

# How to Write a Scientific Paper

## Lecture 3

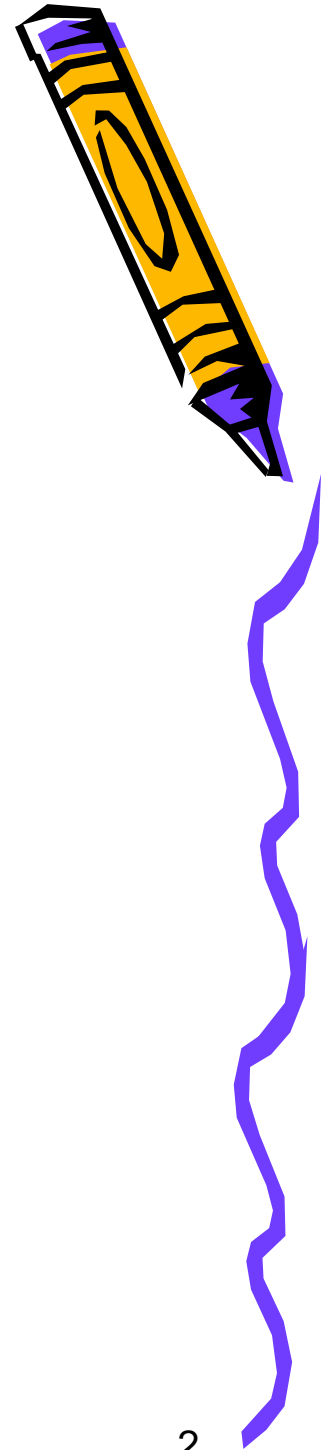
Georgia Cancer Center

April 10, 2018

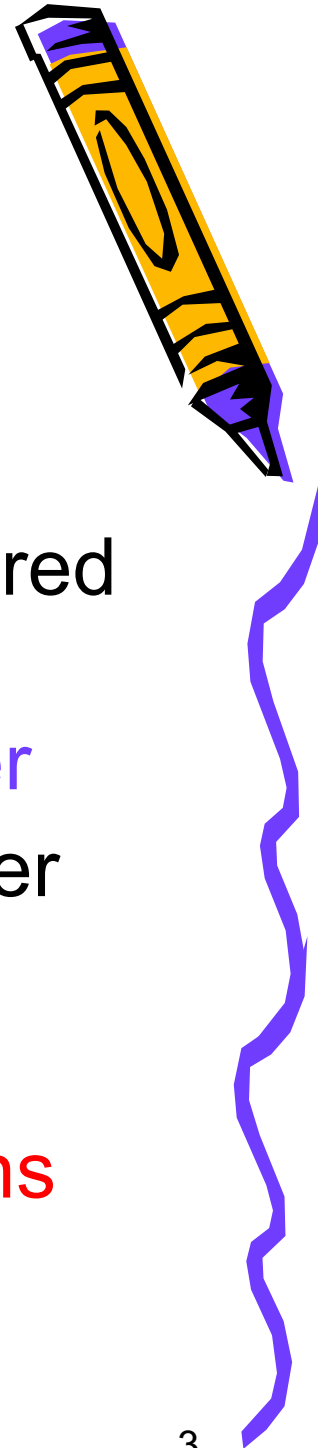


Georgia Cancer Center  
Professional Skills Development  
Writing Program

Rhea-Beth Markowitz, PhD  
Director, Grant Development  
Georgia Cancer Center  
Augusta University  
CN 1179C 1-7916  
[rbmarkowitz@augusta.edu](mailto:rbmarkowitz@augusta.edu)



# Outline



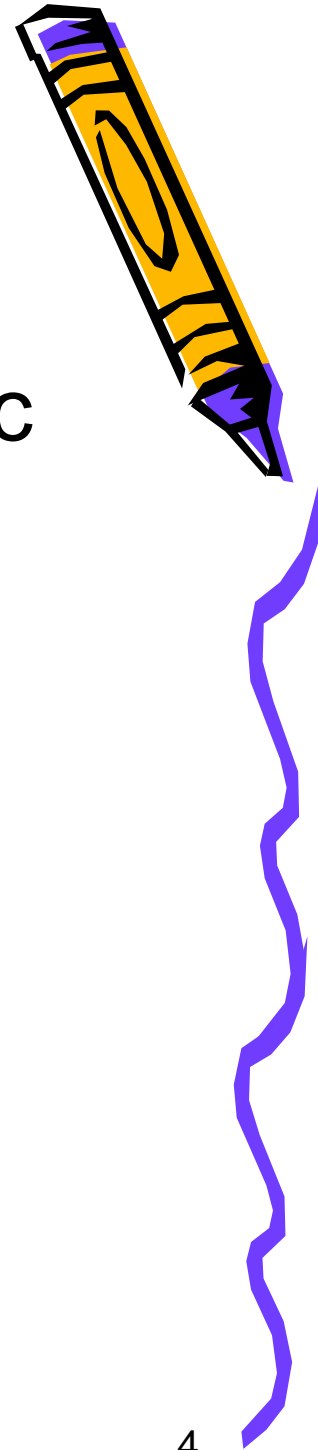
- Session 1: Elements of Scientific Writing
- Session 2: Common Difficulties Encountered by Non-Native English Speakers
- Session 3: How to Write a Scientific Paper
- Session 4: Bibliographic References (Peter Shipman)

Fall Semester: Grant Writing presentations

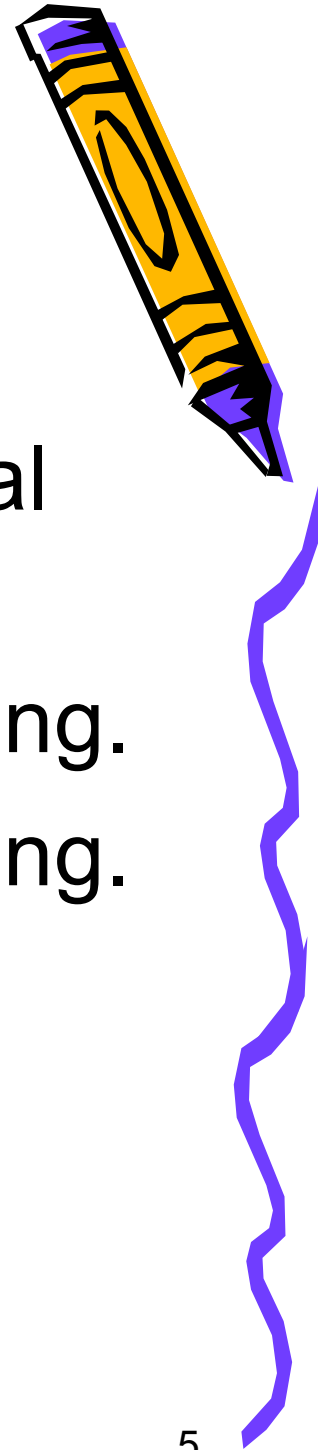


# Topics

- How to write a (biomedical) scientific paper
- ICMJE Recommendations
- Authorship
- Sections of a paper
- Journal submission
- Bits of Advice



# Points to Remember

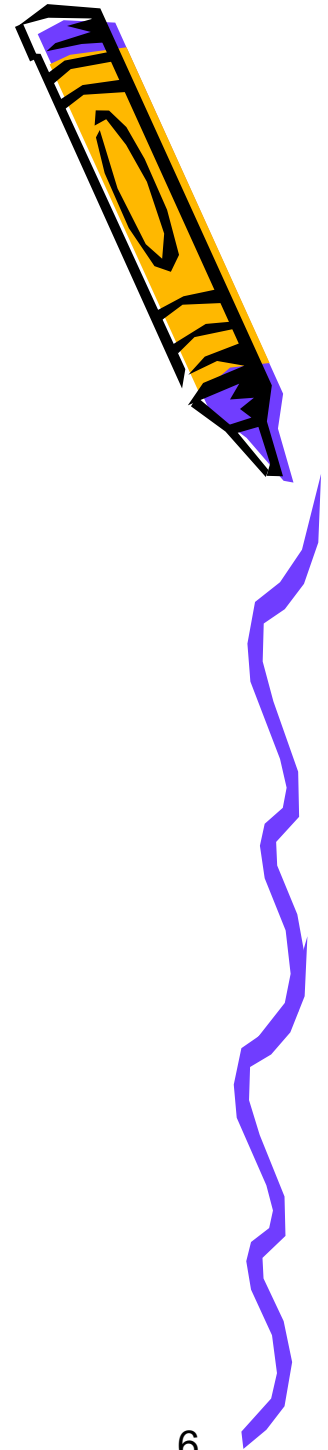


- Your paper should represent a critical argument.
- Clear writing results from clear thinking.
- Clear thinking results from clear writing.
- Write with vigor. Write to excite.



And.....

- LOGIC
- LOGIC
- LOGIC
- Your paper must be logical!

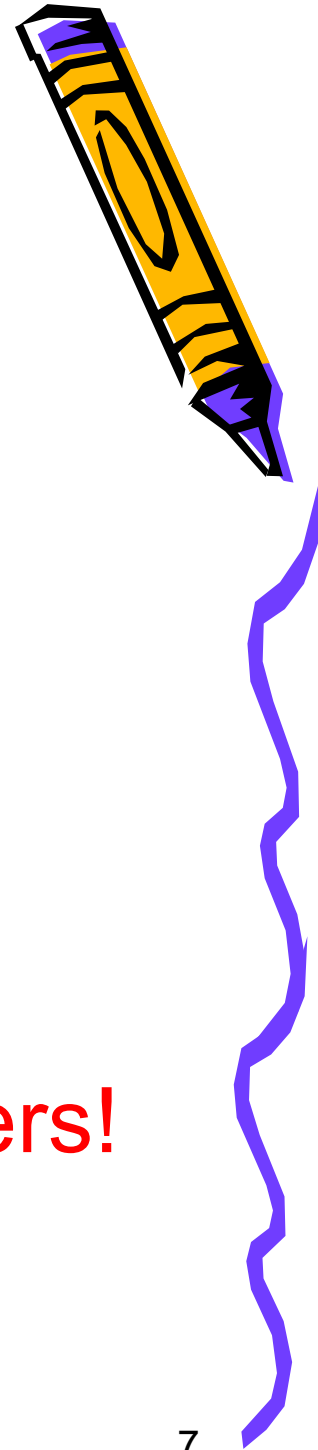


# ICMJE

[www.icmje.org](http://www.icmje.org)

International Committee of Medical  
Journal Editors

Your “Go To” Website for writing papers!



# History of ICMJE



- 1968, a nephrologist complained about having to re-format (re-type) references when a paper was rejected by one journal and resubmitted to another.
- He wrote to the editors of Annals of Internal Medicine, JAMA, and New England Journal of Medicine who then got together in Atlantic City in 1968 to standardize reference format. Accepted in 1970 by 18 journals.
- Early 1970s: further discussions about standards for manuscripts.



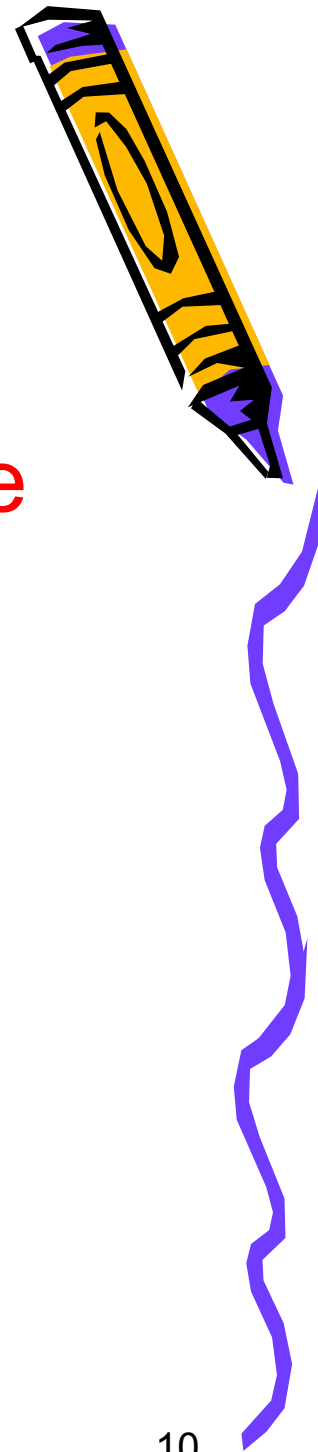




- 1978: a group met in Vancouver, BC. Called themselves the International Steering Committee; later changed to **International Committee of Medical Journal Editors (ICMJE)**. Often referred to as the Vancouver group.
- **Uniform Requirements for Manuscripts (URM) Submitted to Biomedical Journals** was born in 1979 to standardize manuscript format and preparation.
- As new issues arose, “Separate Statements” on editorial policy were developed.
- Major revisions of the URM were made, incorporating the “Separate Statements.”



# “ICMJE Recommendations”

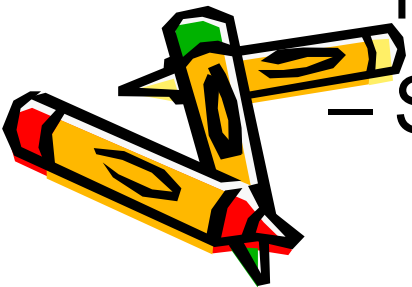


- Renamed “Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals” in 2010.
- Revised every year or so.
  - Most recent version, December 2017
    - <http://www.icmje.org/icmje-recommendations.pdf>



# Includes sections on:

- Role and responsibilities of authors
- Submission/peer review process
- Publication and editorial issues
- Scientific misconduct, duplicate publications, fraud, editorial freedom
- Manuscript preparation and submission
  - IMRAD format
  - Is the Authority on how to cite all kinds of references, including Internet references
  - Style issues



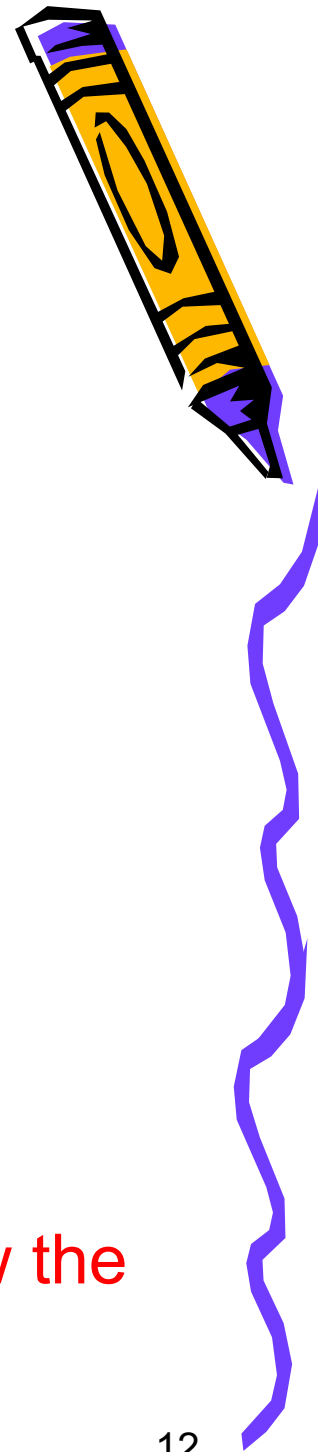
# ICMJE

ICMJE continues to meet to update the guidelines

Current members are:

- Annals of Internal Medicine
- British Medical Journal
- Bulletin of the World Health Organization
- German Medical Journal
- Ethiopian Journal of Health Sciences
- Iranian Journal of Medical Sciences
- Journal of American Medical Association (JAMA)
- Journal of Korean Medical Science
- New England Journal of Medicine
- New Zealand Medical Journal
- PLOS Medicine
- The Lancet
- Medical Journal of Chile
- Danish Medical Journal

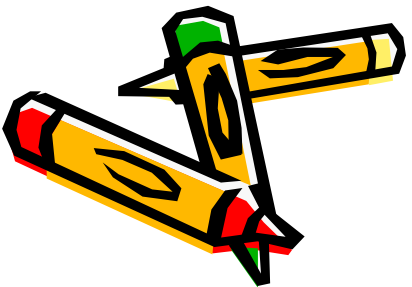
Many (most ?) non-member journals follow the ICMJE Recommendations



# Authorship: an important, but sticky issue



- Authorship confers **credit**.
- Authorship implies **responsibility** and **accountability** for the published work.
- Some journals request a statement of what or how each author contributed to the work.



# Authorship is based on the following 4 criteria:



1. Substantial contributions to the conception or design of the work, or acquisition, analysis or interpretation of data; **AND**
2. Drafting the work or revising it critically for important intellectual content; **AND**
3. Giving final approval of the version of the work to be published; **AND**
4. Agreement to be accountable for all aspects of the work and ensure that questions related to accuracy or integrity of the work are appropriately investigated & resolved.



**All 4 of the previous criteria must be met!**

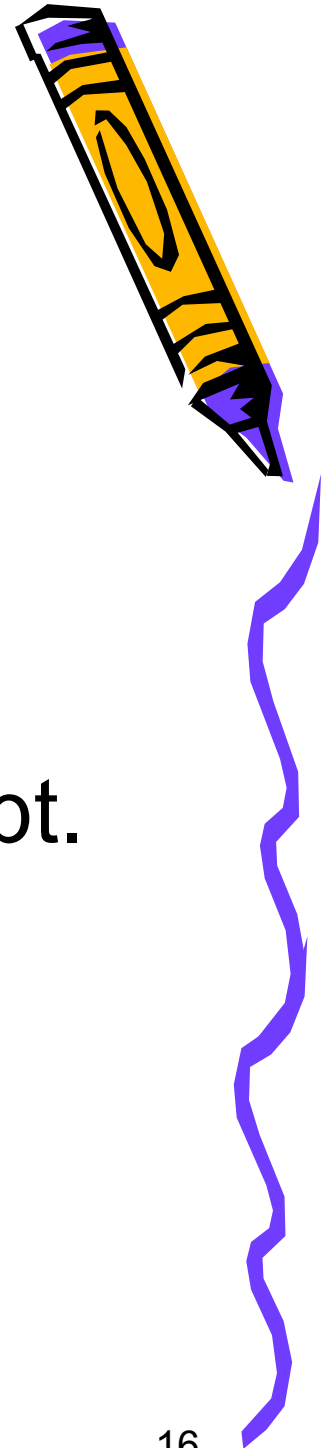
**Participation in only 2 or 3 do not justify authorship.**

There are no honorary or courtesy authorships.

People who have made contributions but do not meet all 4 criteria should be acknowledged in the Acknowledgements section.



# Order of Authors

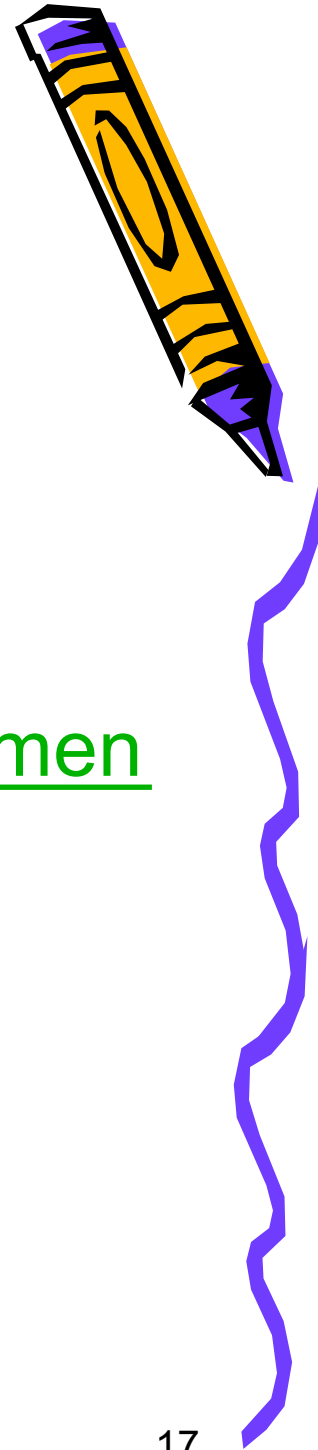


- Should be a joint decision of the co-authors.
- Should be determined, preferably, before starting to write the manuscript.





# Augusta University's Policy on Authorship of Scholarly Activities



- Based on ICMJE Recommendations.
- Can be found at:

<https://augusta.policytech.com/dotNet/documents/?docid=2418&public=true>



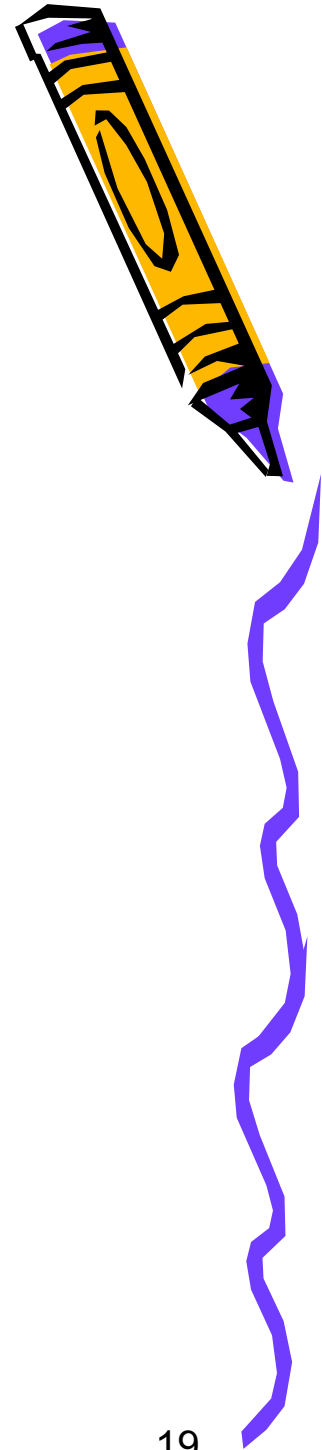
# **Warning!!!**

**At Augusta University,  
faculty can be charged  
with misconduct and lose  
their job if they do not  
follow AU's Policy on  
Authorship of Scholarly  
Activities!**



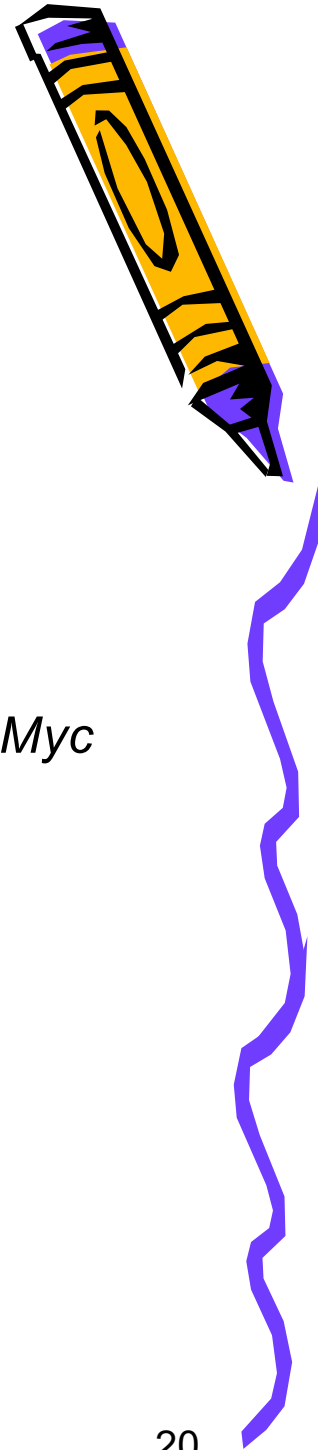
# Sections of a Paper

- Title (title page)
- Abstract
- Introduction
- Materials & Methods
- Results, including figures
- Discussion
- Acknowledgments
- References
- Figure legends



# Title

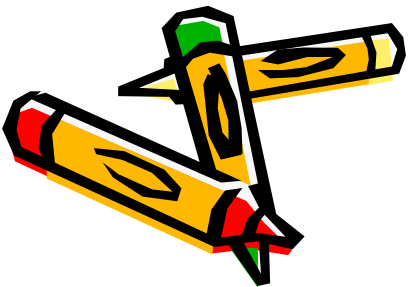
- Concise and descriptive
- Your title is a label
- Preferably not a declarative sentence
  - This: *Disruption of the ARF-Mdm2-p53 Tumor Suppressor Pathway in Myc-induced Lymphomagenesis*
  - Not: *B-cell Lymphomas Occur in Transgenic Mice When the Myc Oncogene Inactivates ARF or p53*
- Include a “running head” version of title
  - Title: *Bone Marrow Failure Associated with Human Herpesvirus 8 Infection after Transplantation*
  - Running head: *HHV-8 infection after transplantation*



# Problems with titles.....

*The Characteristics of Patients with Swallowing  
Difficulty in Primary Care*

Do the patients have difficulty swallowing only  
when they are in the primary care clinic? Or  
also at home or at work?



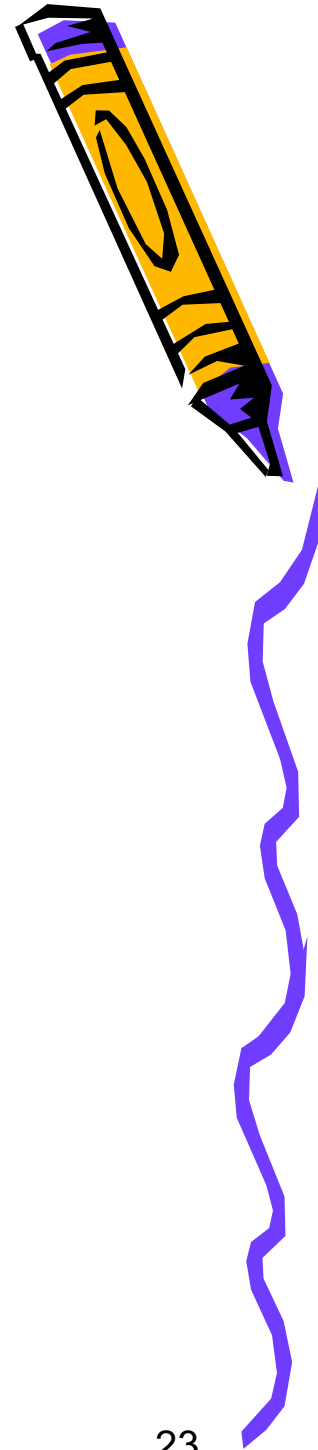
# What was the actual study done?



Patients visiting primary care clinics for any reason were given questionnaires asking if they had had difficulty swallowing (dysphagia) at any time during the past several years. If so, they were asked about some of the characteristics of their dysphagia (frequency, severity, etc).



# Did the title really reflect what the study was?



Title: The Characteristics of Patients with  
Swallowing Difficulty in Primary Care

# NO!!!!





What we changed it to.....

*The Prevalence of Dysphagia in Primary Care Patients*





# Also on Title Page



- Names of authors, with first name, highest academic degree (depending on the journal), name of department and institution where the work was done, and current institutional affiliation (as footnote, or with asterisk, depending on journal)
  - Note: once you start publishing, always write your name the same way (e.g., with or without a hyphen, one or two words) for referencing purposes.
    - Ling-Ling vs Lingling vs Ling Ling
    - Rhea-Beth vs Rhea Beth vs Rhea B
  - ICMJE encourages listing of authors' Open Researcher and Contributor Identification (ORCID)
- Name and address of corresponding author (phone, fax, e-mail)
- Acknowledgment of grant support (funding agency and grant number), maybe here or maybe elsewhere
- Disclaimers/conflicts of interest

Word count, number of figures and tables, maybe

**KNOW your journal requirements!!**



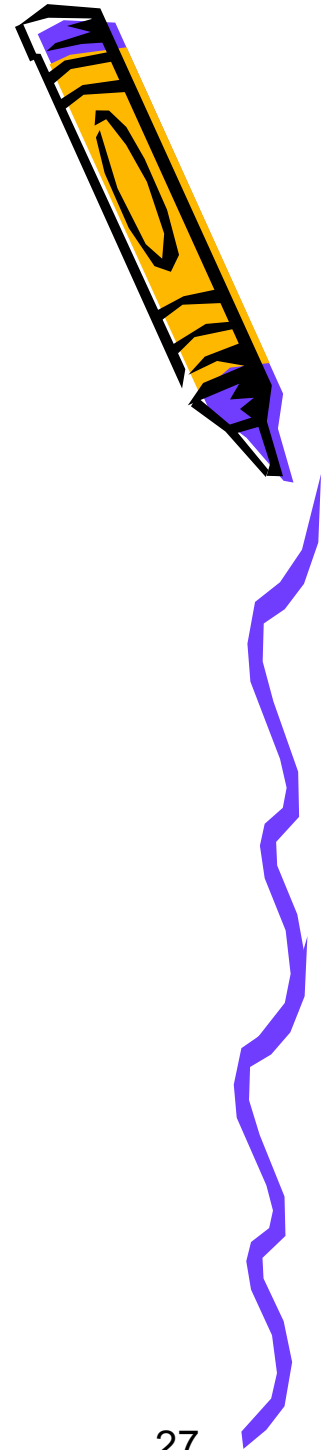
# Abstract

- Usually less than 250 words
- Make every word count
- Abstract should be able to stand alone
  - No abbreviations
  - No references
- Be sure the abstract accurately reflects the content of the article.
  - If you revise the manuscript, you may need to revise the abstract.

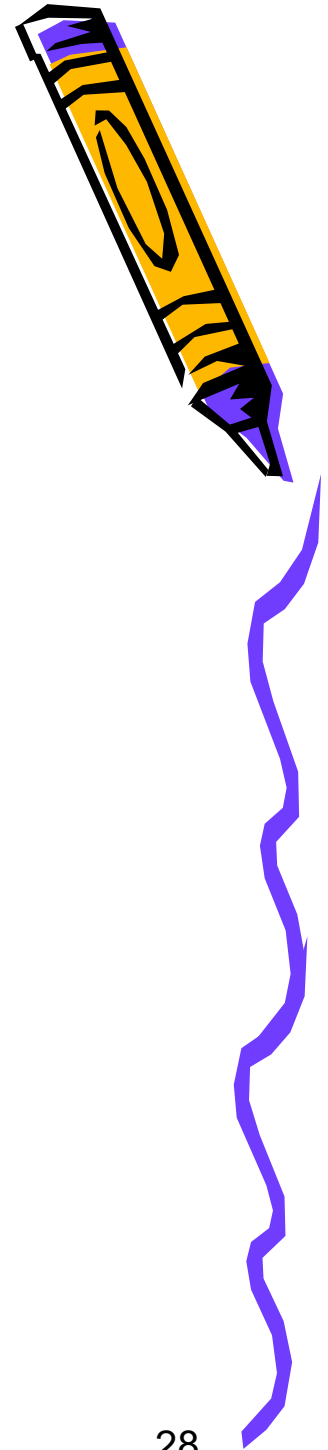


# Abstract

- Abstract should summarize:
  - Problem
  - Methods used
  - Results
  - Overall conclusions



# Abstract: 2 models



- Basic Science Journal Model
  - Consists of a single paragraph
- Clinical Journal Model
  - Consists of 4 short paragraphs
    1. Background (describe the problem)
    2. Methods used
    3. Results (the data)
    4. Overall conclusions



# Key Words



- Also on Abstract page (often)
- 3 to 10 key words (use Medical Subject Headings-- MeSH from National Library of Medicine)
  - <http://www.nlm.nih.gov/mesh/>
- Choice of words is important because that is how your paper will be indexed
  - Index Medicus
  - Search engines (e.g., Google)



# Introduction

- Purpose of the paper
- Why should you care about this problem?
- Background information
- Previous experiments done by others (tell a story, start to finish, not random details)
  - But not data
- End with brief statement of your results and conclusions
  - *We show here that.....*



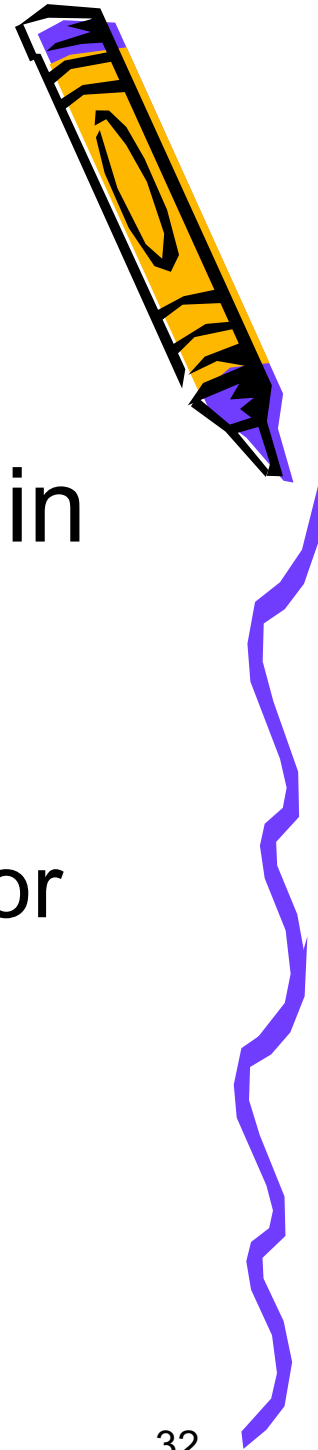
# Remember



- Be Logical
- Introduction should be a logical story



# Materials & Methods



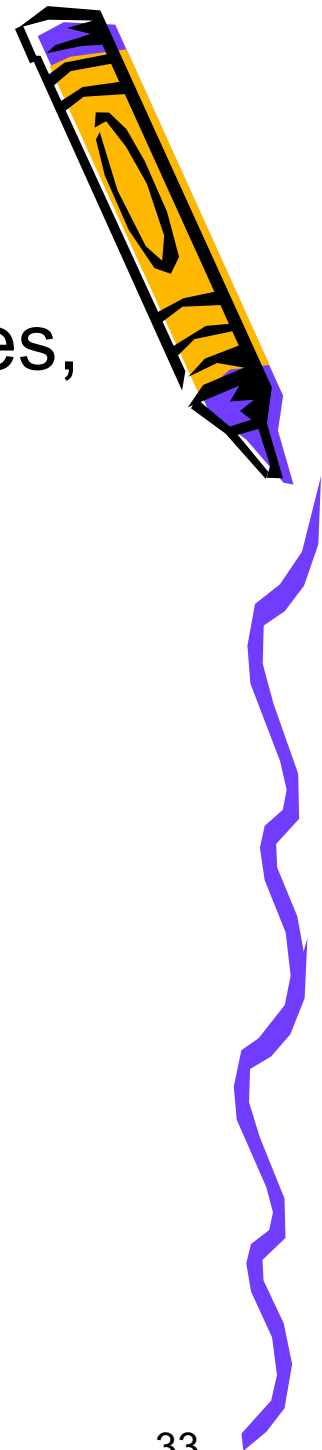
- How and why a study was done in a particular way.
- How much detail?
  - Enough so that another investigator can repeat the experiment.
- Do not include results!
- Use past tense!





# Materials & Methods

- Start with biological materials: cell lines, mouse strains, or human subjects
  - Description of experimental subjects
    - Age
    - Sex
    - Ethnicity (if important)
    - Other important characteristics
      - Clinical symptoms
      - Diagnoses
    - Exclusionary criteria
    - Descriptions of controls
    - Justification of the use of special populations, e.g., only males



# Materials & Methods



- Use chronological order for methods.
- Describe instruments/questionnaires used (and give references).
- For clinical trials, provide details on methods of randomization and blinding.
- End with data analysis tools.
  - Statistical methods, computer programs.
  - Numbers of observations and report subject losses.
  - Power analysis.





- For established method, give reference and include modifications you made
  - *Southern blots were performed as described (24) except that....*
- For method that has been published but is not widely known, give a brief description
  - *In vitro phosphorylation was performed essentially as described (30). Phosphorylation reactions contained 25 mM.....*

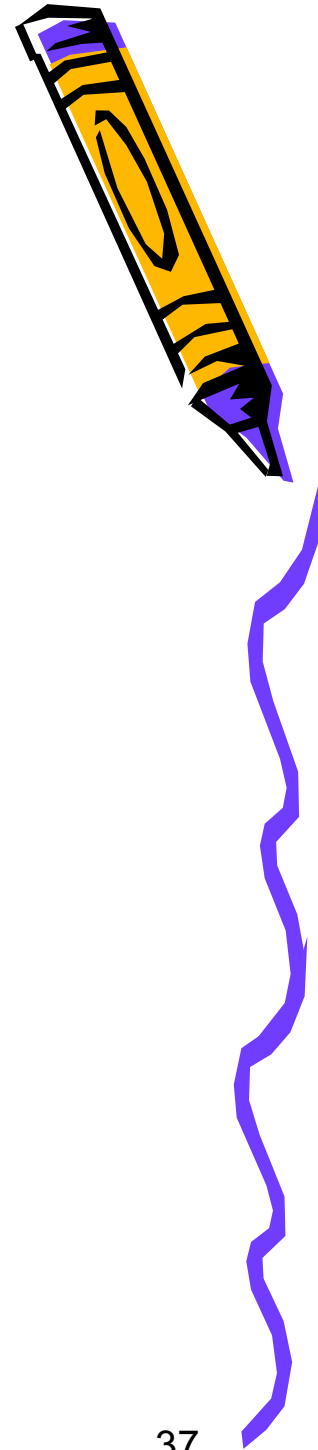


- Identify chemicals and drugs precisely, give manufacturer, city, and state in parentheses.
  - *Glutathione-agarose, (Sigma, St. Louis, MO)*
  - Give route of administration for drugs.
    - Intraperitoneal (i.p.); subcutaneous (s.c.); oral gavage
- For specific instruments and equipment, give precise name and manufacturer name and location.
  - *Analyzed on a FACScan (Becton Dickinson, Mountain View, CA)*
- Give concentrations of chemicals.
- Give final concentration of solutions.

Remember, use past tense.



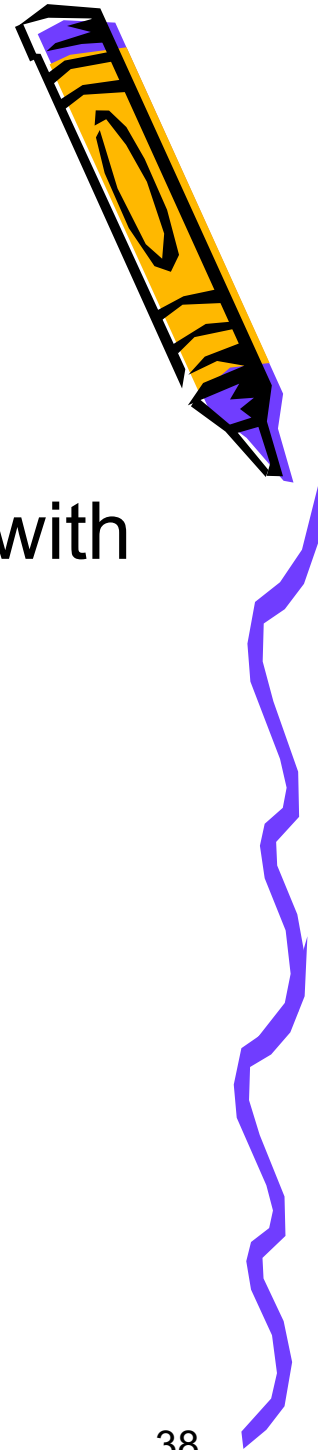
# Animal Studies



- For animal studies, indicate that the procedures were in accordance with the institutional guide or Institutional Animal Care & Use Committee.



# Human Subjects Studies

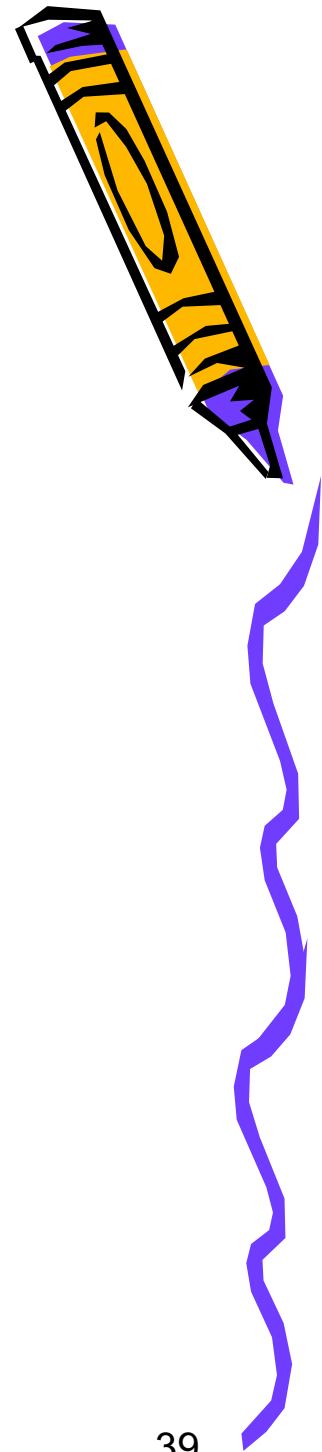


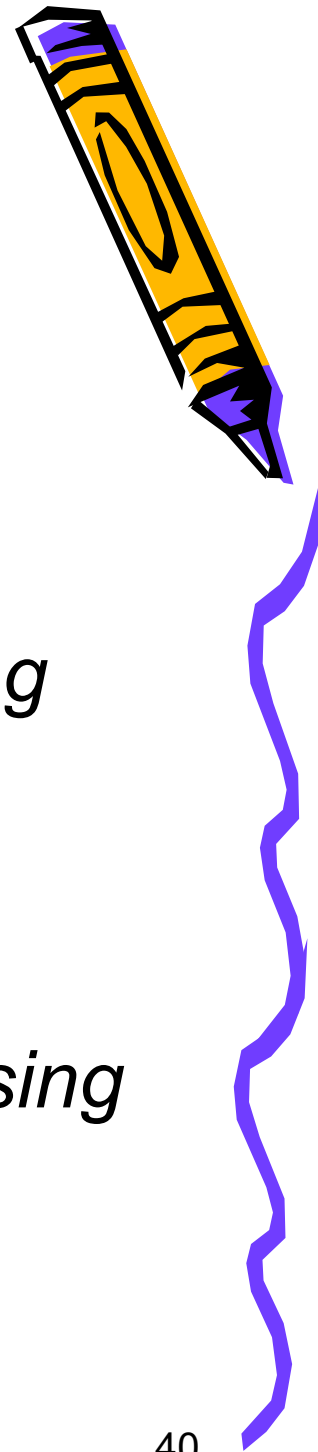
- For human subject studies, indicate that procedures followed were in accordance with the Institutional Review Board and Declaration of Helsinki (know what this means!!).
  - Indicate that informed consent was obtained.
  - Do **not** use patient names (HeLa), initials, or hospital numbers.
  - Use unique identifiers that allow only the investigator to link the data to the patient.



# Results

- Flow in a linear fashion.
- Logical.
- For each set of experiments,
  - Tell why you did the experiment.
  - Tell how you did it.
  - Present the data.
  - Give the conclusions from the data,
    - But not the interpretation.





- Use topic sentences
  - *In order to determine whether....*
  - *Results from the previous experiment suggest that....*
  - *To more precisely map the DNA-binding region....*
- Refer to Materials & Methods
  - *Western analysis was performed as described in Materials and Methods, using antibody RM203 as probe.*







- State what the data tell you.
  - *As can be seen in Fig. 3B, control cultures contained large numbers of apoptotic cells, whereas cultures of cells expressing the PDQ gene showed very little apoptosis.*
- It may be helpful at times to add in the text:
  - *(Fig. 4A, compare lanes 1 and 2 to lanes 5 and 6)*





- Do not repeat in the text all the data in the tables or figures.
- Summarize the most important findings.
- Extra or supplementary materials or details can be published in the electronic version of the journal (Supplemental Material).
- Do not use statistical technical terms in a non-technical manner.
  - e.g., random, significance, sample



# Discussion



- Briefly summarize your main findings.
- State your conclusions.
- Why are they novel and important?
- Do not reiterate the actual data from Results section.
- Discuss the implications of your work in reference to studies by others.
- Do not repeat the Introduction, but relate your work to what you presented earlier.





- Discuss possible reasons why your results conflict with others.
- Speculate, but be sure the reader knows you are speculating!
- Suggest new experiments or state new hypotheses, but remember, someone else might do them before you do!
- End with **significance** of the work.
- Make every word count. Kill verbosity.

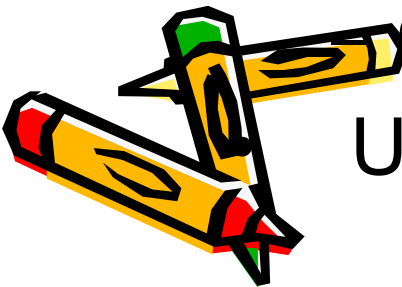


# Acknowledgments

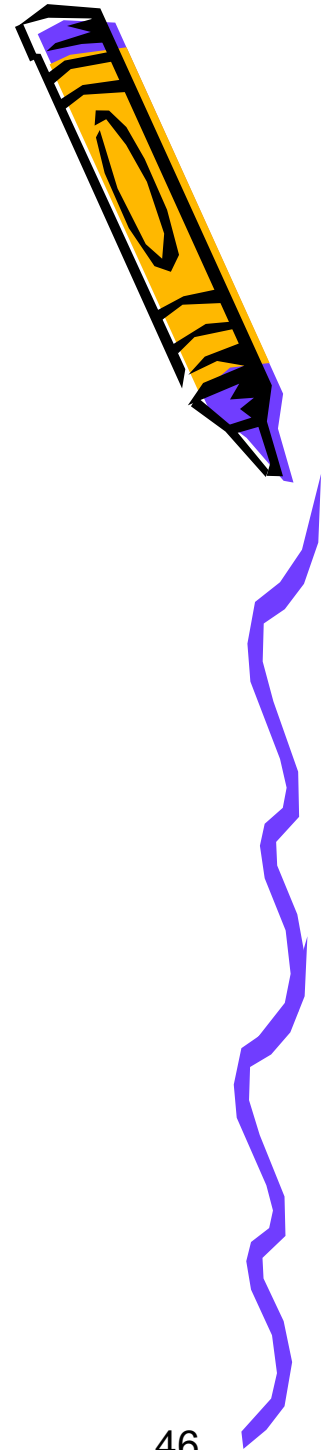
- Acknowledge and thank colleagues who contributed to the work but do not meet the criteria for authorship (but ask their permission first).
  - Provided reagents
  - Referred patients
  - Provided technical help
  - Suggested an experiment
  - Discussed your results

Critically read the manuscript

Use ***We thank***.....not *We would like to thank*.



# Acknowledgments



- Acknowledge financial support
  - Agency, grant number, recipient (use initials)
  - (Note: this may go as a footnote on abstract page in some journals.)



# References

- Use a reference program,
  - EndNote
- Keep your reference library up-to-date
  - Every time you read a paper, add it to your library.
- You are responsible for knowing if a reference has been retracted.



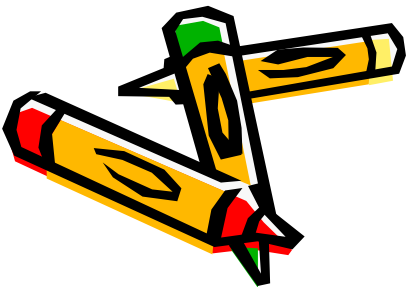
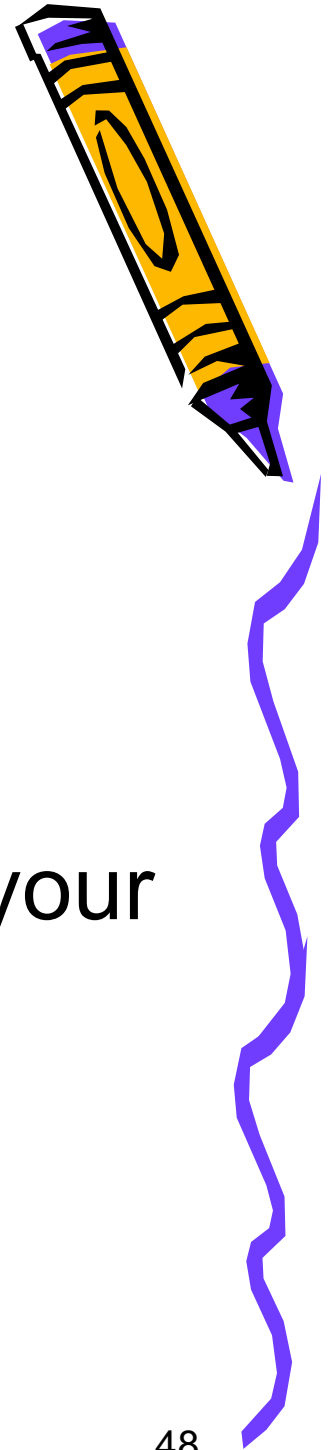
# References

Next lecture:

**Mr. Peter Shipman,**

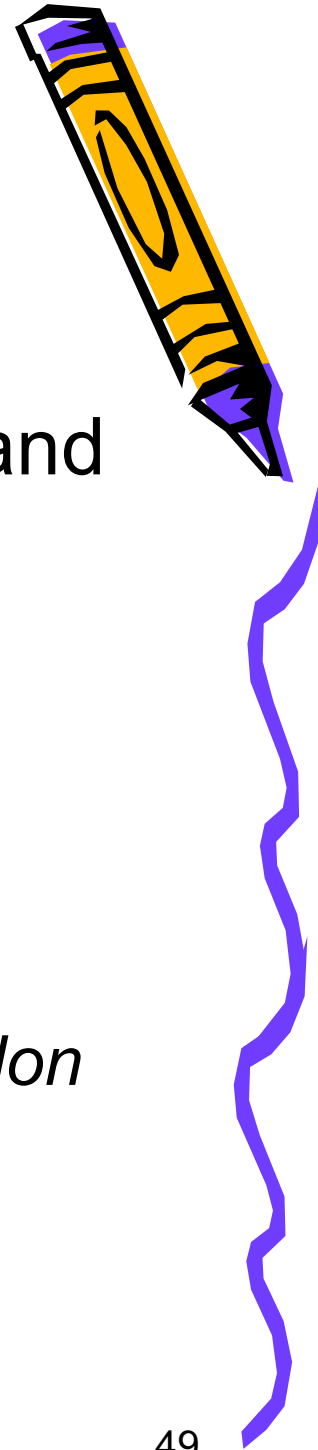
Cancer Center-dedicated Librarian,  
will speak more on electronic tools for your  
bibliography.

May 22, 2018





# Figure Legends



- The reader should be able to look at the figure and legend and be able to understand how the experiment was done, as well as know the results.
- Title of figure can state what figure represents.
  - *Levels of p53 protein in human lymphomas.*
  - *Northern blot analysis of myc oncogene in colon carcinomas.*





- Or, title can give conclusion of figure
  - *p53 protein expression is absent in most human lymphomas.*
  - *Expression of myc oncogene is increased in colon carcinomas.*
- But be consistent throughout the paper.
- Use brief, clipped style.
  - can leave out a/an/the
- Legend should state how the experiment was done.



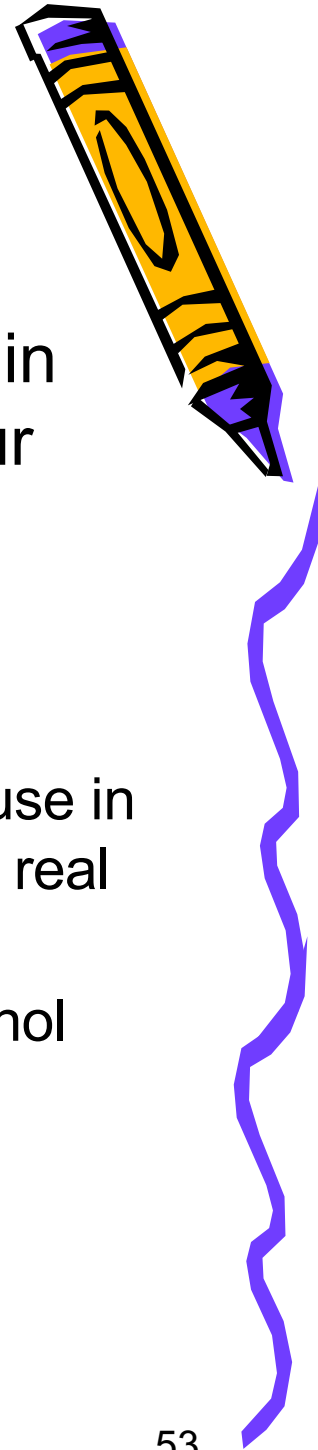
- Tumors were excised from brains of mice and DNA isolated as described in Materials and Methods. Equivalent amounts of DNA were digested with *Eco* RI as described and loaded onto agarose gels. Southern blotting was performed using c-myc probe 468. Lanes 1-4, DNA isolated from malignant glial tumors from four different mice; lanes 5-8, DNA isolated from normal glial cells from syngeneic control mice; lane 9, size markers as indicated. Arrow indicates 683 bp band, as expected for.....



- Check lane numbers, graph symbols, other notations between figures and text!!!
  - Digital images should be submitted in a format suitable for publication.
  - Use high-resolution photographic images of specimens, photomicrographs, and radiological images.
  - Letters on figures should be readable.
- Size and color (contrast).



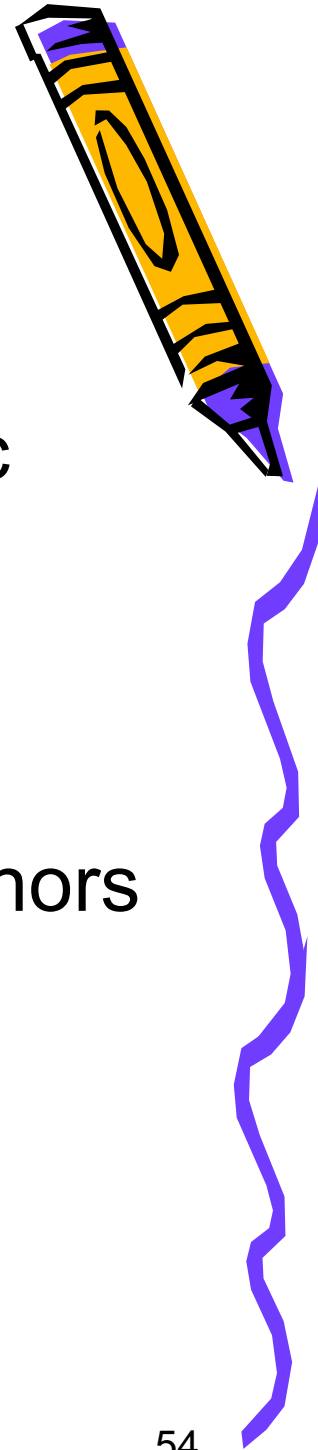
# Abbreviations



- Spell out the word(s) and then give abbreviation in parentheses the first time the term is used in your manuscript. Do not redefine it again.
  - You can redefine terms in a grant, however.
- Use only standard abbreviations.
  - Not your own “made-up” abbreviations that you might use in your notes; they might mean something different in the real world.
  - GTP: guanosine triphosphate, NOT green tea polyphenol
  - PI: propidium iodide or principal investigator??
- Avoid abbreviations in the title.



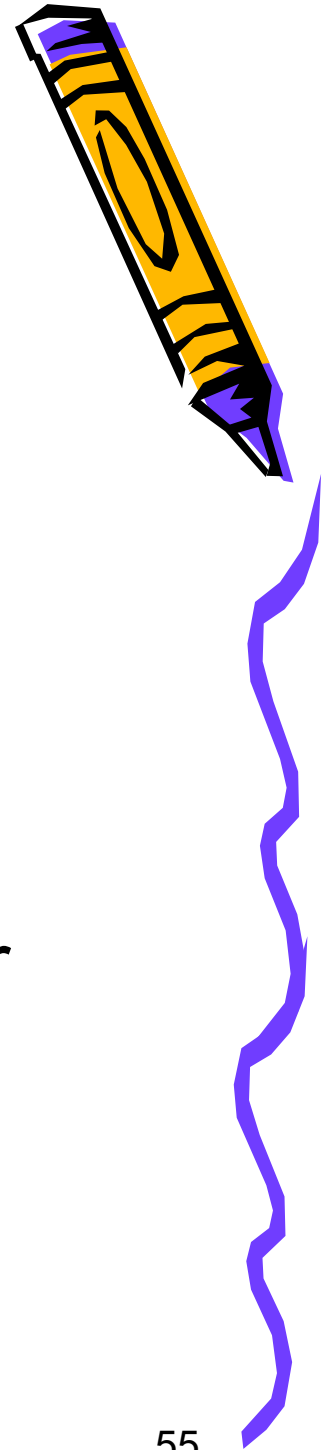
# Units



- Units of measurement should be in metric units.
  - Meter (m), kilogram (kg), liter (l)
- Temperature should be in °Celsius.
- Consult your journal's Information for Authors for other unit terms.



# Submission Process



- Most journals now require electronic submission.
- Follow instructions in “Information for Authors” for your specific journal.
  - Or “Instructions to Authors”
  - Just Google: information for authors for “journal name”



# Submission Process

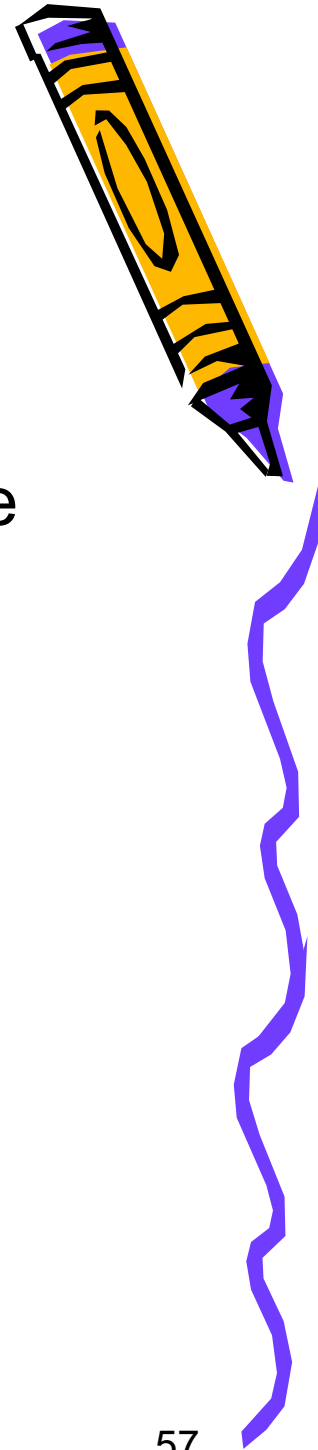


- Check Information for Authors for specifics about style, nomenclature, supplemental data, fees, peer review information, etc.
- Beware of “predatory journals” that are not transparent, not peer-reviewed, or charge outrageous publication fees.
  - See wame.org (World Association of Medical Editors) for “white papers”
    - *Identifying Predatory or Pseudo-Journals*
    - *Principles of Transparency and Best Practice in Scholarly Publishing*





# Cover letter



- Explain important points of your paper.
  - Why it should be published in this particular journal.
- Statement about other submissions that could be considered redundant.
- Statement about financial relationships.
- Statement on authorship (depending on journal).
- Contact information.
- Know your journal: Instructions to Authors
  - Some journals do not accept papers about certain subject areas, e.g., descriptive studies
- **Your letter can “make it or break it”**
- Editorial rejection (before going out for review)



# Final Bits of Advice

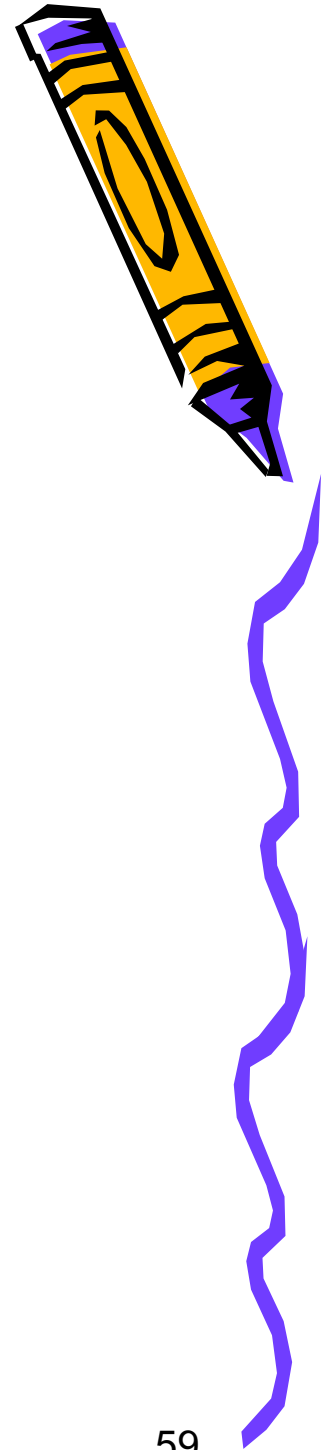


- Write for an extended period of time.
- Let your first draft lie dormant for a while, then reread.
- When you reread/rewrite, check meanings of words.
- Let a colleague read your paper.
  - Listen to his/her comments.
  - Accept them.
  - Don't be defensive.



**“Honest criticism is hard to take,  
particularly from a relative, a  
friend, an acquaintance, or a  
stranger.”**

*Franklin P. Jones*



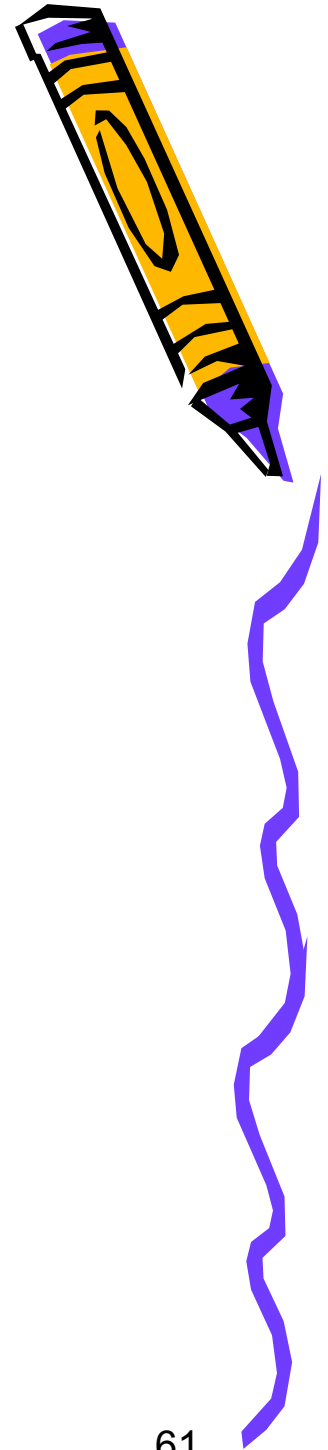
# Don't React Like Lemont



## Candorville



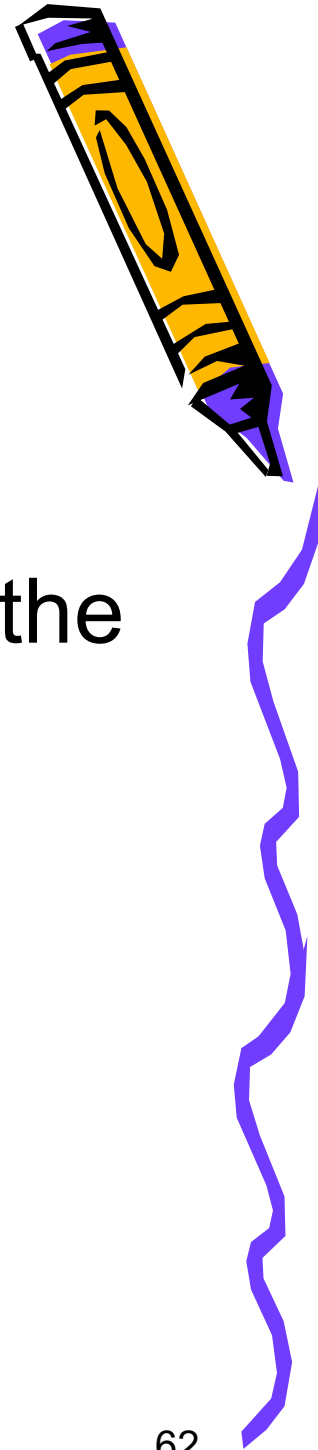
# Ethics in Writing/Publishing



- Authorship
- **Plagiarism**
- Duplicate publication
- Fabrication/falsification of data
- Conflicts of interest
- Other research misconduct



# Ethics in Writing/Publishing



Expect to have a lecture about this in the  
fall, before we start the  
Grant Writing  
classes



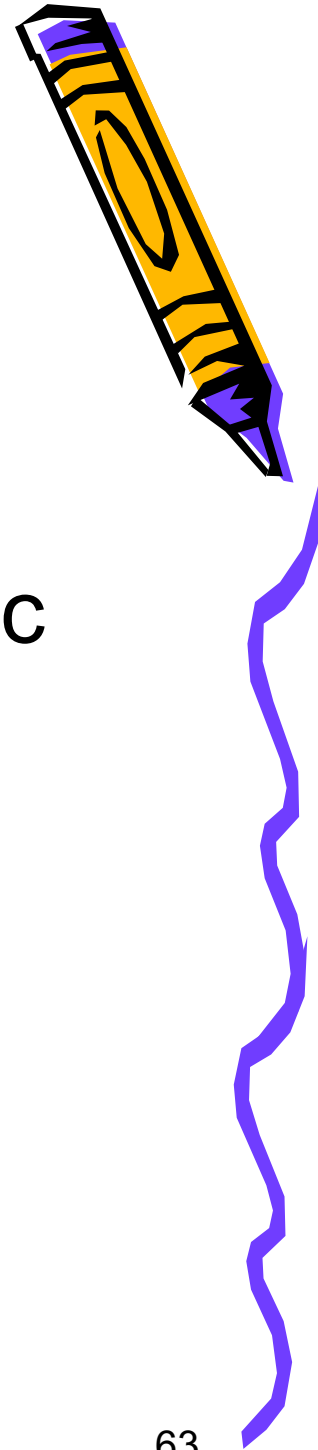
# Reference

How to Write and Publish a Scientific  
Paper

8<sup>th</sup> edition, 2016

Barbara Gastel and Robert A. Day

ISBN: 978-1-4408-4280-1



**Any Questions**  
**?**

