# Becoming a Critical Reader

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## Becoming a Critical Reader

Disclosure:

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## Reading Well or Writing Well?

- ABOS requires residents to write, but…
- No "critical reading" requirement of residents
- No standards for journal clubs
- We don't all need to write, but we all need to read; our deficiencies in this area allow other information sources to fill the gaps

Which is more important?

## Eminence-based Medicine

C. Everett Koop, MD—Former Surgeon General of the United States

*"It is true there are people in my situation who could not receive a million-dollar grant and stay objective. But I do."*

## AAOS CPG on HA

OrthoGuidelines | AAOS American Academy of Orthopaedic Surgeons

Search Orthoguidelines

Home | Guidelines | Appropriate Use Criteria | Implementation Resources | Education/CME Credit

Home > All Guidelines > Treatment of Osteoarthritis of the Knee (2nd edition)

**Treatment of Osteoarthritis of the Knee (2nd edition)**

Full Guideline PDF | Print Summary | View Case Study

Non-Arthroplasty Treatment of Osteoarthritis of the Knee AUC

Viscosupplementation; cannot recommend

★★★★ STRONG EVIDENCE

Biologic Injections

INCONCLUSIVE

## Since CPG, Market Share INCREASED

european pharmaceutical review

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Viscosupplementation market value to exceed $2.6 billion by 2021, says GlobalData

25 June 2015 • Author: Victoria White

## If We Don't Read Well

- rhBMP
- MoM THA

***Ads, not science, will drive practice***

- Intra-articular local anesthesia catheters

## Reading Affects Our Patients

- We know what needs to happen
- We know what should drive our practice choices
- How well we read affects our patients' lives and health

**So…**

## How Do You Treat This?

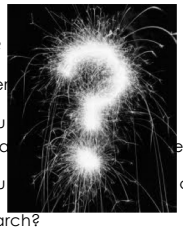
Active 55 year old woman

What do you do?

Hemi?
Bipolar?
THA?
ORIF?

## How Did You Make Your Choice?

- Guess?
- Ask the rep?
- Ask a partner
- Do what you
  - May (or mo e years, but then…?
- Do what you conference?
- MedLine search?



## But the Search Yielded 300 Hits!?!

- How do you know what you find is good?
- You're so busy…how to read efficiently?
- No one is born doing this
- Acquired skill

## Topics

- Types of validity
- Most common kinds of bias in clinical research
- Three "Questions to Ask" of most common study designs

## Validity: Two Types

- Internal validity ("Methodological Rigor")
  - Within boundaries of the methods, conclusions appear reasonable
  - Different criteria for internal validity are used for different study types
- External validity ("Generalizability")
  - Can results of an internally valid study be applied to MY practice
  - Patient population, study site, provider experience, technology
  - Consistent criteria for all study designs
- External validity X Internal validity = 1
  - Restrictive inclusion criteria: Homogeneous but not "real-world"

## Good Studies Can Lack "Validity"?

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## Bias

***"A systematic situation or condition that causes a result to depart from the true value in a consistent direction. Bias refers to defects in study design or measurement."****

*AMA Style Guide, 10th ED

## Bias: Three Common Types

- Selection bias
- Transfer bias
- Detection bias

## Selection Bias

- Compare results between prognostically dissimilar groups
- Prevent with appropriate randomization

## Transfer Bias

- Loss to follow-up or insufficiently long followup
- Especially important when differential loss to follow-up
- Non-responders usually have worse health status
- Would a worst-case analysis change the conclusion?

## Detection (Assessment) Bias

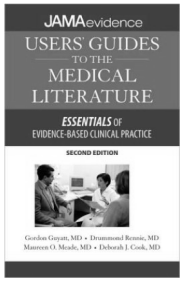
- Who's asking the questions and how?
- Use of non-standardized or inconsistent endpoints
- Blinding, independent examiners, validated instruments are best

## Most Common Study Types

- Retrospective Therapy Study
- Prospective Therapy Study
- Meta-analysis or Systematic Review

***3 questions on each one***

## Resource for the Curious



## Approaching an Article

- All types: Begin by assessing external validity
- Can you apply it to your practice?
- Do their patients look like yours?
- Do you "have the technology"?
  - If not…

## Skip It!

## If it Looks Good, Ask…

- If "true," is it interesting/useful?
  - Key: Don't try to tell if it's "true" from the abstract; you can't
- Can you tell what they're really studying?
  - Good, clear questions?
- If not…

## Skip It!

## If it Looks Interesting: Skip the Intro!

- Go right to methods
- Check for major deficiencies ("fatal flaws")
- If obviously flawed…

## Skip It!

## Then, Skip to the Methods

- A few key questions for each study design
- Let's look at each of the "big 3"
  - Retrospective Therapy Study
  - Prospective Therapy Study
  - Meta-analysis / Systematic review

## Retrospective Therapy Studies

- Who received the intervention, and were all of those patients included? (Selection bias)
  - Selection bias: What % of patients were enrolled? Which ones?
- Was followup sufficiently long and complete? (Transfer bias)
  - Transfer bias: 97% successful but 55% of patients lost to followup
- Were outcomes measured appropriately? (Detection bias)

## Common Biases are Additive

- Typically, same kinds of bias appear
  - Selection bias
  - Transfer bias
  - Assessor bias
- Effect is not offsetting, it's additive
  - Increase the effect size, generally favor new treatment
  - Higher LoE: Smaller effect sizes

## Prospective Therapy Studies

- Same questions as retrospective studies, plus:
- Were groups similar at the outset of the trial?
  - Randomization helps
- Aside from new treatment, were groups treated equally
  - Blinding helps
- If randomized, was intention-to-treat applied?
  - Not doing this tends to make the treatment look better than it is

## Meta-Analysis and Systematic Review

- Was the search adequately described?
  - Search terms, databases
  - Inclusion/exclusion criteria and how applied
  - "Grey literature"
- Do the authors deal with the fact that not all studies are similarly designed and convincing?
  - Do they grade studies by quality or are all lumped together?
- Do the authors address publication bias and heterogeneity?
  - Is it even appropriate to pool data (meta-analyze)?

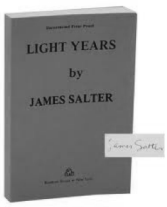
## If It "Passes," Read Results Next

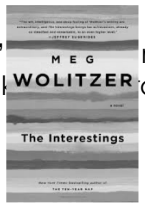
- What do YOU conclude from them?
- Is there anything new here?
- Are there any "caveats" or limitations you'd apply based on methodological limitations?

## Finally, Read Intro / Discussion

- Now it's more fun…
  - You've already decided what you think
  - You don't have to take their word for it
- If it seemed valid, Intro/Discussion gives context, may point out some limitations you missed

## Have Fun!




read
ature


# *Thank You*

## No-Difference / "Negative" Studies

- Important to publish
  - Positive-outcome bias harms meta-analysis
  - Pooled POB: Overestimates treatment effect sizes
  - Resource utilization: Duplication of effort
- Not always "fun" reading, but often important
  - Tip you off that initial positive findings may not be true
  - Often no-diff studies are better-designed studies
    - Eliminate bias -> decrease effect size
  - Cautionary messages

## No Difference / "Negative" Studies

- Insufficient power
  - Could a difference have been detected if present?
  - If not, be modest with conclusions drawn
  - No-difference finding + immodest discussion = misleading conclusion
- Absence of proof ≠ inefficacy

*Users' Guides to the Medical Literature: Essentials of Evidence-Based Clinical Practice, 2nd Ed.* (Guyatt, Rennie, Meade, and Cook; McGraw Hill Professional, 2008)

- Originally published in '90s in *JAMA* as series of "Users' Guides"
- Subsequently republished in *JBJS*
- Very well done

## And One More: Publication Bias

- Most common type: Positive-outcome bias
  - More later: Importance of (and how to interpret) no-difference studies
- More generally: Influence of non-scientific factors on likelihood of publication
- Factors: Direction of finding, funding source, country of origin
- Publication bias may occur at different levels
  - Investigator
  - IRB
  - Journal

## Quick Power Tutorial

- Four elements: Alpha, Beta, Delta, Variance
- Alpha: Chance of falsely concluding a difference if absent
- Beta: Chance you'd fail to detect a difference if present
- Delta: Difference you wish to be able to detect
- Variance: Spread of data in your sample

## What's Wrong With This?

- "With six specimens we had 80% power to detect a difference between treatment and control"
- Difference to detect *WHAT?* Need delta.
- Common, misleading power statement