How to Read and Evaluate Published Basic Science Articles in Dentistry

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Introduction to
Oral Biology 720
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References: Books

- Ben YudKin: Critical Reading-Making sense of Research Papers in Life Sciences and Medicine
- Trisha Greenhalgh: How to Read A Paper
- Stephen H. Gehlbach: Interpreting the Medical Liturature

References: Online

- Naomi Lederer
  Colorado State University Library
  http://lib.colostate.edu/howto/evaljrl2.html
- John W. Little and Roy Parker
  University of Arizona
  http://www.biochem.arizona.edu/classes/bioc568/papers.htm
- Ann McNeal
  Hampshire College
  http://hampshire.edu/~apmNS/design/RESOURCES/HOW_READ.html
- Steven Simon
  Children's Mercy Hospitals and Clinics
  http://www.childrensmercy.org/stats/journal/jour2003-07.htm

Why do we need to read papers?

- Keep your knowledge up-to-date
- Practice modern and evidence-based dentistry
  - Do we simply read any articles?
  - How do we valid the information?
  - What kind of level of evidence for each article?

Why Read Papers?

Greenhalgh 2001, Donald & Greenhalgh 2000

- Do we simply practice evidence based dentistry by following any information in the dental literature?
- Evidence-based medicine
  - "The enhancement of a clinician's traditional skills in diagnosis, treatment, prevention and related areas through the systematic framing of relevant and answerable questions and the use of mathematical estimates of probability and risk"

Reasons to Read Journal Articles

Gehlbach 2002

- New health problems or New disease manifestation
  - Relationship between HPV infection and oral cancer
- Extent & natural history of health problems
  - Prevalence of denture stomatitis in assisted-living facilities
- Accuracy in Dx
  - Use of Cone beam CTs
- New treatments/protocols
  - Immediate implant placement/loading
- Adverse effects of current care
  - Prevalence of implant failure, Bisphosphonate use and osteonecrosis of the jaw bones
- Causes & predictors of disease
  - Relationship between smokeless tobacco and oral cancer
- Experience of others & Expert recommendations
  - Editorial comments, opinions, case reports

Basic Structure of An Article

- Title
- Summary/Abstract
- Introduction
- Methods
- Results
- Discussion & Conclusion
- References

Title

- Highlight or Summary of the article
  - "Applications of Surface-Enhanced Laser Desorption/Ionization Time-Of-Flight (SELDI-TOF) Mass Spectrometry in Defining Salivary Proteomic Profiles"
  - "Salivary histatin-5 and oral fungal colonisation in HIV+ individuals"
  - "Initial comparison of proteomic profiles of whole unstimulated saliva obtained from generalized aggressive periodontitis patients and healthy control subjects"
- Could be broad or specific.
- Usually indicate type of article
- Journal and Specialty

Abstract/Summary

- Overview or summary of the work
- A concise statement of goal of the work
- Highlights of the results
- General statement of significance
- Could be structure or non-structure
  - Depending on discipline and journal

Introduction

- Background information
  - From broad overview to specific information related to this work
  - History, Patho-physiology, Mechanism, Previous Theory, Clinical Presentation
- Review of the work of others
  - Literature review
- Rationale for this paper
  - Lead to why the authors did this work
  - Hypotheses

Abstract & Introduction

Yudkin 2006

- Should explain why the paper was written
- May not give detailed information, but should allow you to estimate how much time to spend on reading this paper.

"Introduction sections are an entry into a paper- Never a substitute for reading it properly."

Methods

- Study design
- Information on Subjects
  - Population/Animals/Cells/Proteins/Molecules
- Measurements/Experimental Details
- Analytical techniques

Methods: Basic Science

Yudkin 2006

- Define reproducible experimental protocols
- Must have controls
- Why was the experiment done this way? Is it the ideal or standard technique? If not, why?
- Direct experiments v.s. indirect experiments
- Results should be confirmed with independent experiments
- All relevant variables should be controlled

Methods: Clinical Science

Gehlbach 2002

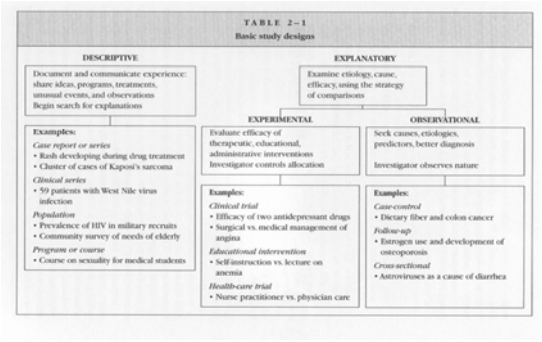


TABLE 2–1
Basic study designs

DESCRIPTIVE	EXPLANATORY	
Document and communicate experience: share ideas, programs, treatments, unusual events, and observations Begin search for explanations	Examine etiology, cause, efficacy, using the strategy of comparisons	
	EXPERIMENTAL	OBSERVATIONAL
Examples: *Case report or series* • Rash developing during drug treatment • Cluster of cases of Kaposi's sarcoma *Clinical series* • 59 patients with West Nile virus infection *Population* • Prevalence of HIV in military recruits • Community survey of needs of elderly *Program or course* • Course on sexuality for medical students	Evaluate efficacy of therapeutic, educational, administrative interventions Investigator controls allocation	Seek causes, etiologies, predictors, better diagnosis Investigator observes nature
	Examples: *Clinical trial* • Efficacy of two antidepressant drugs • Surgical vs. medical management of angina *Educational intervention* • Self-instruction vs. lecture on anemia *Health-care trial* • Nurse practitioner vs. physician care	Examples: *Case-control* • Dietary fiber and colon cancer *Follow-up* • Estrogen use and development of osteoporosis *Cross-sectional* • Astroviruses as a cause of diarrhea

Results

- What happens and Findings
  - A good comparison (control) group?
  - An appropriate plan?
  - What was done and when they were done?
  - What was left out?
  - How much did things change?
    - Between control and test groups
- Graphics (summarized findings)
  - Tables, Charts, Figures

Discussion

- Interpretation of Results
- Significance of Work
- Critiques
  - Limitations, strengths, further analysis
- Compare results with others
- Others….
  - Disclaimers, Speculation, Fantasy…
- Clinical/biological significance/applications

References

- Credit others' previous works
- Leads to further investigation of the (related) subject
- Showing expertise of the authors

How to approach an article

- Read only if you are interested or if it will be useful to you
- Quickly scan the article to get an overview
  - Read Abstract and Introduction
  - See if you need more background
    - Read literature reviews or textbooks on the subject
- Methods
  - Do you understand the methods?
- Results and Discussion/Conclusion
  - Go back to hypothesis
  - Anything unexpected?
- "Reserve the right of final judgment"

Criteria for Evaluation

- Purpose of the article
- Type of the article
- Type of the Journal & Audience
- Organization & Content
  - Outline of an articles
  - Illustration
- Bias
- Date of Article
- Bibliography
- Usefulness
- Authors

Purpose of the Article

Why did the author(s) write this article?

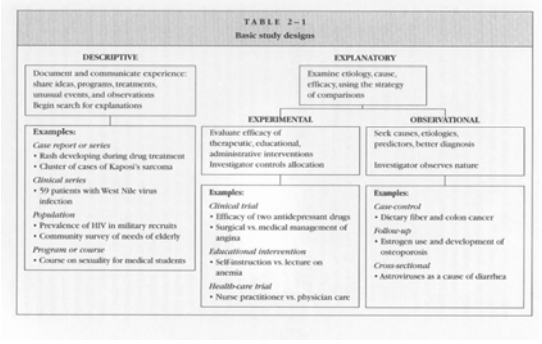
- To advocate or persuade the reader(s) to do something or believe in something
- To give particular information to the reader(s)
- To prove a hypothesis

Type of Scientific Articles

- Peer-reviewed articles
  - Research Articles
    - Reports/communication (Short) articles****
    - Typical research articles *****
  - Review Articles
    - Narrative (conventional) reviews**
    - Systemic reviews***
  - Clinical Articles
    - Case Series, Case Report, Technical Articles*
- Non-peer-reviewed articles
  - Editorial Comments
  - Opinions & Letters
  - Communications (non-peer-reviewed)

Type of Clinical Science Articles

Gehlbach 2002



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Type of the Journal & Audience

- Is this journal is a general, specialty, or sub-specialty journal?
  - What is an impact factor or page rank of this journal?
    - A measure of the citations
    - Proxy to the important of the journal in the field
  - Who are the audience for this journal?
- Science, Nature, Cell
- NEJM, Nat Med, JAMA, Lancet
- JDR, JPD, IJOMI

Content & Organization

- Originality
  - Novel or not novel
  - Research or Review
- Impact to current knowledge or practices
  - Innovation
- Organization
  - Well organized and focused
- Understandable argument/presentation

Illustrations

- Charts, Graphs, Clinical Figures
  - Provide clear, concise, and sufficient information for the concept or story
  - Are neat and professional looking
  - If needed, attached appropriate legends

Bias in publications

- Positive V.S. Negative Results
- Controversial Issues
- Authors
  - Are they experts in the field?
  - Are they associated with the Journal?
    - Authors are editors or editorial board members
  - Who supports these authors?
    - A dental implant company?
- Journals
  - Scope of the journals
  - Editors & Reviewers
  - Special interest group

Date of Publication

- Depending on type of information
  - Out of date information
  - Up to date information
  - Timeless
  - Historical data

Bibliography

- if a bibliography exists.
  - Editorial, comments, opinion, letter to editor may not have one.
- if the bibliography is short or long.
  - Depending of type of article
- if the bibliography is selective or comprehensive.
  - Bias in presenting supportive literature
- if the references are primary sources (ex. research articles) or only secondary sources (e.g. reviews, books).
- if the references are contemporary to the article or much older.
- if the citation style is clear and consistent

Usefulness

- Is this article relevant to current research or science?
- Is this article relevant to you and your research/clinical interests or project?
- If so, does it:
  - Support or refute an argument
  - Provide sound and clear scientific methodology
  - Provide reasonable conclusion
  - Provide "wrong" information that can be challenged or disagreed

Authors

- Are experts in the field?
- Hirsch (H) index
- Employed or supported by certain organization?
- Won any award or honor?

Let’s read some articles

Examples

- Hwang et al Science 2005
- Tahara et al J Prosthodont 2007
- Venza et al J Periodontol 2006
- Potter et al J Endodont 2009
- Gregson et al J Dent Educ 2010

Thank You!