

**Fake News and Alternative Facts:  
Being an Informed Consumer of  
Medical Science**

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**Disclaimer**

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Neither presenter has any financial conflicts of interest to disclose

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There is a high likelihood of feeling uncomfortable when discussing strongly-held beliefs

**Aims**

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- Be aware of the continuum of evidence in medical research
- Identify several study designs in treatment studies
- Be able to spot “red flags” for potentially unsupported treatments

## Grand Overview: Scientific Method

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- Evaluate current evidence
- Formulate hypothesis
- Test hypothesis
- Aggregate findings into theoretical framework
- Use theoretical model to contribute to formulate, refine, and test additional hypotheses
- Repeat...

## How do Consumers Evaluate Medical Claims?

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- Does it feel true?
- Do we want it to be true?

## Problem 1: Cognitive Biases

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- “The first principle is that you must not fool yourself – and you are the easiest person to fool.” – Richard Feynman

## Problem 1: Cognitive Biases, Continued

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- We tend to remember/believe things that confirm our expectations
- Practitioners can be fooled
  - Remember success stories
  - Improving patients are more likely to return
  - Improvements are often informally assessed and not quantified and tested
  - Demand characteristics: Patients tend to report nice things

**Solution 1: Acknowledge the susceptibility to be fooled; Consult with external sources**

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- ▣ What does tradition say?
- ▣ What do authority figures claim?
- ▣ Should we defer to those speaking with confidence or eloquence?

**Problem 2: Authority, tradition, and charm have no direct relationship with reality**

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- ▣ Blood-letting and indiscriminate use of leaches were used for centuries
- ▣ Tarot cards have a long track record, but undemonstrated validity
- ▣ TV doctors give the impression of authority and professionalism, but often dispel oversimplified or even misleading information

**Problem 2, Continued: TV Doctors**

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- ▣ A 2014 study (Korownyk et al., 2014) evaluated 80 randomly selected "stronger" recommendations from "The Dr. Oz Show" and found that evidence (including as little as a single case study) agreed with claims for 46% of claims made on the shows.
- ▣ 15% of recommendations were directly contradicted by medical evidence and a panel of content experts concluded that only 33% of recommendations were either "believable" or "somewhat believable."
- ▣ Of 479 specific recommendations made on "The Dr. Oz Show," only once was a potential conflict of interest disclosed.

**"I think the way to live your life is to find the study that sounds the best to you and you go with that."**

- \*Dr. Al Roker

\*Honorary Doctorate from New York College of Health Professionals, 2006

## Solution 2: Consult Original Research

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- Withhold judgment
- Examine relevant research
- Be willing to change your position if the evidence is sound and convincing

## The Evidence Continuum: From Informative to Misleading

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- Preliminary evidence can be established through case studies and pre- post-treatment designs

## Anecdotal Evidence

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- Non-scientific observation or studies
- Does not provide proof but may assist in generating research hypothesis
- Reliability by objective, independent assessment may be in doubt

## Case Studies

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- Good for illustrating concepts, highlighting key issues, and generating hypotheses
  - Better than an anecdote, which is often hearsay (removed from the source)
  - Necessarily cherry-picked for novelty
  - Saliency is often heightened because it creates a tangible mental image

### Pre-post Treatment Studies

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- ☞ Only addresses whether participant patients are better off at the end of treatment, compared with before treatment

### Problem 3: Not all Research is Equally Valid

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- ☞ 100 sufficiently flawed studies do not equal one well-designed and executed study

### Solution 3: Comparison Groups: Solution

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- ☞ Problems often resolve over time
- ☞ People often improve because they expect to improve
  - A placebo, in research, is designed to appear like a treatment, but without active "ingredients"
    - Sham acupuncture, sugar pill, support group
- ☞ Ideally, participants should not know which treatment condition they receive
  - They are "blinded"

### Definition: Control Group

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- ☞ Control group
  - Groups that serve as standard for comparison in experimental studies
  - Similar characteristics to experimental group
  - Do not receive the intervention

## Cohort Study

- AKA: prospective observational study
- Subjects presently have certain condition
- Follow individuals over time and compare them to people who do not have condition

## Case-Control Study

- Compares those with a condition to those without (control)
- Retrospectively compares frequency of various factors in each group
- Determines relationship between these factors and the condition of interest

## Definition: Cross-Over Studies

- Cross-over studies
  - Studies comparing two or more treatment groups
  - Upon completion of one treatment course, groups are switched to another treatment
  - Groups are randomly assigned to the initial treatment condition

## Problem 4: Researchers may have vested interests

- Vested interests may be only psychological
- They may see problems “improve” because they expect this to happen

Solution 4: To the degree possible, experimenters should not know which condition their participants receive

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- ▣ This is referred to as being “double-blinded”
  - E.g., Vaccine studies

### Definition: Double-Blind

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- ▣ Double-blind method
  - Both subjects and investigators are unaware of who is getting the active treatment
  - Attempts to reduce bias from experimenter expectancies

### Randomized Controlled Trial

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- ▣ Randomly assigns subjects in 2 or more groups w/ at least 1 control group
- ▣ Attempts to account for individual variation in subject pool

### Systematic Review

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- ▣ Critical assessment and eval of all research studies that address particular clinical issue
- ▣ Use organized method of locating, assembling, and eval body of literature
- ▣ Typically includes description of findings

## Meta-Analysis

- Combining data across research studies
- Statistical process that combines findings from multiple studies
- Synthesizes conclusions
- Often used to evaluate the efficacy of treatments

## Problem 5: Some research is published based on spurious findings

- Pressure to publish
- Publication bias of journals
- File drawer effect on researchers
- Spurious "Positive" findings

## Solution 5: Study Design

- Large sample sizes
- Replication by independent groups of researchers

## Problem 6: Meta-analyses

- Meta-analyses, which aggregate findings across published studies, can mislead
- Assembling deeply flawed studies does not wash-out the flaws



### Solution 6: More Recent Meta Analyses have Quality Controls

- ▣ Reporting that accounts for sample sizes
- ▣ Describe the methodological limitations

### Problem 7: Biologically Implausible Mechanisms

- ▣ It is always helpful to know the proposed underlying biological mechanisms, regardless of the results of the outcome research

### Solution 7: Peer Review

- ▣ Professionals review research submissions to ensure biological plausibility, sound statistical analyses, and representative review of the relevant literature
- ▣ Value of fake literature:
  - "Transgressing the Boundaries: Toward a Hermeneutics of Quantum Gravity" -Sokal
  - "The Conceptual Penis as a Social Construct." - Boghossian & Lindsay

### Definition: Peer Reviewed Journals

- ▣ Evaluation of work by professionals
- ▣ Self regulation by qualified members of field
- ▣ Goal is to maintain standards of quality, improve performance, and provide credibility

## Open Access Journals

- ☞ Publications freely available online to anyone
- ☞ Unrestricted use, provided that author/editor is properly attributed
- ☞ Possible damage to peer review
- ☞ Possibly diminishing quality of scientific publishing

## Red Flags: Certainty, Testimonials, and Logical Fallacies

- ☞ Research rarely use terms like “cause” and never “clinically proven”
- ☞ Testimonials are persuasive, but not usually representative
- ☞ Failing to disprove does nothing to establish a claim
- ☞ Failing to demonstrate one thing has no bearing on the validity of competing hypotheses
  - “Western medicine does not have all the answers”
    - So, what? New techniques still need to be rationally demonstrated.

## Solutions: Summary

- ☞ Acknowledge the susceptibility to be misled
- ☞ Consult with relevant research
- ☞ Be willing to change your position if credible evidence suggests
- ☞ Use of control groups
- ☞ Comparisons with placebo treatments
- ☞ Blind research staff (double-blind)
- ☞ This is referred to as being “double-blinded”
- ☞ Large sample sizes
- ☞ Replication
- ☞ Peer-reviewed

## Remaining Obstacles

- ☞ Limited access to top-quality journals, aside from abstracts, which can be misleading
- ☞ Plenty of access to open journals, which usually contain inferior papers
- ☞ Misleading local news health reports

