00 (range 0.12–0.78). The most obvious methodological shortcomings were inadequate blinding, small sample sizes, short follow-up times, great diversity of outcome measures and numerous control treatments, some of unknown effectiveness. Splint therapy was found superior to 3, and comparable to 12 control treatments, and superior or comparable to 4 passive controls, respectively. Occlusal adjustment was found comparable to 2 and inferior to one control treatment and comparable to passive control in one study. Because of the methodological problems, only suggestive conclusions can be drawn. The use of occlusal splints may be of some benefit in the treatment of TMD. Evidence for the use of occlusal adjustment is lacking. There is an obvious need for well designed controlled studies to analyse the current clinical practices. © 1999 International Association for the Study of Pain. Published by Elsevier Science B.V.

The use of occlusal splints may be of some benefit for the treatment of TMD

Gainesville, University of Florida, February 2008



**Cited Refer**  
Occlusal treatments in temporomandibular disorders: a quality  
 Forssell H, Kalso E, K  
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55 refs

12 refs appear in both papers

**Cited References**  
Oral splints: The crutches for temporomandibul  
 Dao TTT, Lavigne GJ  
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 9 (3): 345-361 AUG 1998

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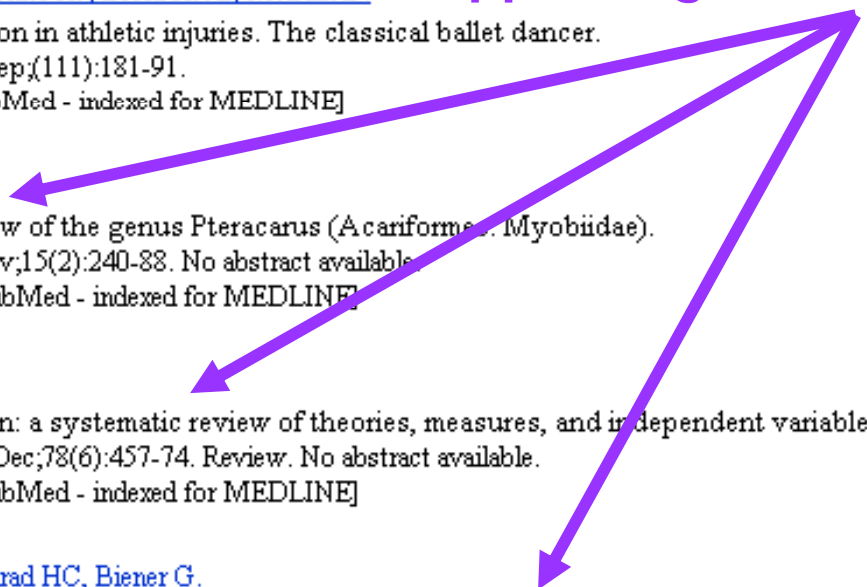
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 A new consideration in athletic injuries. The classical ballet dancer.  
 Clin Orthop. 1975 Sep;(111):181-91.  
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- 11568:** [Dusbabek F.](#)  
 A systematic review of the genus Pteracarus (Acariformes: Myobiidae).  
 Acarologia. 1973 Nov;15(2):240-88. No abstract available.  
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"Systematic reviews"  
appearing 1971, 1972, 1973?





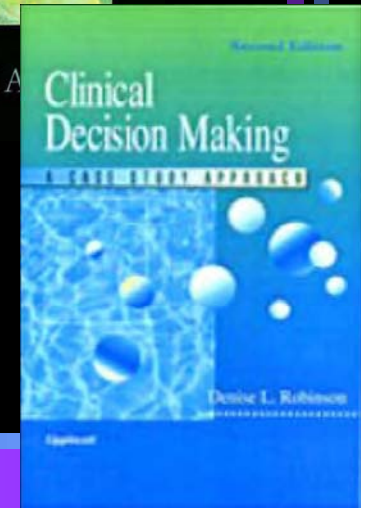
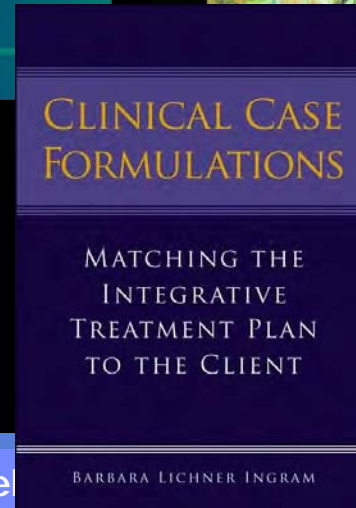
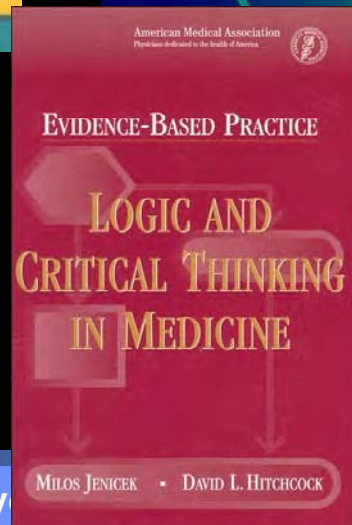
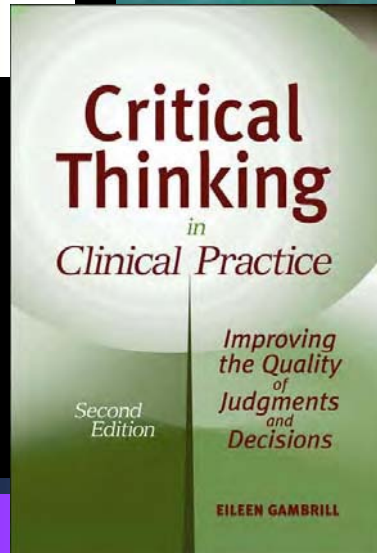
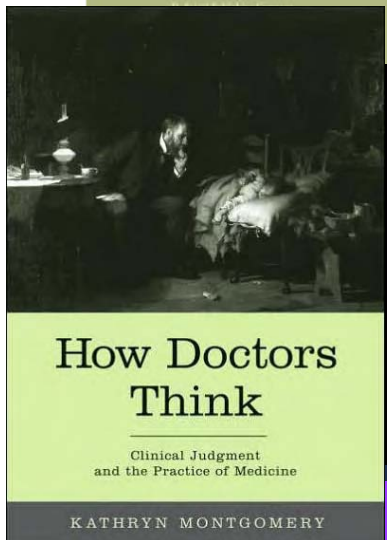
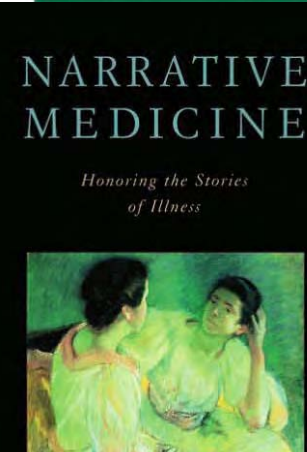
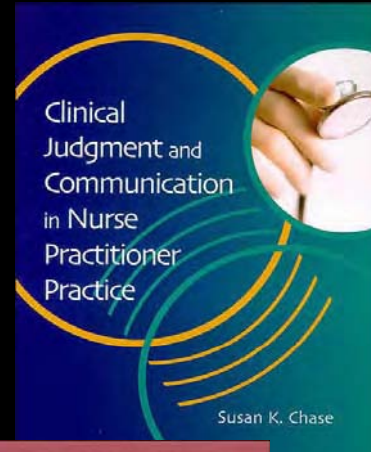
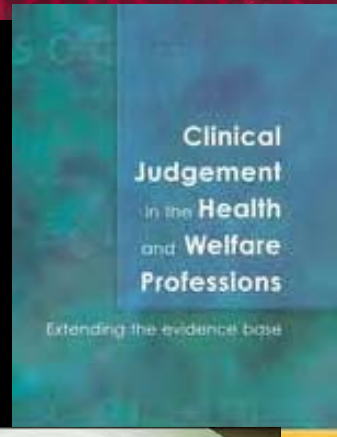
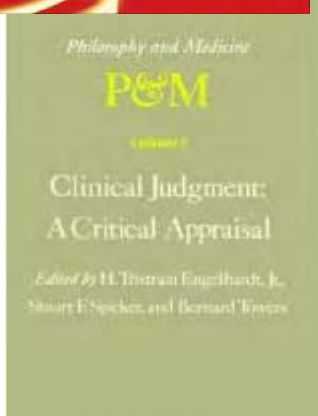
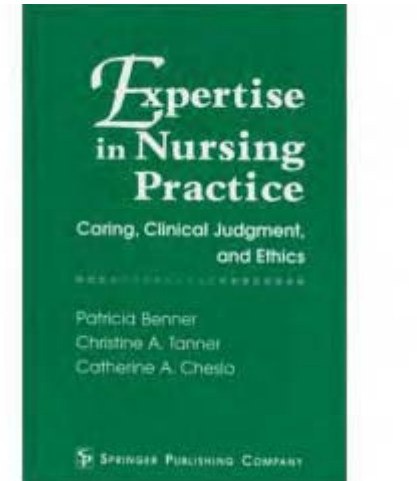
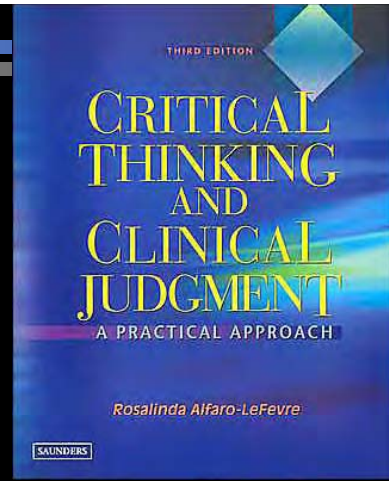
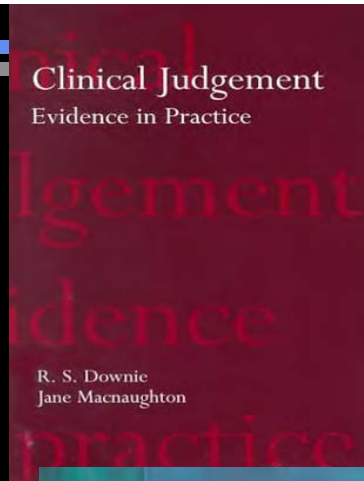
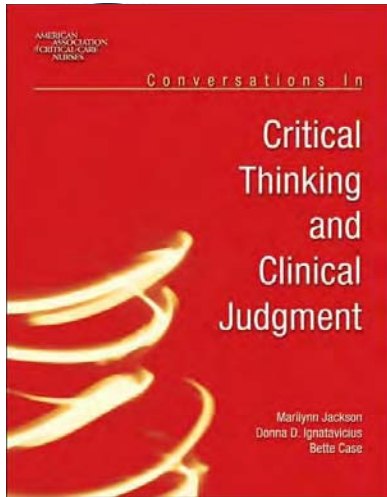
*"Systematic" review?*

Is just a word!

Learn how to recognize one...



How many in the audience here can comfortably state that they were adequately trained to critically appraise secondary research papers?





Information  
is not synonymous  
to knowledge  
and even less so to  
clinical competence





How quickly do dentists adopt to new research information?

Impacted wisdom teeth?

TMD management?

Need for restoration replacement?

Caries and remineralization potential

....

Why does the science transfer to dentists seem to be ineffective?

The British Association  
Address http://www.nchta.org/fullmono/mon415.pdf

Health Technology Assessment 2000; Vol. 4: No. 15

Health Technology Assessment 2000; Vol. 4: No. 15  
d review

http://www.sign.ac.uk/pdf/sign43.pdf - Microsoft Internet Explorer

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Bookmarks

- SIGN Publication No. 43
- Key to evidence stater
- Contents
- Guideline development
- Notes for users of the
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- 4 Assessment and refe
- 5 Clinical management
- 6 Recommendations fo
- Annexes
- References
- Quick Reference Guide

Signatures

Scottish Intercollegiate Guidelines Network

Management of Unerupted and Impacted Third Molar Teeth

SIGN Publication Number 43

A National Clinical Guideline

please note: 25.04.2000 14:53:06  
This guideline was issued in 2000 and will be reviewed in 2002 or sooner if new evidence becomes available. Any updates to the guideline in the interim period will be noted on the SIGN website. Comments are invited to assist the review process. All correspondence and requests for

# USA

1979: NIH  
Consensus dev.  
Conference for  
removal of third  
molars

1995: Am.Acad.Oral Med.Surg.  
Parameters of Care

1993: Am.Acad.Or.Med.Surg.  
Workshop on the managem. of  
patients with third molar teeth

1991 Am.Acad.Oral Med.Surg  
Parameters of Care

2000: SIGN  
Guidelines

1980

1990

2000

1995: Br. Assoc.Oral Med. Surg. Pilot Clinical Guidelines

1996: NHS R&D. National guidelines

Sept 1997: FacDentSurg RoyCollSurg(Eng)

1998: Effectiveness Matters 3(2)

2000: NHS R&D HTA Programme

2000: NICE  
Guidelines

Gainesville, University of Florida, February



# Dentists' decisions on prophylactic removal of mandibular third molars: a 10-year follow-up study

Kerstin Knutsson<sup>1</sup>, Leif Lysell<sup>2</sup> and Madeleine Rohlin<sup>1</sup>

<sup>1</sup>Department of Oral Radiology, Faculty of Odontology, Malmö University, Malmö,

<sup>2</sup>Department of Oral Surgery, Central Hospital, Kristianstad, Sweden

Knutsson K, Lysell L, Rohlin M: Dentists' decisions on prophylactic removal of mandibular third molars: a 10-year follow-up study. Community Dent Oral Epidemiol 2001; 29: 308-14. © Munksgaard, 2001

Abstract - Objectives: In recent years, several critical outcome studies concerning the prophylactic removal of mandibular third molars have been published. These

with studies on the contribution of the edgged at-molars over s and hird y the e

***“...studies ....appear to motivate a more restrictive approach today compared with 10 years ago”***



ery;  
accepted 8 November 2000



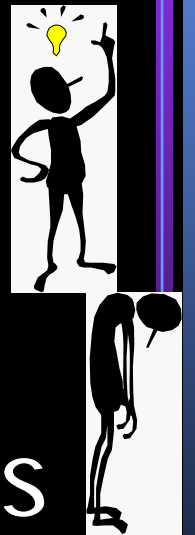
# Even if we have new research

1. This is not necessarily known amongst the dental clinical practitioners



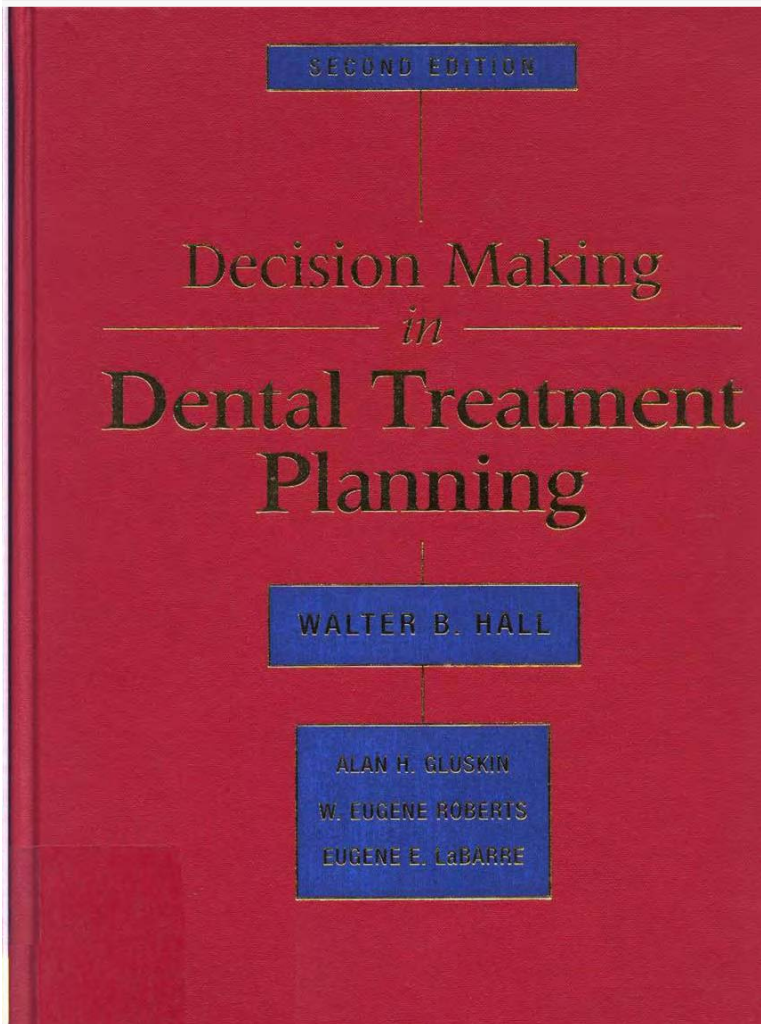
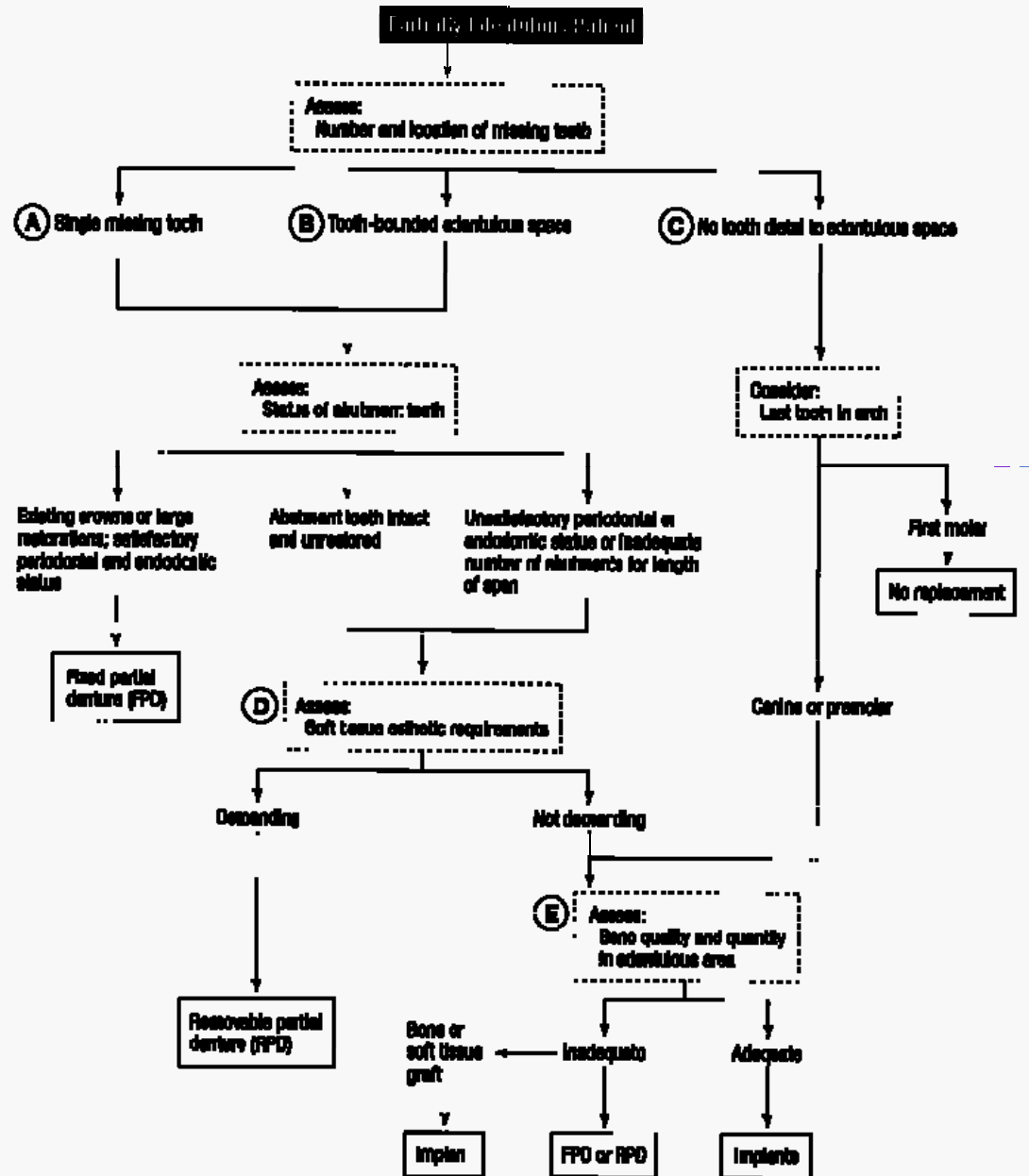
# Even if we have new research

1. This is not necessarily known amongst the dental clinical practitioners
2. Do educators ensure that they adequately prepare our future health professionals to change behavior, attitude and techniques rapidly in light of new knowledge?



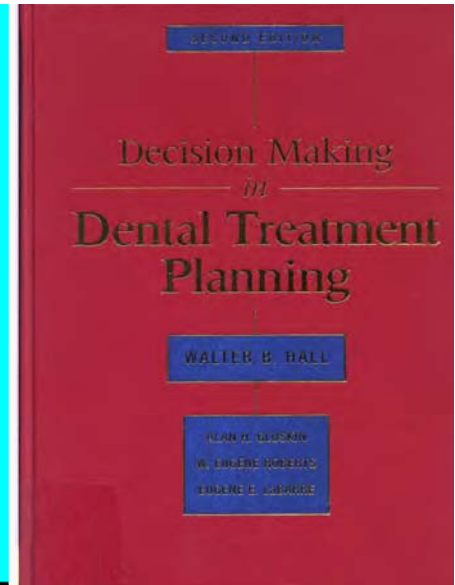
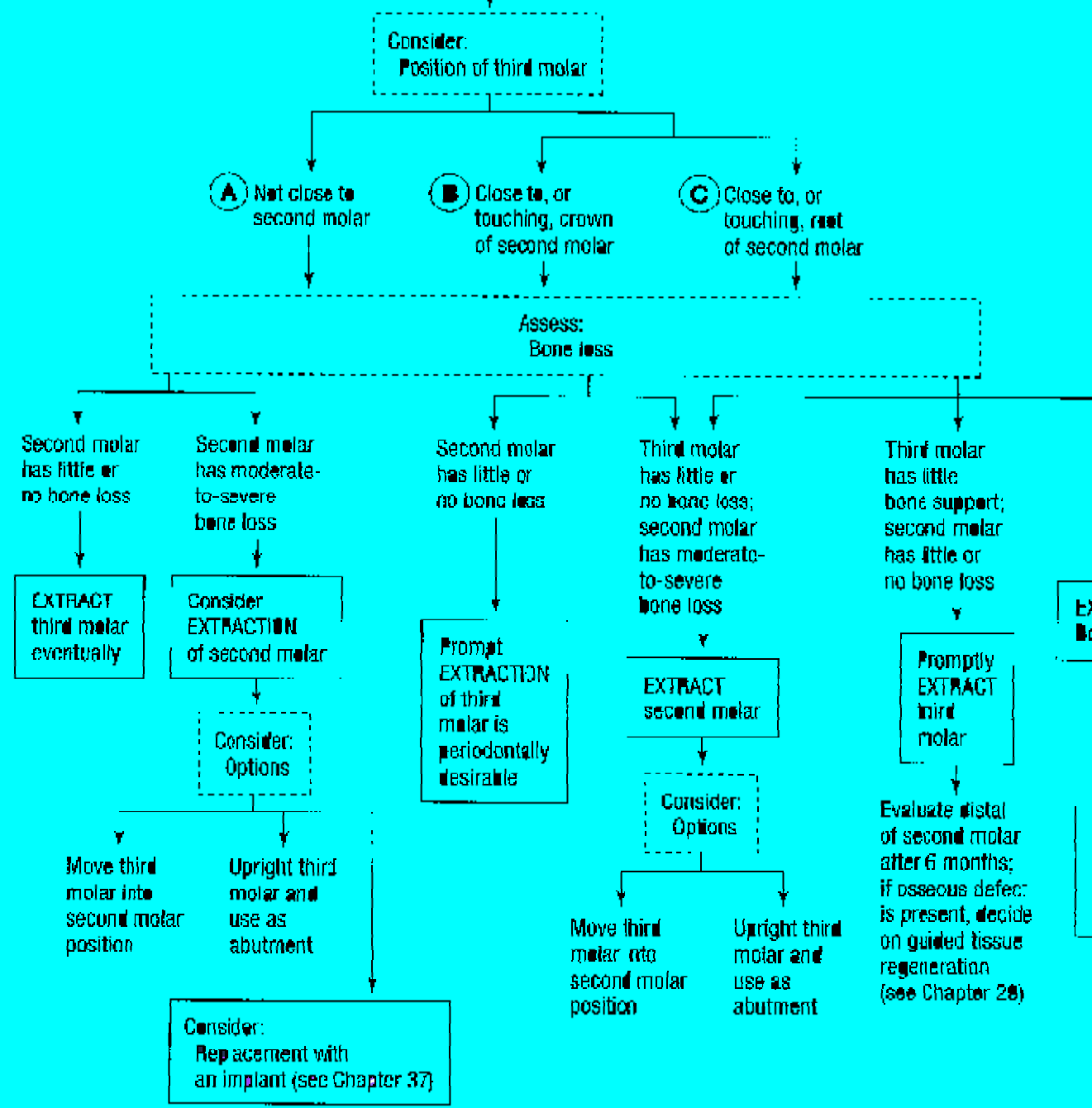


# Useful, or just cookbook dentistry?





**IF BOTH MOLARS EXHIBIT EXTENSIVE BONE LOSS**







Are dentists worse or  
better than other  
health professions?

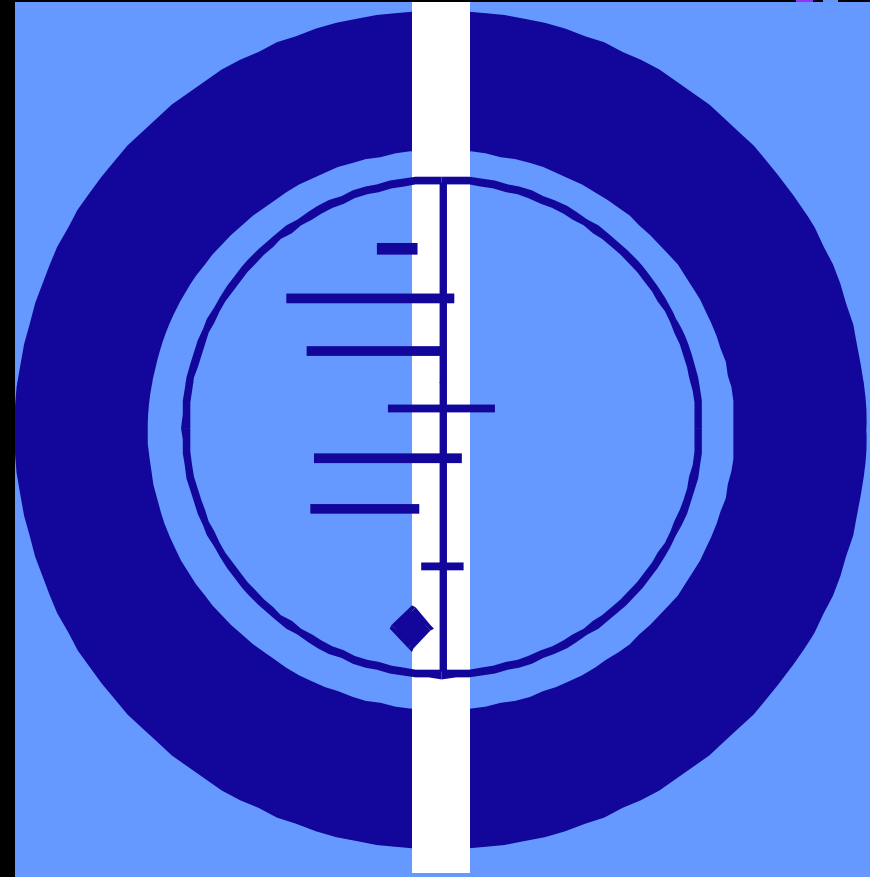


# The Cochrane Collaboration

- 1972: 1st trial
- 1972-1987: +6 trials
- 1989: 1st SR

From 1992

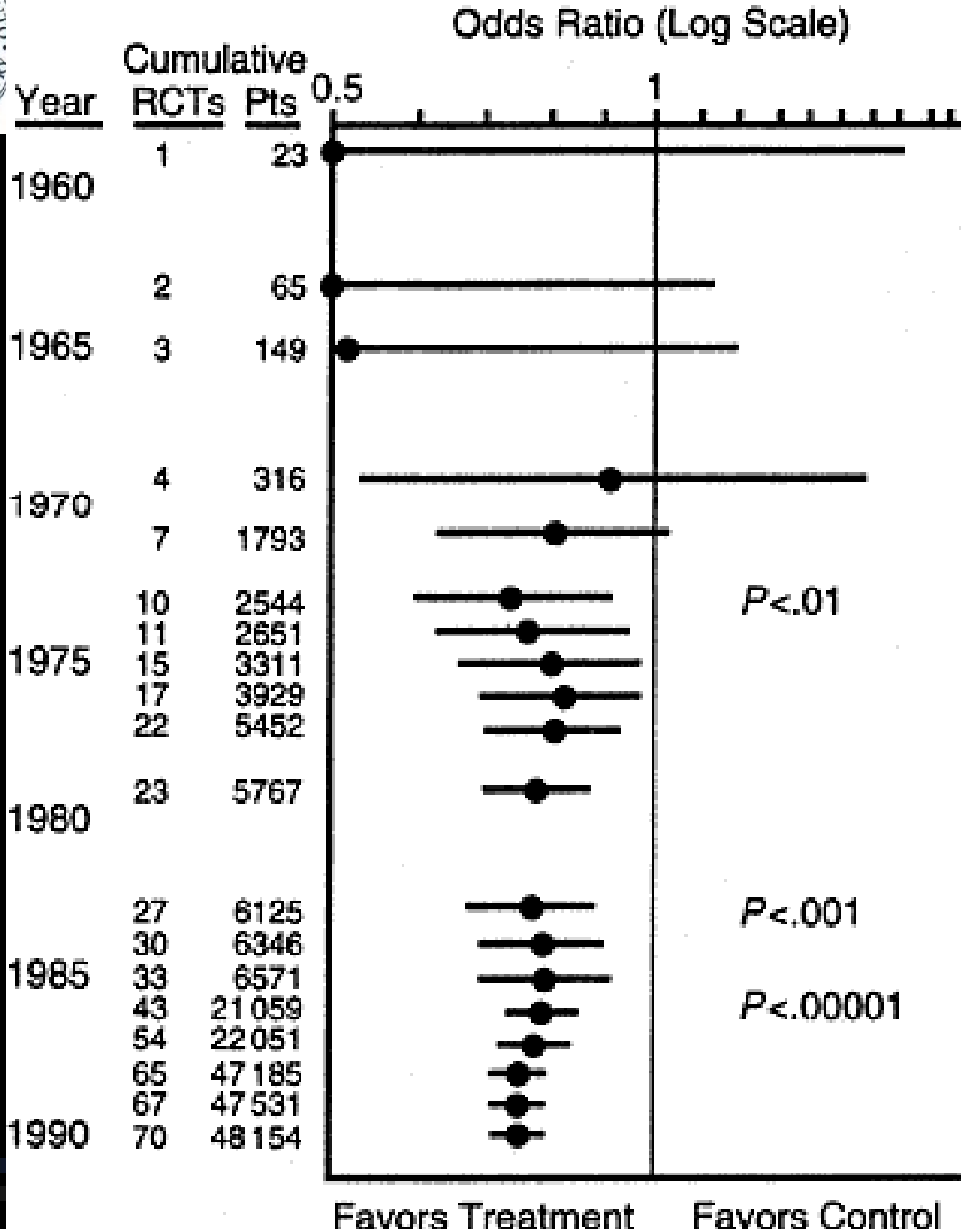
1  
2  
3  
4  
5  
6  
7



Logo



# Thrombolytic Therapy

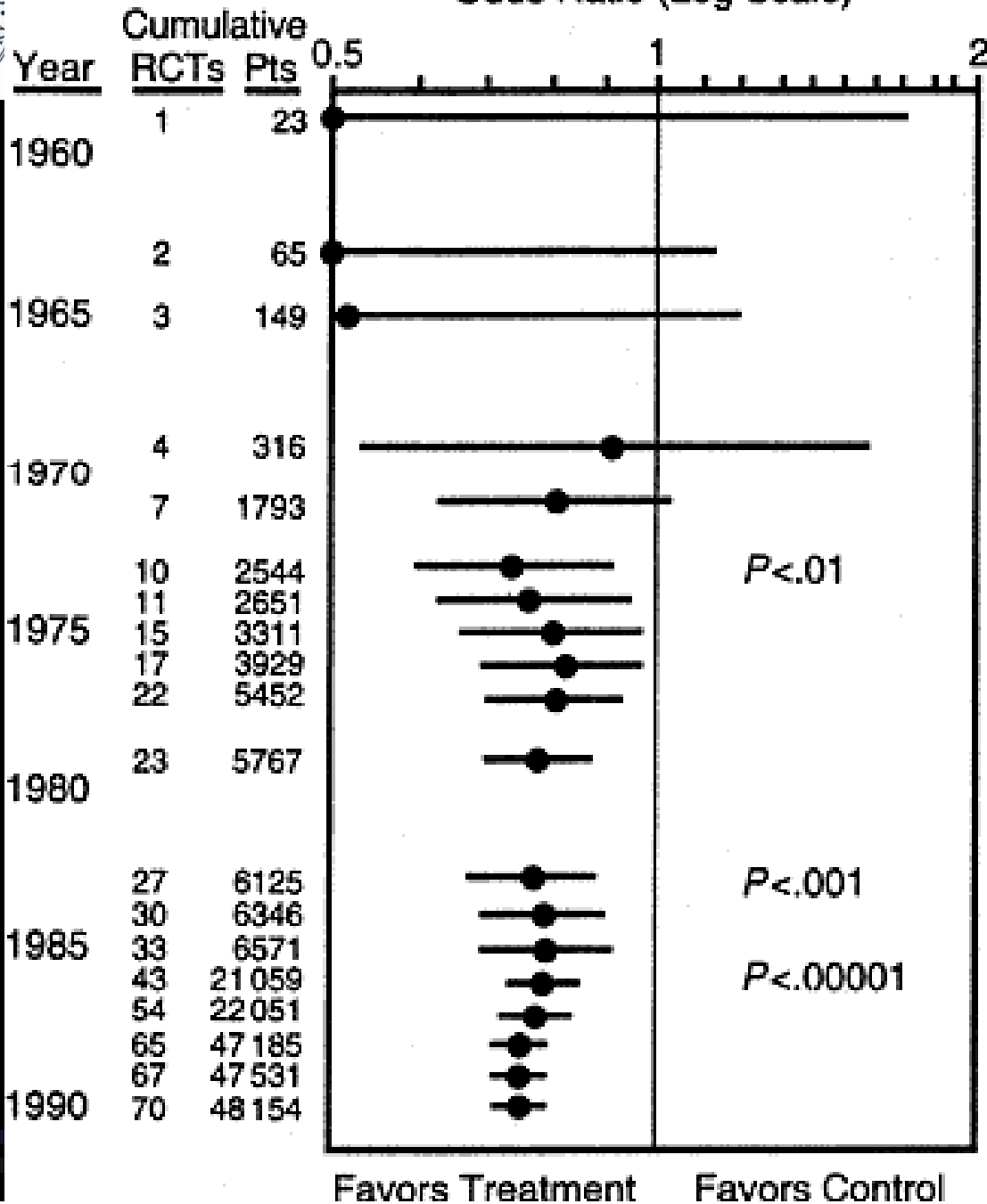


Cumulative meta-analysis of RCTs



# Thrombolytic Therapy

Odds Ratio (Log Scale)



## Textbook/Review Recommendations

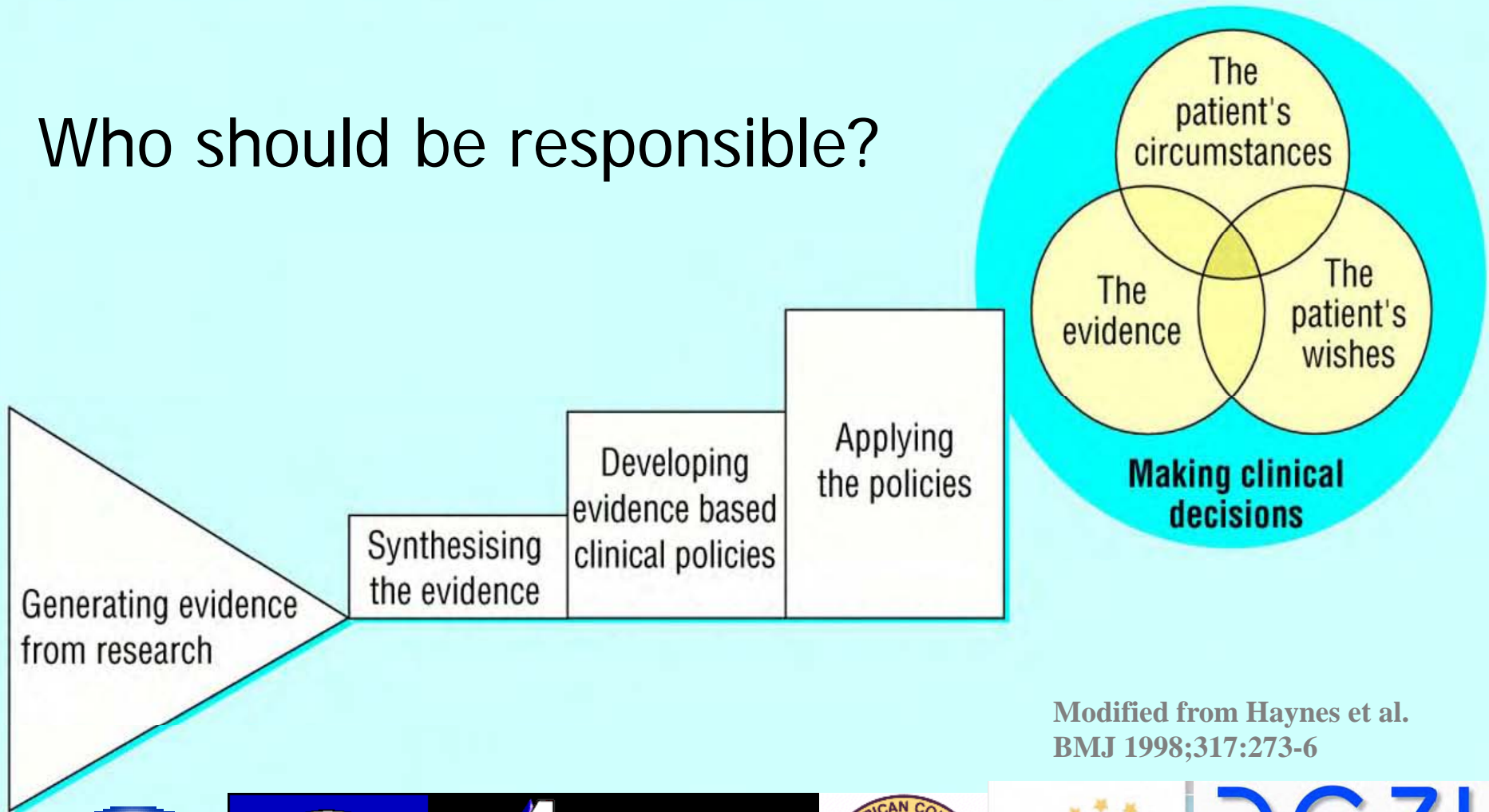
	Routine	Specific	Rare/Never	Experimental	Not Mentioned
					21
					5
				1	10
				1	2
				2	8
					7
					8
	1				12
M	1			8	4
M	1			7	3
M	5	2		2	1
M	15	8			1
M	6	1			



# Even if we have new research

1. This is not necessarily known amongst the dental clinical practitioners
2. Have our educators adequately prepared students to change .... in light of new knowledge?
3. Who's responsibility should it be to disseminate (new) research results that impacts directly on patient care?

# Who should be responsible?



Modified from Haynes et al.  
BMJ 1998;317:273-6





# Who should be responsible?: The state of research on oral implants

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