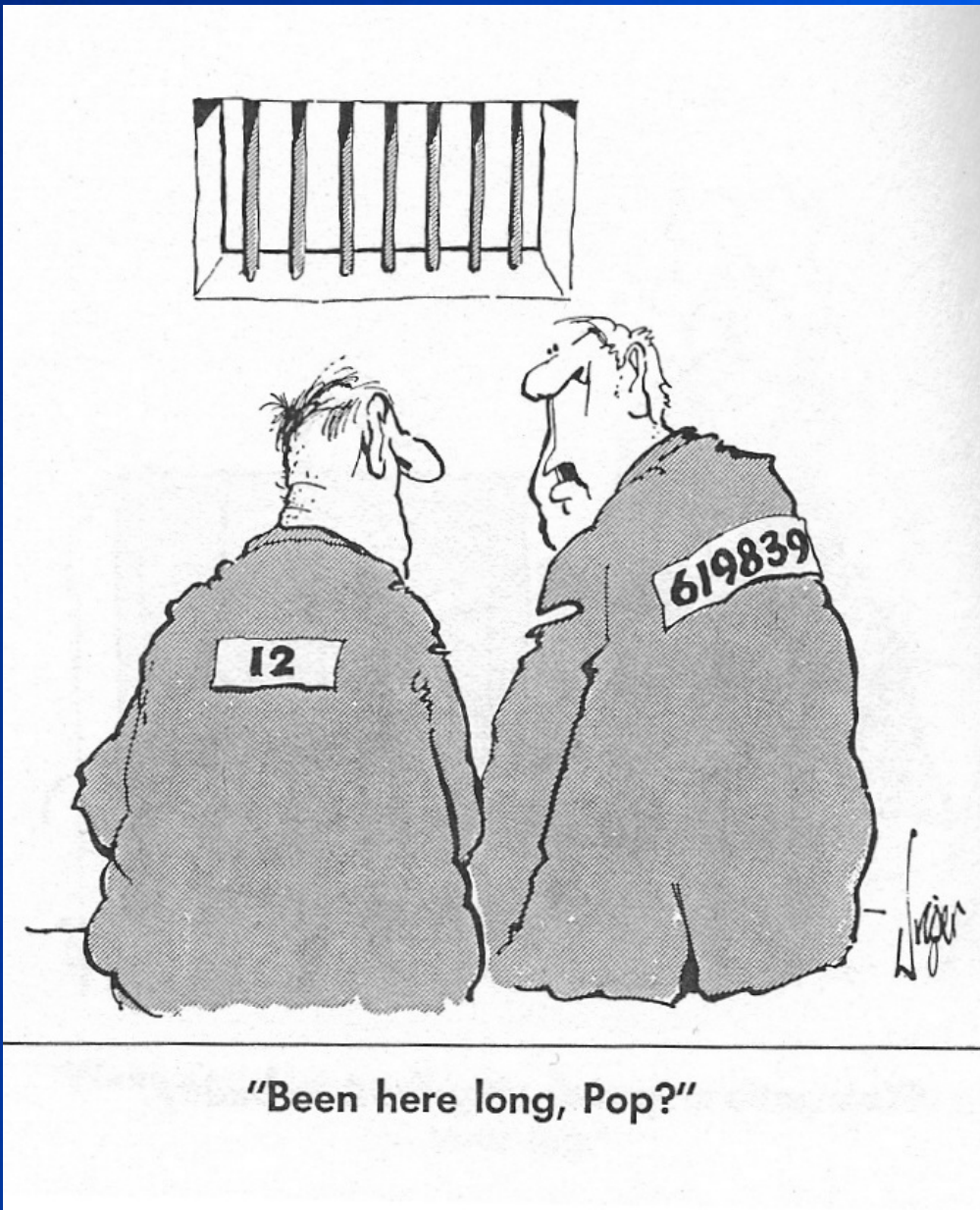


# Evidenced Based Therapy Practice within the BOP

Presented by:  
CDR Eric Payne, DPT, OCS



"Been here long, Pop?"

# JASPA\*(Journal associated score of personal angst)

*J: Are you ambivalent about renewing your **JOURNAL** subscriptions?*

*A: Do you feel **ANGER** towards prolific authors?*

*S: Do you ever use journals to help you **SLEEP**?*

*P: Are you surrounded by **PILES** of **PERIODICALS**?*

*A: Do you feel ANXIOUS when journals arrive?*

\*

Modified from: BMJ 1995;311:1666-1668

Paul Glasziou

University of Queensland & Oxford

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**0 (?liar)**

**1-3 (normal range)**

**>3 (sick; at risk for polythemia gravis and related conditions)**

\*

Modified from: BMJ 1995;311:1666-1668

Paul Glasziou

University of Queensland & Oxford

# Training Objectives

- Be able to provide examples for various levels of evidence for clinical research.
- Be able to formulate a good searchable clinical question using the PICO format.
- Understand the basic components of a critical appraisal topic (CAT) and be able to utilize CATMaker to help produce a CAT.
- Be able to interpret the findings of a treatment PICO question using the Number Needed to Treat and Absolute Risk Reduction statistics.
- Be able to utilize a nomogram to calculate post test probability given positive and negative likelihood ratios.

# Massive Information Overload

Leads to Professional Guilt Syndrome (PGS)

- Hundreds of journals related to rehabilitation
- Estimated that a therapist would have to read more than 15 professional articles per day to keep up with the basic research
- Very easy becoming overwhelmed and abandoning journal reviews

# What is EBP?

*“Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values” - Sackett, et al 2001*

## What EBP is not:

EBM is not cook-book medicine

evidence needs extrapolation to my patient's unique biology and values

EBM is not cost-cutting medicine

when efficacy for my patient is paramount, costs may rise, not fall

-Sackett 1997



# The ABCs of EBP

How do we do this?

- Asking an answerable clinical foreground question.
- Searching for the best evidence.
- Critically-appraising the evidence.
- Integrating the evidence with our expertise and our patient's unique biology and values
- Evaluating our performance

# Asking an Answerable Question

PICO format most commonly used.

P - Patient Population

I - Interventions or Exposures

C - Comparison Intervention

O - Outcome

# PICO Examples for Treatment

<http://www.cc.nih.gov/rm/pt/advPTprac.htm#PTcat>

“For a 60 year old male with bilateral osteoarthritis of the knees, is a physical therapy program of manual therapy plus guided exercises more effective than placebo in reducing pain, improving function, and reducing the likelihood of surgery?”

LCDR Jessica Feda, DPT, OCS

October 2006

# PICO Example for Prognosis

“For a 46 year old male with a venous stasis ulcer of 16.5 cm<sup>2</sup> in size which has remained open for 2.5 years, what is the likelihood of the wound closing with compression therapy by the time that the patient is released from prison in 4 months?”

CDR Eric Payne, DPT

January 2007

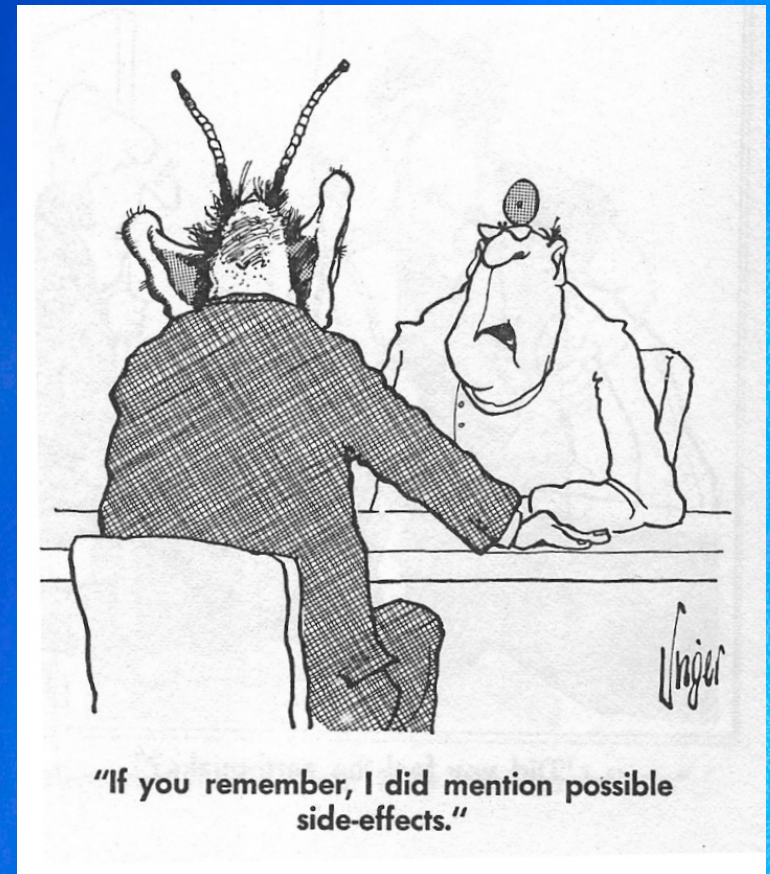
# PICO Example for Diagnosis

“For a 22 year old male runner is there a clinical test that is valid for determining patellofemoral pain syndrome?”

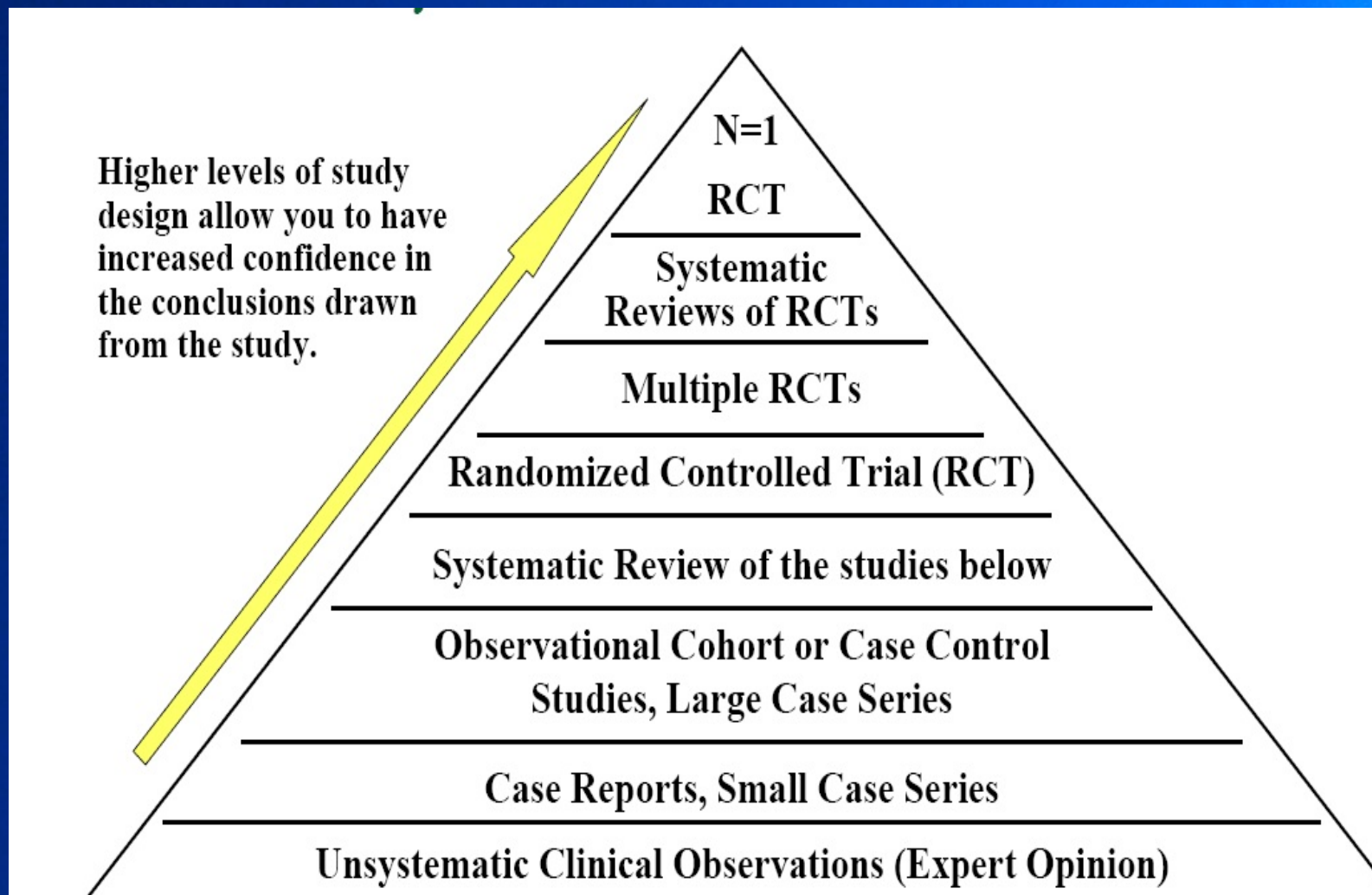
Heather Khan, DPT  
January 2007

# PICO Example for Harm

For a 54 year old man taking a non-FDA approved drug for male pattern balding what is the prevalence for permanent disfigurement as related to drug side effects?



# Searching for the Best Evidence



Adopted from Dr. Steve Allison, PhD, MPT

# Improving Search Techniques

- Practice improves efficiency
- Particularly useful are the tutorials from NIH:  
<http://www.nlm.nih.gov/bsd/disted/pubmedtutorial/>
- Proper search will result in less than 20 related articles.
- Choose the research with highest level of evidence.



# Example Search Criteria

Pubmed Clinical Queries: narrow, specific search for prognosis with the following search string:

```
(venous AND ulcer* AND heal* AND predict*) AND  
(prognos*[Title/Abstract] OR (first[Title/Abstract] AND  
episode[Title/Abstract]) OR cohort[Title/Abstract])  
AND (Humans[Mesh]).
```

The search yielded 17 hits, one of which was the Margolis et al article.



## PubMed Clinical Queries

About Entrez

Text Version

Entrez PubMed

Overview

Help

FAQ

Tutorials

New/Noteworthy

E-Utilities

PubMed Services

Journals Database

MeSH Database

Single Citation Matcher

Batch Citation Matcher

Clinical Queries

Special Queries

LinkOut

My NCBI

Related Resources

Order Documents

NLM Mobile

NLM Gateway

TOXNET

Consumer Health

This page provides the following specialized PubMed searches for clinicians:

- [Search by Clinical Study Category](#)
- [Find Systematic Reviews](#)
- [Medical Genetics Searches](#)

After running one of these searches, you may further refine your results using PubMed's [Limits](#) feature.

Results of searches on these pages are limited to specific clinical research areas. For comprehensive searches, use [PubMed](#) directly.

### Search by Clinical Study Category

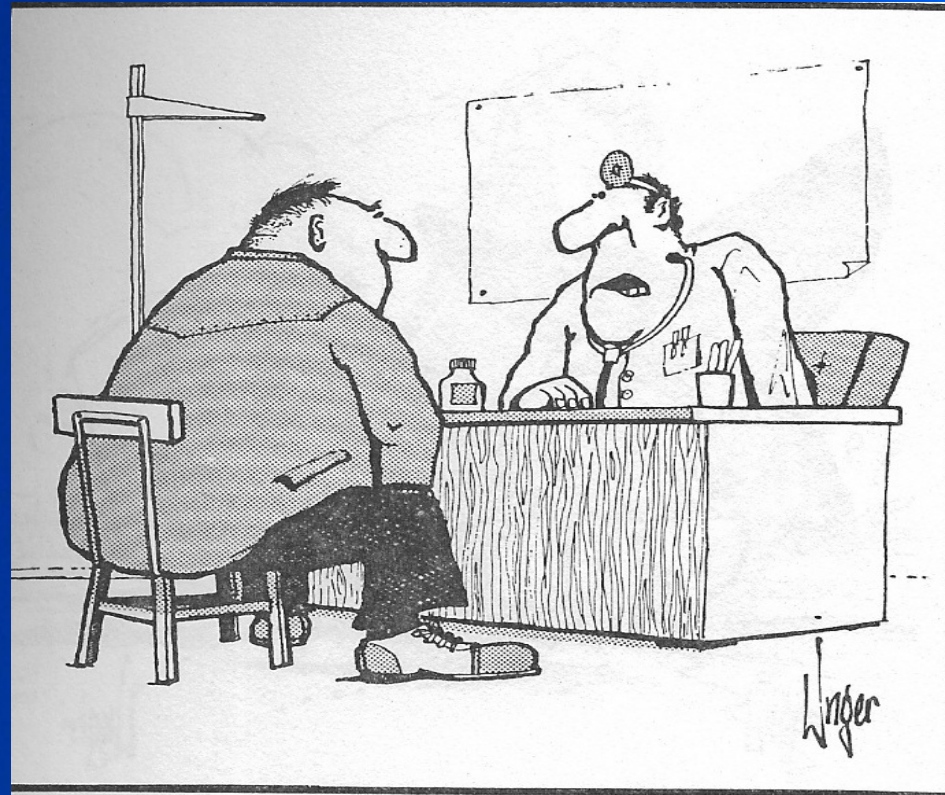
This search finds citations that correspond to a specific clinical study category. The search may be either broad and sensitive or narrow and specific. The search filters are based on the work of [Haynes RB et al.](#) See the [filter table](#) for details.

Search

Category	Scope
<input type="radio"/> etiology	<input checked="" type="radio"/> narrow, specific search
<input type="radio"/> diagnosis	<input type="radio"/> broad, sensitive search
<input type="radio"/> therapy	
<input checked="" type="radio"/> prognosis	

# Critically Appraising the Evidence

Are we looking at the data the way we should be?



"Let me put it this way . . . for your weight you should be thirty-seven feet tall."

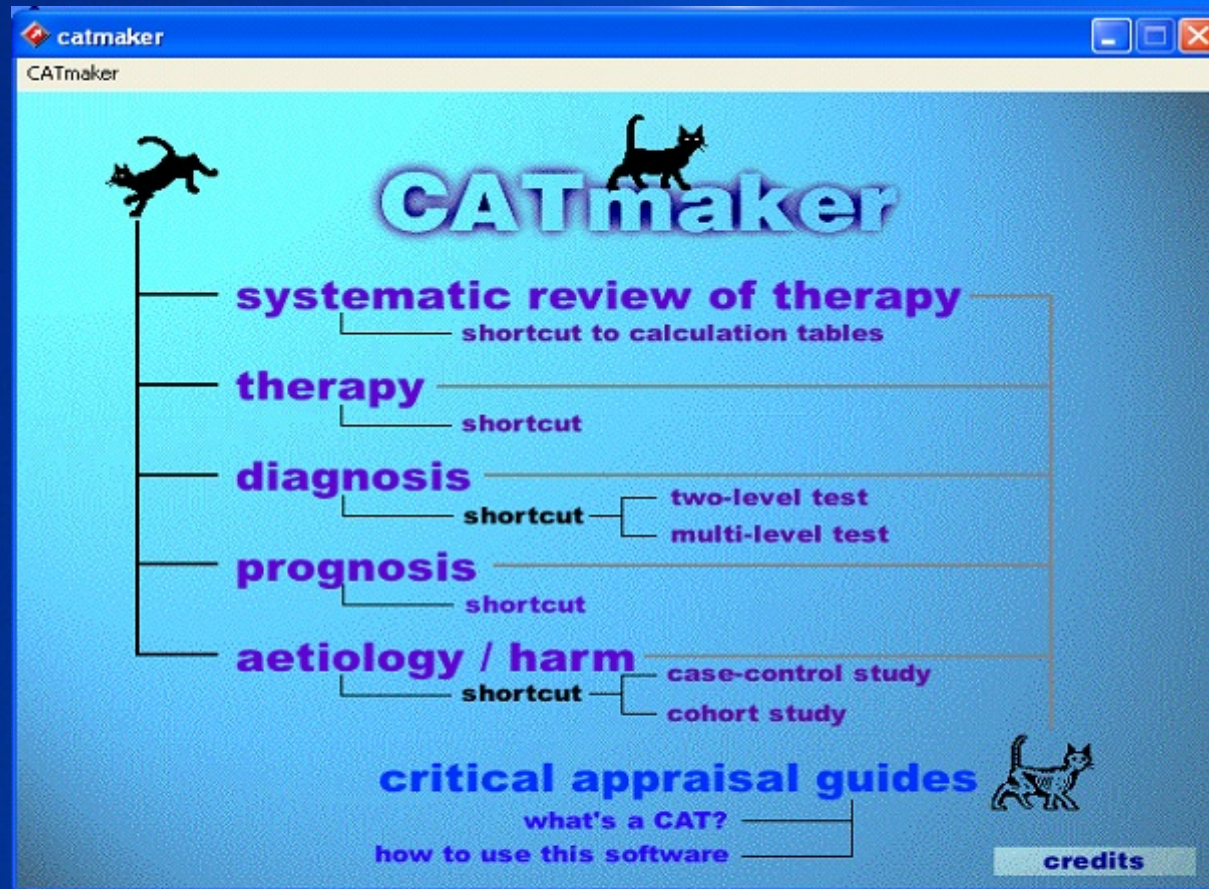
# Critically Appraising the Evidence

- EBP allows for comparing apples to apples by using specific statistics which have been shown to be more clinically useful.
- Critical Appraisal Topic (CAT) is a formal way of analyzing research to answer the clinical question.
- CATmaker software available free at:  
[http://www.cebm.net/mod\\_product/uploads/catmaker.zip](http://www.cebm.net/mod_product/uploads/catmaker.zip)

# Anatomy of a CAT



# CATmaker



# CATmaker: The Question

The screenshot shows the CATmaker software window. The title bar reads 'catmaker'. Below the title bar, the text 'CATmaker' is displayed. A help message in a speech bubble says 'Use Control-C to copy selected text, Control-V to paste and Control-X to cut.' The main area has a blue background with a cat silhouette on the left and right. The title 'making a CAT therapy' is centered. Below it are five tabs: 'Your Question' (selected), 'the Study Patients', 'the Study Evidence', 'the Bottom Line', and 'the Other Stuff'. On the left side, there are two purple buttons: 'Your 3-part Clinical Question' and 'Your Search Terms'. The main content area contains two white text boxes with red text: 'Enter your PICO question here.' and 'Be specific enough that someone can duplicate your search'. At the bottom, there are 'restart' and 'next' buttons. A footer box contains instructions: 'Click any white field and type away! You can TAB between them. To get instructions or see an example, click the purple button to the left of the white field. When you've finished the page, click "NEXT"; to start from scratch, click "RESTART".'

Use Control-C to copy selected text, Control-V to paste and Control-X to cut.

**making a CAT therapy**

Your Question   the Study Patients   the Study Evidence   the Bottom Line   the Other Stuff

Your 3-part Clinical Question

Your Search Terms

Enter your PICO question here.

Be specific enough that someone can duplicate your search

restart   next



Click any white field and type away! You can TAB between them. To get instructions or see an example, click the purple button to the left of the white field. When you've finished the page, click "NEXT"; to start from scratch, click "RESTART".

# CATmaker: The Study Patients

catmaker

CATmaker

Use Control-C to copy selected text, Control-V to paste and Control-X to cut.

 **making a CAT therapy** 

Your Question **the Study Patients** the Study Evidence the Bottom Line the Other Stuff

Patients' key Clinical Characteristics

Control Regimens and Durations

Experimental Regimens and Durations

The Study Features

restart previous next

Now think about the patients who were in the citation and how they were treated and studied. For more information on any item, click the relevant purple button. When you're finished, click "NEXT".

**C** **E** **B** **M**

Consisely extract patient data to allow the reader to determine if the study groups were homogenous and if subjects are similar to readers' patient.		
Concisely describe the study control groups to include treatment and duration.		
Consisely describe the experiemntal group to include number enrolled and number used for analysis.		
Randomised Controlled Trial.? <input type="radio"/> Yes <input type="radio"/> No	Blinding..? <input type="radio"/> Single <input type="radio"/> Double <input type="radio"/> None	Intention-to-Treat..? <input type="radio"/> Yes <input type="radio"/> No




# CATmaker: The Study Evidence


catmaker

CATmaker

Use Control-C to copy selected text, Control-V to paste and Control-X to cut.



## making a CAT therapy



Page 1 of 2

[Your Question](#)
[the Study Patients](#)
[the Study Evidence](#)
[the Bottom Line](#)
[the Other Stuff](#)

E V I D E N C E S U M M A R Y					
EVENT	Time to Event	Control or Placebo		Experimental	
		Total Patients Entered:	25	Total Patients Entered:	25
		Total Patients Analysed:	23	Total Patients Analysed:	24
Unhealed Wound after 12 weeks of care	12 Weeks	Number of Events:	12	Number of Events:	18
		Control Event Rate (CER):	<input type="text"/>	Exptl. Event Rate (EER):	<input type="text"/>
		Number of Events:	<input type="text"/>	Number of Events:	<input type="text"/>
		Control Event Rate (CER):	<input type="text"/>	Exptl. Event Rate (EER):	<input type="text"/>
		Number of Events:	<input type="text"/>	Number of Events:	<input type="text"/>
		Control Event Rate (CER):	<input type="text"/>	Exptl. Event Rate (EER):	<input type="text"/>

[Click here to Record Other Outcomes](#)
[Click here to Record Differences between Means](#)

[restart](#)
[calc](#)
[previous](#)
[next](#)

Please enter: the numbers of patients analysed in the Control and Experimental groups; the Events of interest (over which times); and either the Numbers or Rates (decimal proportions) of these Events. "CALC" will check their consistency and the follow-up rate. You can also record continuous outcomes.

# CATMaker: The Study Evidence

catmaker

CATmaker

Use Control-C to copy selected text, Control-V to paste and Control-X to cut.

**making a CAT therapy**

Your Question   the Study Patients   **the Study Evidence**   the Bottom Line   the Other Stuff

Page 2 of 2

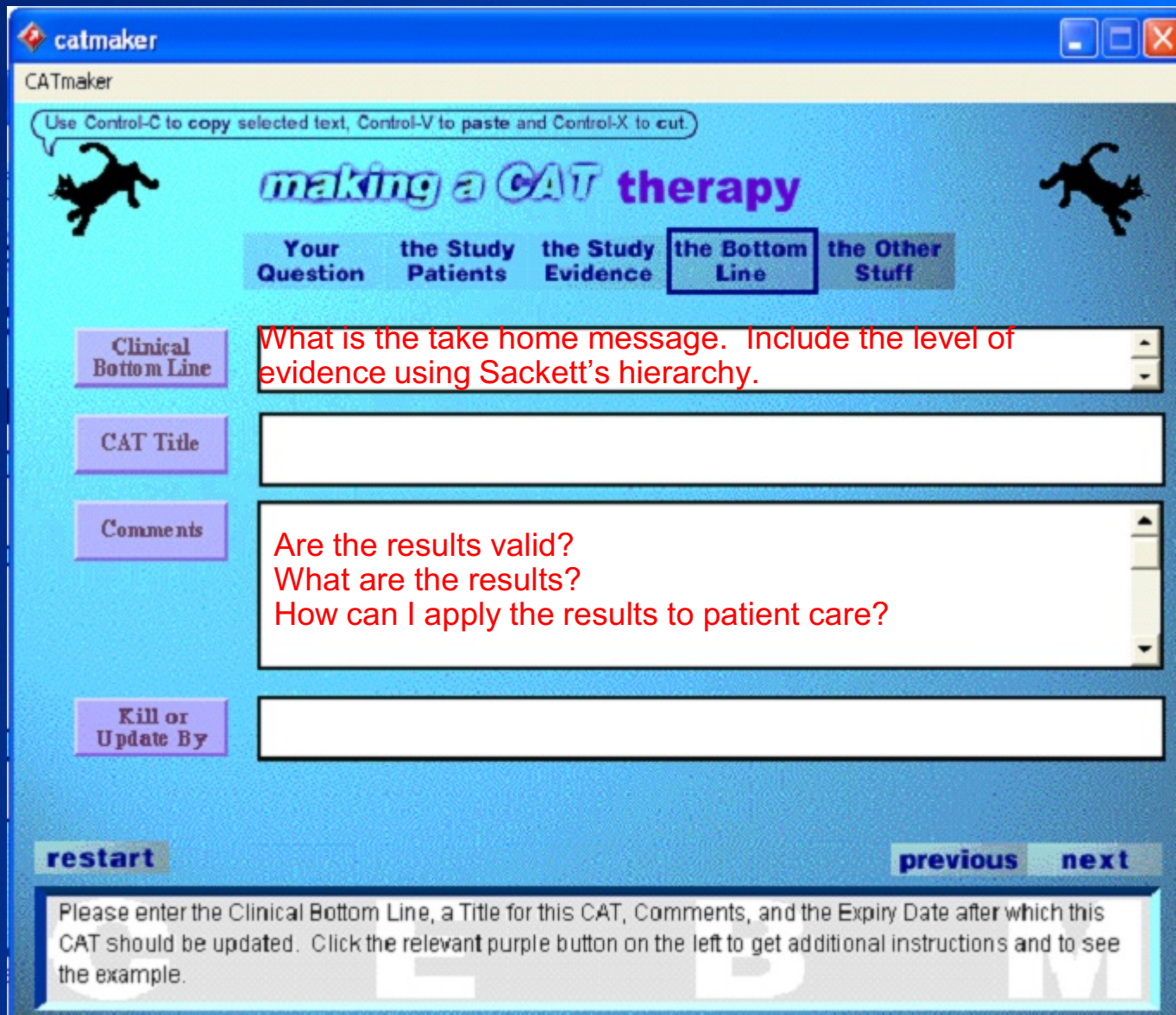
EVIDENCE SUMMARY					
EVENT	CER	EER	Relative Risk Reduction (RRR) 95% C.I.	Absolute Risk Reduction (ARR) 95% C.I.	Number Needed to Treat (NNT) (NNH if negative) 95% C.I.
Unhealed Wound after 12 weeks of care	0.480	0.720	-50% -10.5% to 5%	-0.240 -0.503 to 0.023	-4 NNT = 43 to INF; NNH = 2 to INF
	<input type="text"/>	<input type="text"/>			
	<input type="text"/>	<input type="text"/>			

[Click here to Record Other Outcomes](#)   [Click here to Calculate an NNT for Your Patient](#)

**restart**   **show formulae**   **calc**   **previous**   **next**

Clicking CALC will convert the previous screen's entries into Relative (RRR) and Absolute (ARR) Risk Reductions, Numbers Needed to Treat (NNT) and 95% Confidence Intervals (CI). Negative NNTs indicate Numbers Needed to Harm (NNH); if their CI is both positive and negative, both NNT and NNH go to infinity.

# CATmaker: The Bottom Line



The screenshot shows the CATmaker application window. The title bar reads 'catmaker'. Below the title bar, there is a navigation menu with five items: 'Your Question', 'the Study Patients', 'the Study Evidence', 'the Bottom Line' (which is highlighted with a blue border), and 'the Other Stuff'. The main content area has a light blue background with a speech bubble at the top containing the text: 'Use Control-C to copy selected text, Control-V to paste and Control-X to cut.' Below this, there are two black cat silhouettes flanking the text 'making a CAT therapy'. The 'Clinical Bottom Line' section contains a text input field with the red text: 'What is the take home message. Include the level of evidence using Sackett's hierarchy.' Below this is the 'CAT Title' section with an empty text input field. The 'Comments' section contains a text area with the red text: 'Are the results valid? What are the results? How can I apply the results to patient care?'. The 'Kill or Update By' section contains an empty text input field. At the bottom, there are 'restart', 'previous', and 'next' buttons. A footer box contains the text: 'Please enter the Clinical Bottom Line, a Title for this CAT, Comments, and the Expiry Date after which this CAT should be updated. Click the relevant purple button on the left to get additional instructions and to see the example.'

catmaker

CATmaker

Use Control-C to copy selected text, Control-V to paste and Control-X to cut.

making a CAT therapy

Your Question the Study Patients the Study Evidence **the Bottom Line** the Other Stuff

Clinical Bottom Line

What is the take home message. Include the level of evidence using Sackett's hierarchy.

CAT Title

Comments

Are the results valid?  
What are the results?  
How can I apply the results to patient care?

Kill or Update By

restart previous next

Please enter the Clinical Bottom Line, a Title for this CAT, Comments, and the Expiry Date after which this CAT should be updated. Click the relevant purple button on the left to get additional instructions and to see the example.

# CATmaker: The Other Stuff

catmaker

CATmaker

Use Control-C to copy selected text, Control-V to paste and Control-X to cut.

**making a CAT therapy**

Your Question   the Study Patients   the Study Evidence   the Bottom Line   **the Other Stuff**

Citations

Lead Author's Name & Fax

Your Name/s Address & Fax

Your Email

Date of Birth of this CAT

Use the CATmaker menu to save your finished CAT

restart   previous

Click the buttons down the left hand side to get instructions and/or see an example of what a typical entry looks like. When you're finished, the CATmaker menu offers three formats for saving your CAT (\*.bt CAT, HTML webCAT and Kitten). Remember that only kittens can be re-loaded into CATmaker

# CAT Comments

# Are the Results Valid

- Describe the patient selection process.
- Was this a blinded study - who was blinded?
- Was the treatment and control group homogenous?
- Did the study design lend itself to bias?
- Who paid for the study?
- Was there an intention to treat analysis?

# What are the results?

- Need to discuss point estimates and confidence intervals.
  - ▶ NNT of 6 with 95% CI -27 to 46
  - ▶ NNT of 24 with 95% CI 5 to 42
- Effect size and discussion of minimal clinically important difference (MCID)
  - ▶ 6MWT - 39 meters in patient's with pulmonary hypertension
- Need to understand some key EBP stats

# Ready for the CAT stats?



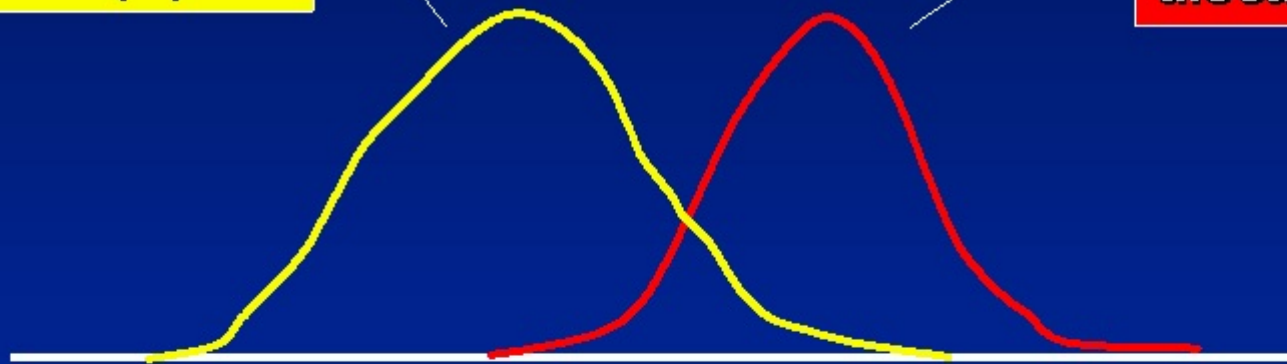
"Testing...testing...one, two, three."



# Diagnostic Test Results Often on a Continuous Scale

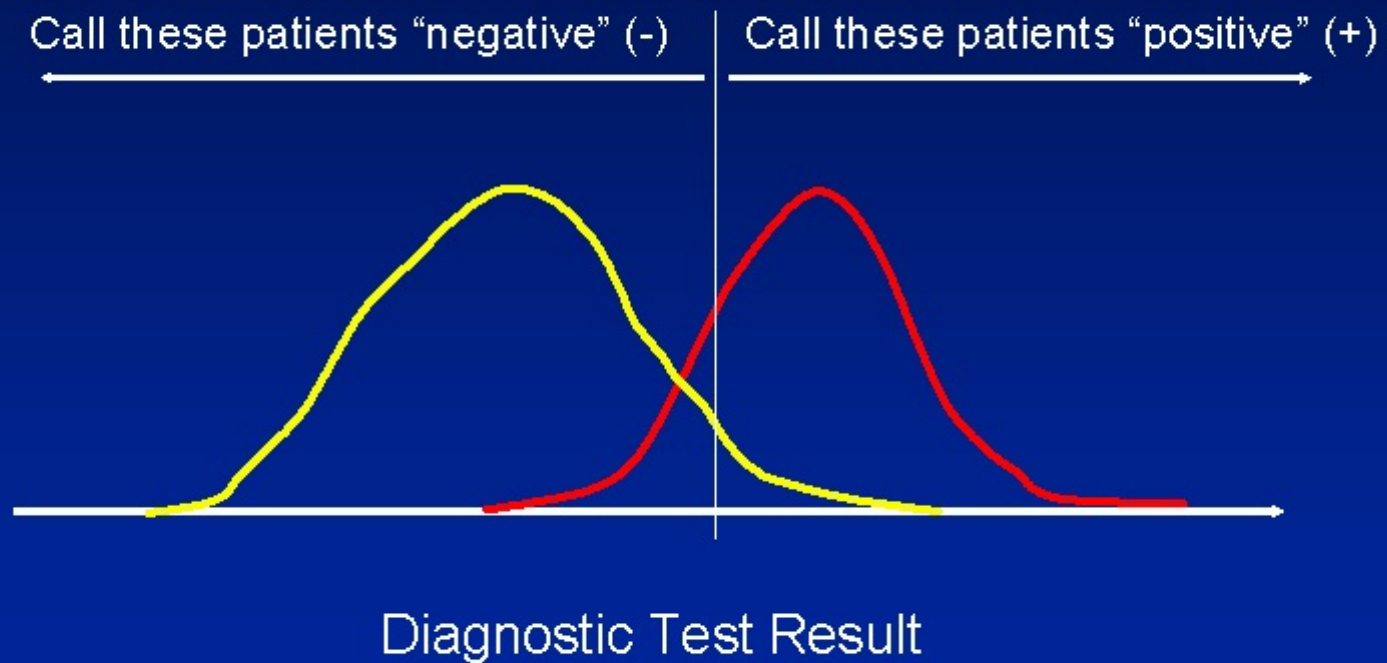
Pts without the  
disease (H)

Pts with  
disease (D)



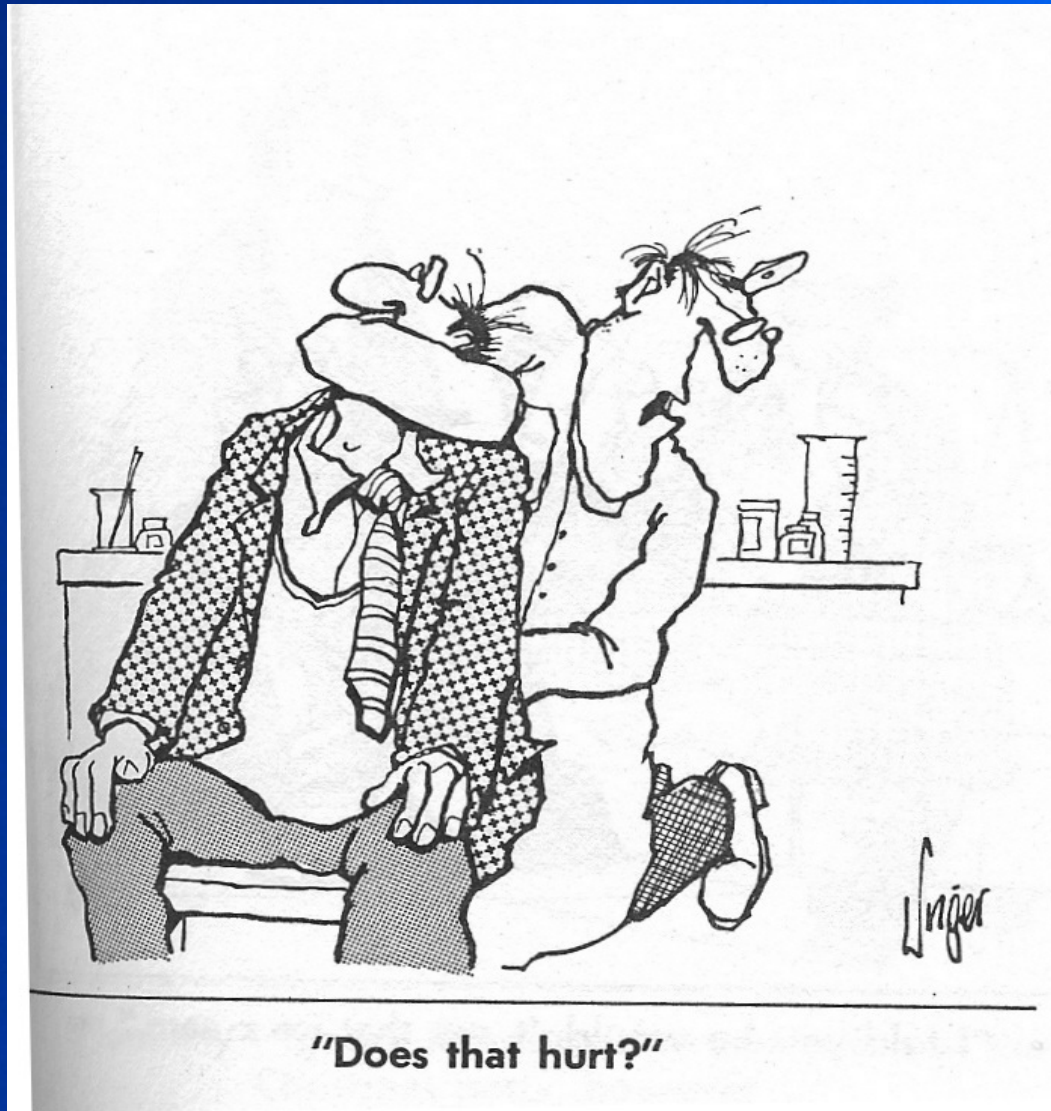
Diagnostic Test Result

# Consider a Cut-point



without the disease (H)  
with the disease (D)

# The Test in Question



# Diagnostic Test Results

Test Result	Condition Present	Condition Absent
Positive	True Positive A	False Positive B
Negative	False Negative C	True Negative D
	SENSITIVITY $A/(A+C)$	SPECIFICITY $D/(B+D)$

## Cut-point Gives Rise to a 2 x 2 table

Consider 1000 patients: 500 with a disease, 500 without

	with disease	no disease	total
test +	400	50	450
test -	100	450	550
total	500	500	1000

# Positive Likelihood Ratio

Positive Likelihood Ratio:

In our example:

$$LR^+ = \frac{\text{sensitivity}}{1 - \text{specificity}} = \frac{0.8}{1 - 0.9} = 8.0$$

Indicates:

- How much odds of disease is increased if test is positive
- A ratio of something that is desirable (true positives) divided by something undesirable (false positives)

General Guidelines:

- 1 => Test is Useless
- 1 - 2 => Rarely important change in pre- to post test odds
- 2 - 5 => Small Change
- 5 - 10 => Moderate Change
- >10 => Large Change

# Negative Likelihood Ratio

Negative Likelihood Ratio:

In our example:

$$LR^- = \frac{1 - \text{sensitivity}}{\text{specificity}} = \frac{1 - 0.8}{0.9} = 0.22$$

Indicates:

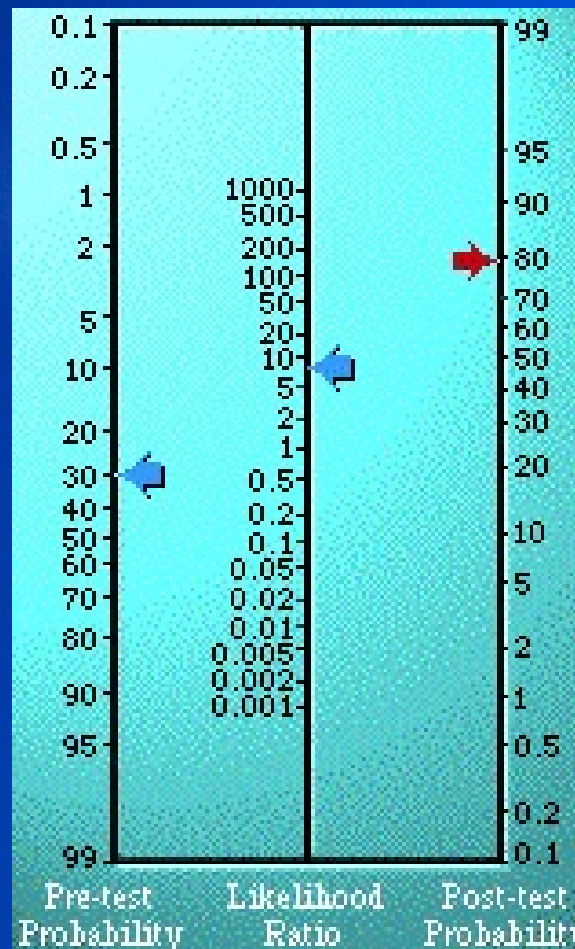
- How much odds of disease is decreased if test is negative
- A ratio of something that is undesirable (false negatives) divided by something desirable (true negatives)

General Guidelines:

0.5 - 1	=>	Rarely important change in pre- to post test odds
0.2 - 0.5	=>	Small Change
0.1 - 0.2	=>	Moderate Change
0 - 0.1	=>	Large change in pre- to post test odds

# Use of Nomogram

Allows the clinician to use results from multiple tests





# Control Event Rate (CER)

Proportion of Patients Responding to Control Treatment

Example:

25 patients in control group

Event studied observed in 15/25

$$\text{CER} = 15/25 = 0.60$$

# Experimental Event Rate (EER)

Proportion of patients responding to experimental treatment

Example:

26 patients in experimental group

Event being studied observed in 22/26

$$\text{EER} = 22/26 = 0.85$$

# Relative Risk Reduction (RRR)

Percent reduction in measured outcome between experimental and control groups

## Example:

Outcome = Cure Rate

Experimental Group Cure Rate = 85%

Control Group Cure Rate = 60%

$RRR = (85-60)/60 = 42\%$

Caution: RRR can make small effect rates seem more important.

# Absolute Risk Reduction (ARR)

Difference in outcome event rate between experimental group and control group

## Example:

Outcome = Cure Rate

Experimental Group Cure Rate = 85%

Control Group Cure Rate = 60%

$ARR = 85 - 60 = 25\%$

# Number Needed to Treat (NNT)

Number of patients who must be treated to prevent one adverse outcome or for one patient to benefit

$$\text{NNT} = 1/\text{ARR}$$

Experimental Group Cure Rate = 85%

Control Group Cure Rate = 60%

$$\text{NNT} = 1/(0.85-0.60) = 4$$

**NNT is most clinically useful statistic.**

Typically a NNT of  $\leq 10$  is useful for treatments.

# Example CAT Statistics Table

## Efficacy of MIST Ultrasound in the Treatment of Chronic Diabetic Foot Ulcers

The Evidence:

Outcome	Time to Outcome	CER	EER	
Failure of wound to close	Up to 12 weeks	0.778	0.743	
	95% Confidence Intervals:			-
Clinically significant adverse reactions such as wound enlargement, wound infection, blister formation or additional wound formation	Up to 12 weeks	0.016	0.100	-
	95% Confidence Intervals:			-1



Rav Stubblebine / Reuters

# Call to all BOP Therapists

Begin to practice EBP by completing one CAT per quarter with submission to Advanced Therapy Practice web page.

Therapist Professional Advisory Committee

## Advanced Physical Therapy Practice

*To Shed Light on Advanced Medical Practices as a U.S. Public Health Service Therapist*

### Purpose:

"Evidence Based Medicine (EBM) has been defined as "the conscientious", explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research" David Sackett et. al "Evidence Based Medicine: What it is and What it isn't" BMJ 312 No. 7023 (1996).

Discipline Board Certifications	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
Other Specialty Certifications	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
Clinical Research Contributions	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
Evidence Based CME's	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
CAT Express	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
Evidence Based Medicine Links	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
Clinical Consultation Forums	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>
Therapy Presentation Postings	<a href="#">PT</a> <a href="#">OT</a> <a href="#">SLP/Aud</a>



# Any Questions?

