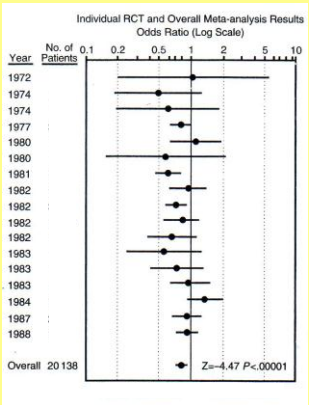
# How to read a Systematic Review ***FAST***

Dr Su May Liew

Massive heart attack




A **Systematic Review** is 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 analyse data*** from the studies that are included in the review

Most reviews do not pass minimum criteria

A study of 158 reviews*

- Only 2 met all 10 criteria
- Median was only 1 of 10 criteria met

* McAlister Annals of Intern Med 1999

## Is the review any good? FAST appraisal

- **Q**uestion – What is the PICO?
- **F**inding
  - Did they find most studies?
- **A**ppraisal
  - Did they select good ones?
- **S**ynthesis
  - What to they all mean?
- **T**ransferability of results

## What is your question?

Search for a systematic review

Does the PICO of the review fit that of your question?

## Using Pedometers to Increase Physical Activity and Improve Health

A Systematic Review

Dena M. Bravata, MD, MS
Crystal Smith-Spangler, MD
Vandana Sundaram, MPH
Allison L. Gienger, BA

**Context** Without detailed evidence of their effectiveness, pedometers have recently become popular as a tool for motivating physical activity.

**Objective** To evaluate the association of pedometer use with physical activity and health outcomes among outpatient adults.

- Population
- Intervention
- Comparison
- Outcome(s)

## Do pedometers increase activity and improve health?

- **Find: what is your search strategy?**
  - **Databases?**
  - **Terms?**
  - **Other methods?**

Do yourself then
Get neighbour's help

**METHODS**

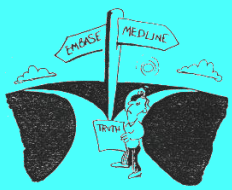
**Data Sources and Search Strategies**

In collaboration with a professional librarian, we developed individualized search strategies for 7 databases: MEDLINE (January 1966 to February 2007); and EMBASE, Sport Discus, PsychINFO, Cochrane Library, Thompson Scientific (formerly known as Thompson ISI), and ERIC (January 1966 to May 2006). We used search terms such as *pedometer*, *activity monitor*, and *step counter*. We also reviewed the bibliographies of retrieved articles and relevant conference proceedings and contacted experts in exercise physiology for additional studies.



## FIND: Did they find all Studies?

- Check for existing systematic review?
- Good initial search
  - Terms (text and MeSH)
  - At least 2 Databases: MEDLINE, EMBASE, CINAHL, CCTR, …
- Plus a Secondary search
  - Check references of relevant papers & reviews and
  - Find terms (words or MeSH terms) you didn't use
  - Search again! (*snowballing*)






## Is finding all published studies enough?

- Negative studies less likely to be published than 'Positive'
- How does this happen?
- Follow-up of 737 studies at Johns Hopkins*
  - Positive SUBMITTED more than negative (2.5 times)

*Dickersin, JAMA, 1992

FIND | APPRAISE | SYNTHESISE | TRANSFERABLE

## Registered vs Published Studies

Ovarian Cancer chemotherapy: single v combined

| | Published | Registered |
|---|---|---|
| No. studies | 16 | 13 |
| Survival ratio | 1.16 | 1.05 |
| 95% CI | 1.06-1.27 | 0.98-1.12 |
| P-Value | 0.02 | 0.25 |

Simes, J. Clin Oncol, 86, p1529

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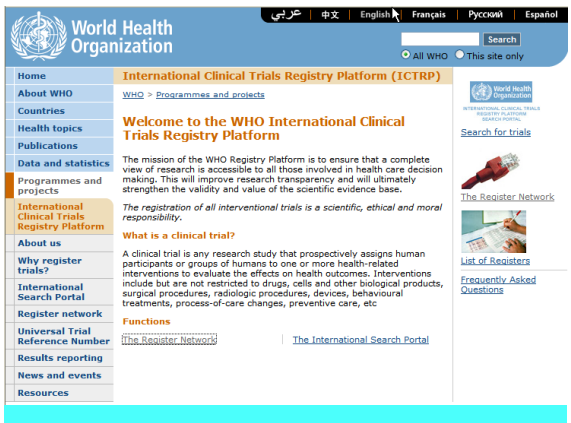
## Which are biased? Which OK?

1. All positive studies
2. All studies with more than 100 patients
3. All studies published in BMJ, Lancet, JAMA or NEJM
4. All studies registered studies

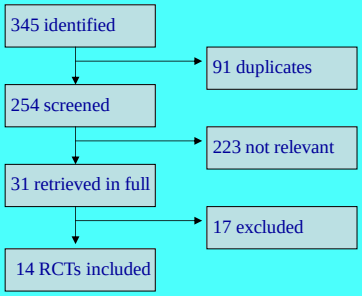
FIND | APPRAISE | SYNTHESISE | TRANSFERABLE

## Publication Bias: Solution

- All trials registered at inception,
  - The National Clinical Trials Registry: Cancer Trials
  - National Institutes of Health Inventory of Clinical Trials and Studies
  - International Registry of Perinatal Trials
- Meta-Registry of trial Registries
  - www.controlled-trials.com




## Flowchart



FIND | **APPRAISE** | SYNTHESISE | TRANSFERABLE

# APPRAISE & select studies

Did they select only the good quality studies?


FIND | **APPRAISE** | SYNTHESISE | TRANSFERABLE

## Assessment: How can you avoid biased selection of studies?

- Assessment and selection should be:
  - Standardized "Objective" OR
  - Blinded to Results

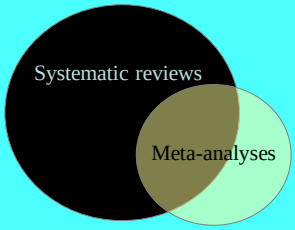
* assessment of quality blind to study outcome

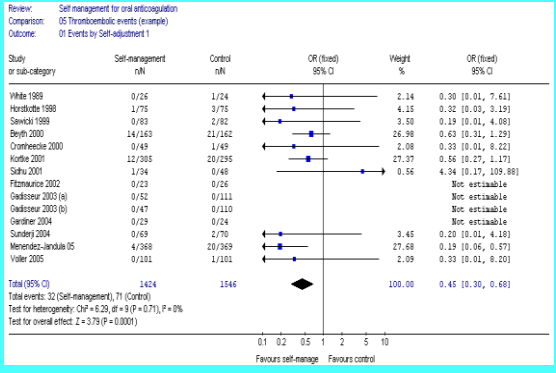
FIND | APPRAISE | **SYNTHESISE** | TRANSFERABLE

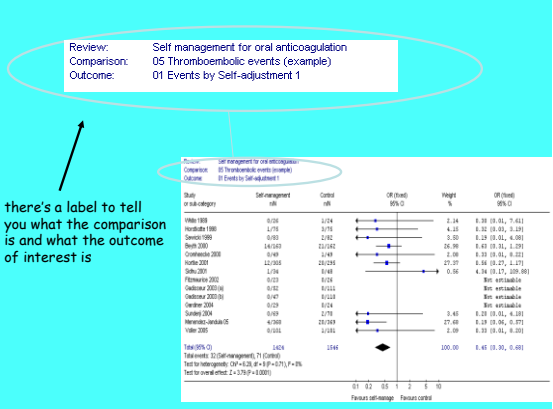
## Synthesis: pooling the results

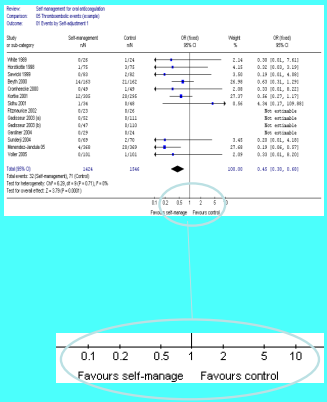

## What is a meta-analysis?

*Optional* part of a systematic review

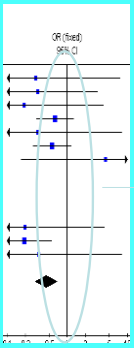


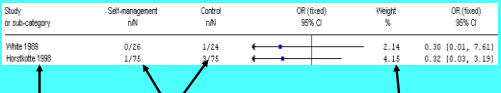






At the bottom there's a horizontal line. This is the scale measuring the treatment effect.



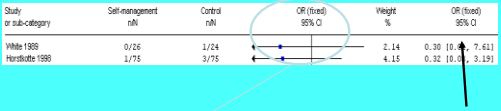

The vertical line in the middle is where the treatment and control have the same effect – there is no difference between the two



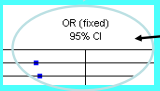

For each study there is an id

The data for each trial are here, divided into the experimental and control groups

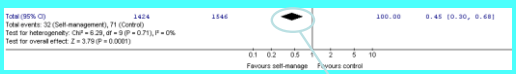
This is the % weight given to this study in the pooled analysis




The data shown in the graph are also given numerically



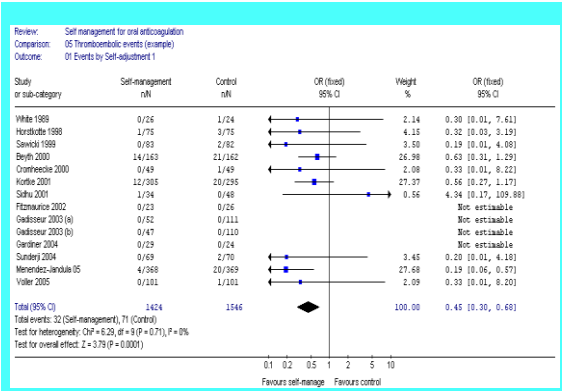

The label above the graph tells you what statistic has been used




The pooled analysis is given a diamond shape where the widest bit in the middle is located at the calculated best guess (point estimate), and the horizontal width is the confidence interval

**Note on interpretation**

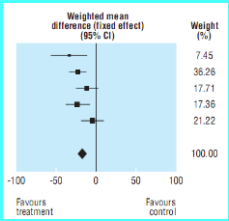
If the confidence interval crosses the line of no effect, this is equivalent to saying that we have found no statistically significant difference in the effects of the two interventions



# Meta-analysis (Forest) plot

The figure on the right is from Figure 3. See if you can answer the following questions about this plot.

1. How many studies are there?
2. How many studies favour treatment?
3. How many studies are statistically significant?
4. Which is the largest study?
5. Which is the smallest study?
6. What is the combined result?






# Meta-analysis (Forest) plot

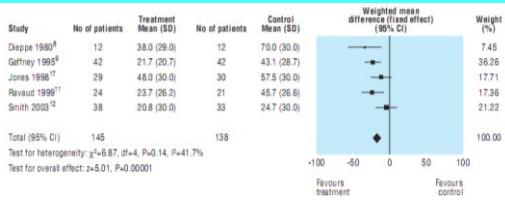
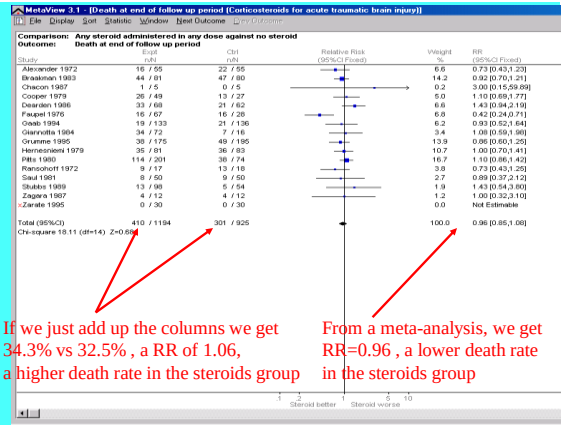



Fig 4 Visual analogue scale for pain up to two weeks after steroid injection in knee

# Weighting studies

- More weight to the studies which give us more information
  - More participants
  - More events
  - More precision
- Weight is proportional to the precision




If we just add up the columns we get 34.3% vs 32.5% , a RR of 1.06, a higher death rate in the steroids group

From a meta-analysis, we get RR=0.96 , a lower death rate in the steroids group



# Transferable? Use in my patients

Is the AVERAGE effect similar across studies?

- If NO, then WHY?
  - Study methods - biases
  - PICO
- If YES, then 2 questions
  - Effect in different individuals?
  - Which version of treatment?



# Meta-analysis (Forest) plot

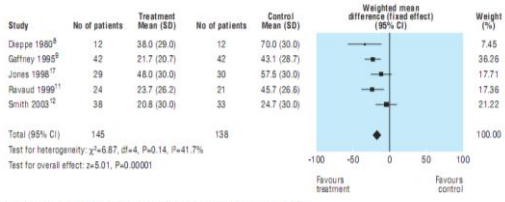



Fig 4 Visual analogue scale for pain up to two weeks after steroid injection in knee

Are the results <u>similar</u> across studies? 3 tests

- Eyeball" test – do they look they same?
- Test of "Null hypothesis" of no variation (p-value)
- Proportion of variation not due to chance ($I^2$)

FIND | APPRAISE | SYNTHESISE | **TRANSFERABLE**

## Are these trials different?

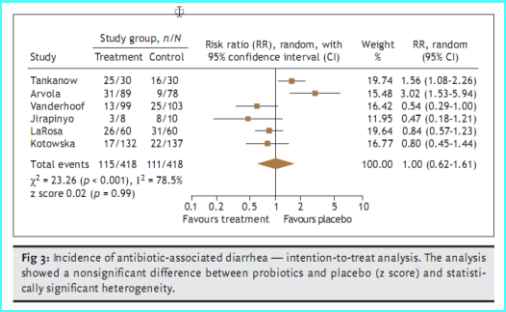
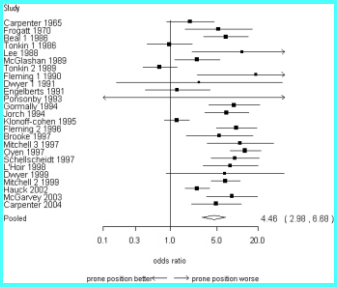
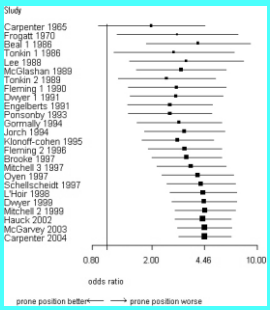



**Fig 3:** Incidence of antibiotic-associated diarrhea — intention-to-treat analysis. The analysis showed a nonsignificant difference between probiotics and placebo (z score) and statistically significant heterogeneity.

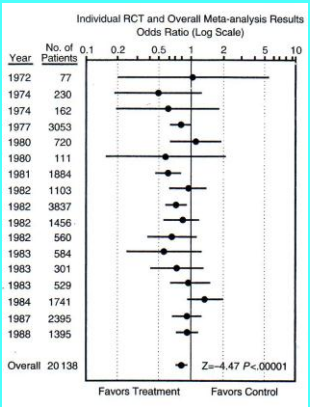
## Risk of SIDS and sleeping position

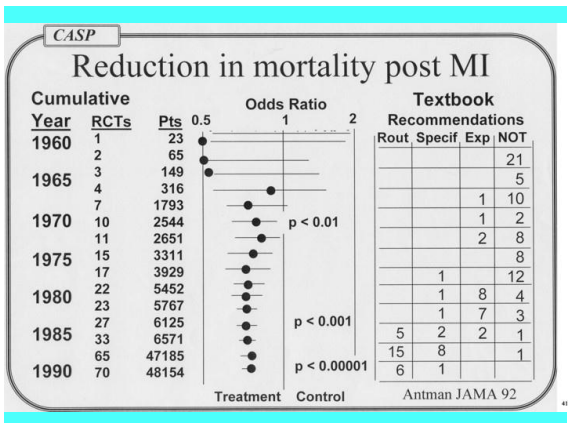



Cumulative meta-analysis

When did we know that sleeping position affected mortality?




## Conclusion
## EBM and Systematic Review

- EBM (quick & dirty)
  - Ask Question
  - Search
  - Appraise
  - Apply
- Time: 90 seconds
- < 20 articles
- This patient survives!

- Systematic Review
  - Ask Question
  - Search ++++ x 2
  - Appraise x 2
  - Synthesize
  - Apply
- Time: 6 months, team
- < 2,000 articles
- This patient is dead

Find a systematic review!! (and appraise it FAST)

## Pros and cons of systematic reviews

- Advantages
  - Larger numbers & power
  - Robustness across PICOs
- Disadvantages
  - May conclude small biases are real effects