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# Effective Scientific Communication

Introduction to Clinical Research

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# Objectives

- Learn how to present research results in different formats
- Learn how to choose data presentation styles appropriate for communication process
- Understand authorship issues
- Understand the manuscript publication process from writing the first draft to final acceptance

# Keys to Successful Scientific Communication

- Scientific Communication
  - Is clear and concise
    - Should be understandable to a diverse audience
  - Report results of well-designed, hypothesis-driven studies with sufficient sample size (power) and appropriate statistical analyses to support conclusions
  - Is timely- Current research methodology
  - Contributes to the body of scientific knowledge
    - The importance of reporting “negative” studies

# Effective Scientific Communication

- Follow directions!
- Stay within word or character limit
- Be concise, eliminate unnecessary words (e.g. we found that...)
- Avoid jargon
- Use active voice
- Use abbreviations (define with first use) sparingly, but effectively

# Visual presentations

- Use schematics for study design, overview of complex relationships
- Graphs helpful for relationships, trends
- If use tables, highlight important points
  - Limit the amount of data in table format per slide
  - Do not use both table and figure formats for same data

# Text vs Figure

## A Composition of Human Surfactant

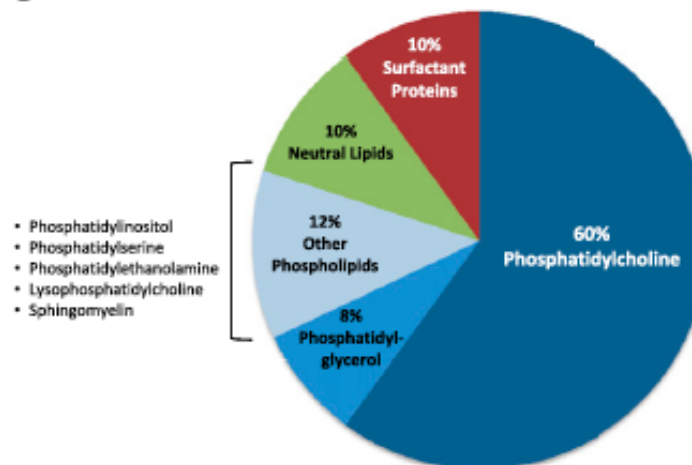
- 90% - Lipids, mainly phospholipids
  - 80% - Phospholipid
    - 60% - Phosphatidylcholine (PC)
      - ◊ 40% - Disaturated dipalmitoyl PC
      - ◊ 20% - Unsaturated palmitoyl PC
    - 8% - Phosphatidylglycerol
    - 12% - Other Phospholipids
      - ◊ Phosphatidylinositol
      - ◊ Phosphatidylserine
      - ◊ Phosphatidylethanolamine
      - ◊ Lysophosphatidylcholine
      - ◊ Sphingomyelin
  - 10% - Neutral lipids
    - Cholesterol esters
    - Acylglycerol fatty acids
- 10% - Surfactant proteins
  - Surfactant A
  - Surfactant B
  - Surfactant C
  - Surfactant D

## B Composition of Human Surfactant

Component	Sub-component	% of Surfactant
Surfactant proteins	• Surfactant A	10%
	• Surfactant B	
	• Surfactant C	
	• Surfactant D	
Lipids		90%
	• Phospholipids	80%
• Neutral lipids	• Cholesterol esters • Acylglycerol fatty acids	10%

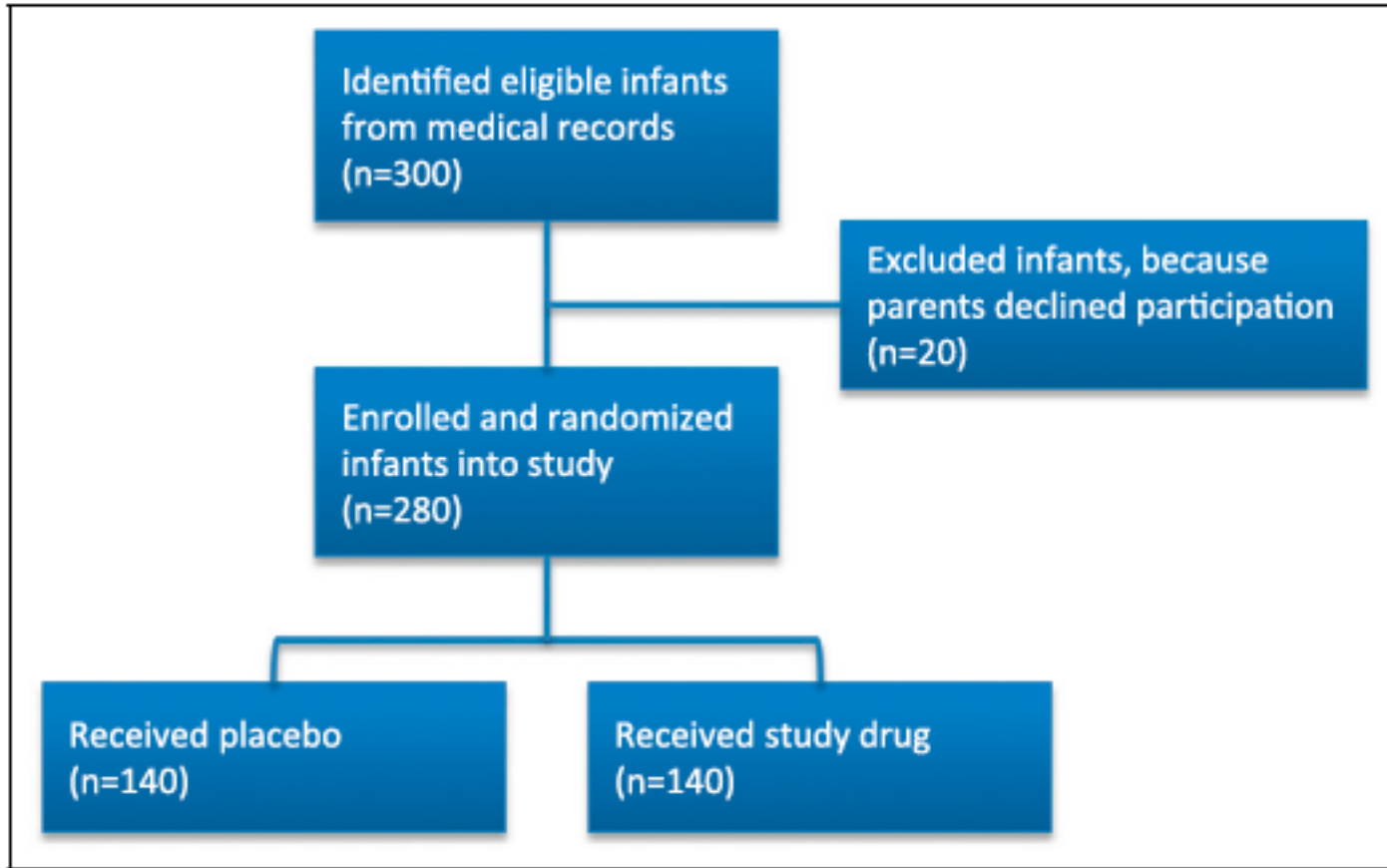
## C

### Composition of Human Surfactant



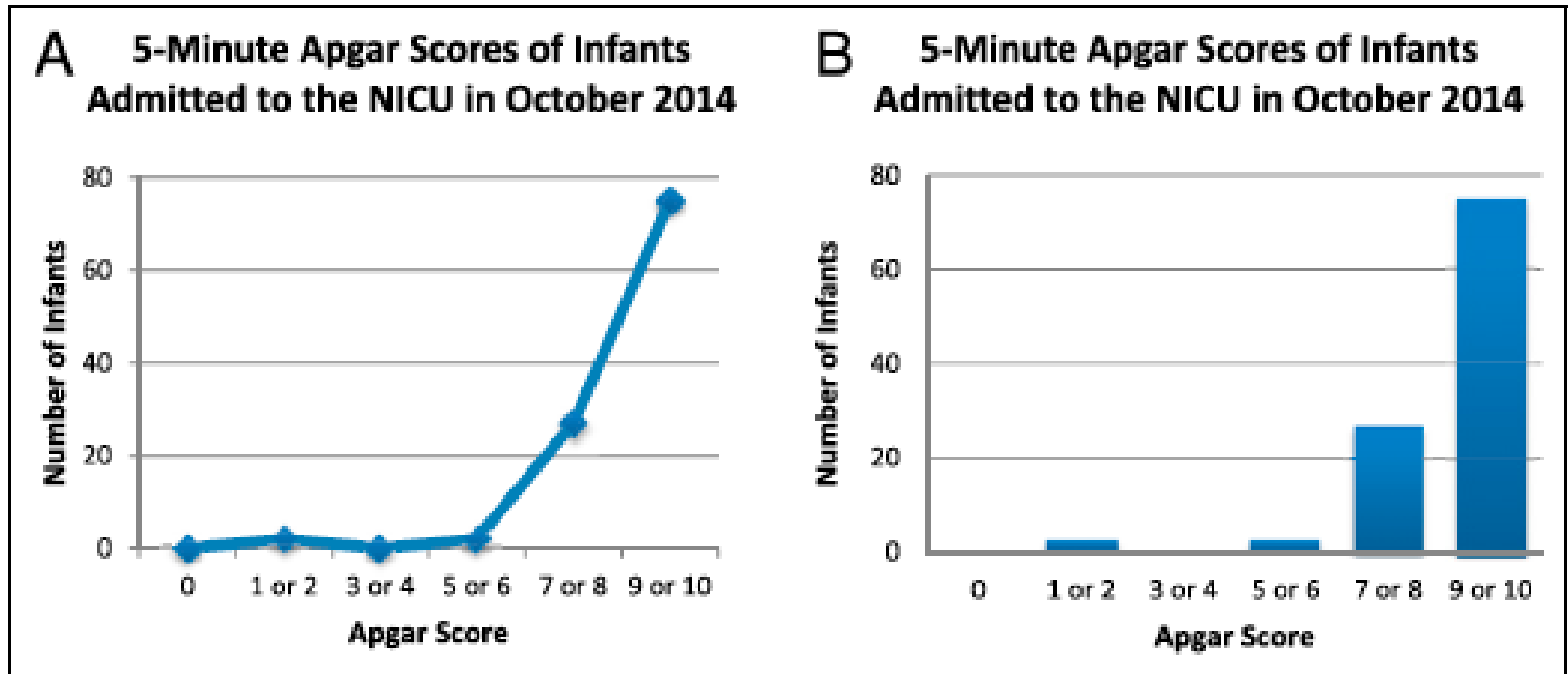
Phospholipids (depicted in shades of blue) comprise 80% of human surfactant, with phosphatidylcholine represented as the major type. Phospholipids prevent lung atelectasis by lowering alveolar surface tension.

# Flowcharts



- Used most commonly in Methods and Results sections
- Provide visual flow of subjects in clinical trials, protocols, experimental designs

# Graph selection depends of type of data



- Bar graphs and pie charts best to represent ordinal data
- Line graph is appropriate for continuous data



# Why you should present your research at regional/national meetings

- Tell a story about your research
- Get valuable input, new ideas
- Get noticed
- Network (possible new collaborations, jobs)
- Earn a free trip to exciting locales

# Tips for Writing a Successful Scientific Abstract

# Is the data ready for prime time?

- Abstract deadline is fast approaching...
- What is the state of your data?
  - Very preliminary
  - Completing final analysis
  - Ready for manuscript submission
- Be careful when submitting abstract with very preliminary data
  - Once published as abstract, may be scooped by competitor
  - Additional data may not support original conclusions

# Too much data?

- May consider separating into multiple abstracts
- Beware that submission of multiple related abstracts discouraged

# Elements of Effective Abstract

- Knowledge gap described
- Clearly stated question or objective
- Hypothesis
- Summary of methods
- Major findings
- Discussion/conclusions

# Abstract Title

- Word limit may apply
- Include key words (think search terms)
- Should be descriptive

# Authorship Issues

- You should be the presenter\* and first author (and do the vast majority of the work)
- Include all faculty, fellows, residents, students who contributed to the project
- Co-authors must approve the abstract
- Good communication appreciated
  - Give deadlines, e-mail disposition with citation for CV (if accepted)

# Abstract Background

- Statement of problem
  - Why is this important or interesting
  - What knowledge gap does this address?
  - 1-2 brief sentences
- Hypothesis
  - What did you think you would find?



# Abstract Methods

- Brief overview of procedures
- What did you do to get your results?
  - What kind of study?
  - What were the experimental and control groups?
  - What were the experimental conditions?
  - How was data collected?
  - How was data analyzed?
- What were the endpoints of interest?

# Abstract Results

- Summarize major (key) findings
- Include N, units of measure (e.g. g vs kg)
- statistical analyses (e.g. use of SD vs SEM, p value, confidence intervals)

# Abstract Results

- Can include table or figures, but space is challenging!
  - Font size on figure labels need to be large enough to be legible when reduced to fit the abstract
  - Check in “preview abstract” prior to submission
  - Is the visual presentation of data in figure helpful in showing relationships?

# Abstract Summary or Conclusion

- Did the results support your hypothesis?
- How did you fill that knowledge gap mentioned in the background?
- Summarize the impact of these findings to your specific field or area
  - How does this change things? What are the future implication on future studies? practice? Policy?
- Do not say “The findings will be discussed”!
- May speculate, but make it clear

# Writing: How to get started

- Read accepted abstracts submitted prior years
- Complete data analysis
- Discuss with mentor the major findings/conclusions to include in abstract
- Write the first draft
- Check spelling and grammar!
- Check formatting and special symbols
- Give yourself enough time for feedback and multiple revisions



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# Abstract Writing: Over the limit?



- Keep track of word/character count
- Writing can always be more concise
- Limit background and conclusions to one sentence each
- Increase abbreviations as last resort!

# Other Abstract Hints

- Avoid jargon and use short sentences
- Use active and NOT passive voice
  - “the study tested” and not “it was tested by the study”
- Use past tense to describe what was done
- Use present tense to describe statistical results that are still applicable
- Be “cautious” in conclusions: “findings suggest that”

# Abstract Review Process

- Reviewed by experts in theme areas
  - Importance of selecting most appropriate theme during abstract submission process
- Ranked by novelty of study, methodology, quality of study, importance of results
- Clear, well-written abstract more likely accepted
- Abstracts with missing key elements (hypothesis, statistical methods, etc) usually rejected



# Abstract accepted: Preparing for the meeting

- Possible formats
  - Poster
    - Large group sessions
    - Small thematic groupings
  - Platform slide presentation (10 min + 5 min Q&A)
  - Poster Discussion (may have oral presentation + Q&A component)

A



# Development of a Research Poster



Susan Izatt<sup>1</sup> and Rita Dadiz<sup>2</sup>

<sup>1</sup>Duke University, Durham NC, and <sup>2</sup>University of Rochester Medical Center, Rochester NY

## Introduction

- State why your study is important.
- What is the clinical significance?
- What information do you aim to elucidate or discover?
- Limit the text of this and other sections to <200 words.

## Hypothesis and Aims

- State a testable hypothesis.
- List aims that are specific and evaluable.

## Methods

- Specify the study design (e.g., cohort, randomized, qualitative, etc.)
- Answer the questions: who, what, where, when and how?
- If appropriate, include a figure or flow chart to illustrate details.
- Include methods of statistical analyses.

## Results – Narrative

- List any findings that cannot be depicted in either tables or figures.
- Position your results, tables and figures in the center of your poster.

## Tables

- Use tables to show demographic information or results not easily displayed in a figure.

## Figures

- Develop figures that can stand alone to convey a message without descriptive text.
- Title figures with a sentence that communicates the main finding.
- Choose a figure format that most accurately and best illustrates your data.
- Limit colors on the whole poster to  $\leq 3$ .

## Abstract

- Replicate the abstract that you originally submitted for review.
- Reduce font size to 20-24 point if you need additional poster space for other sections.

## Discussion

- Do not restate results in this section.
- Discuss the significance of your results.
- Clearly identify any speculations.

## Conclusions

- Do not overstate findings.
- Link conclusions to learning objectives.

## Acknowledgements

- List individuals who provided mentorship.
- Acknowledge any funding sources.

## References

- Limit citations to those that are most pertinent.

# Formatting Sections

## Introduction

Well-developed posters should effectively communicate research and stimulate discussion with viewers at professional conferences. Differing from published articles and oral presentations, posters seek to promote informal discussions between the presenters and viewers that facilitate information transfer. Thoughtful preparation is essential in the creation of a poster that will be effective in capturing the interest of the viewer, as poster sessions at large conferences may have hundreds of posters displayed side by side. Studies have shown that attractive posters capture the viewer's interest, with interest noted as a reliable predictor of time spent looking at the poster. Although limited evidence supports the role of stand-alone posters in disseminating information, the design and appearance of a poster can draw a viewer to the content and promote physical interaction with the presenter. This physical interaction affects aural and verbal learning, improving the transfer of information. In addition, the feedback received during a poster presentation may result in the development of ideas for further research, opportunities to network with others, as well as successful publications.

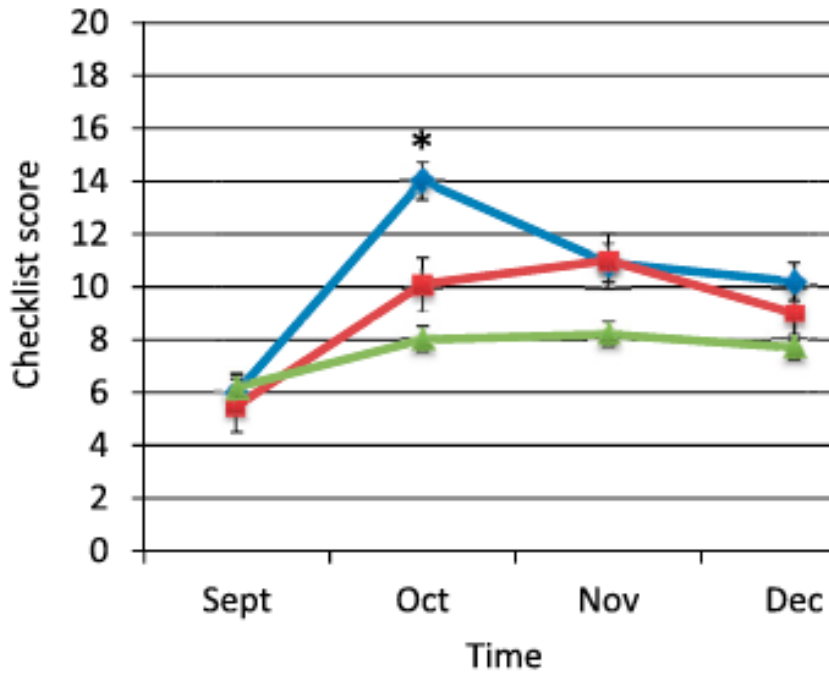
## Introduction

- Posters in healthcare help communicate clinically significant information and research findings at conferences.
- With thoughtful preparation, posters can capture the viewers' interest and facilitate discussion between the author and viewers, resulting in:
  - Aural and verbal learning,
  - Feedback that can be used to further develop ideas,
  - Networking opportunities,
  - Successful publications.
- If poorly designed, posters risk being overlooked when there are many other posters on display.
- This poster presents and illustrates tips for effective poster design, based on research findings and recommendations from healthcare educators, abstract reviewers and graphic designers.

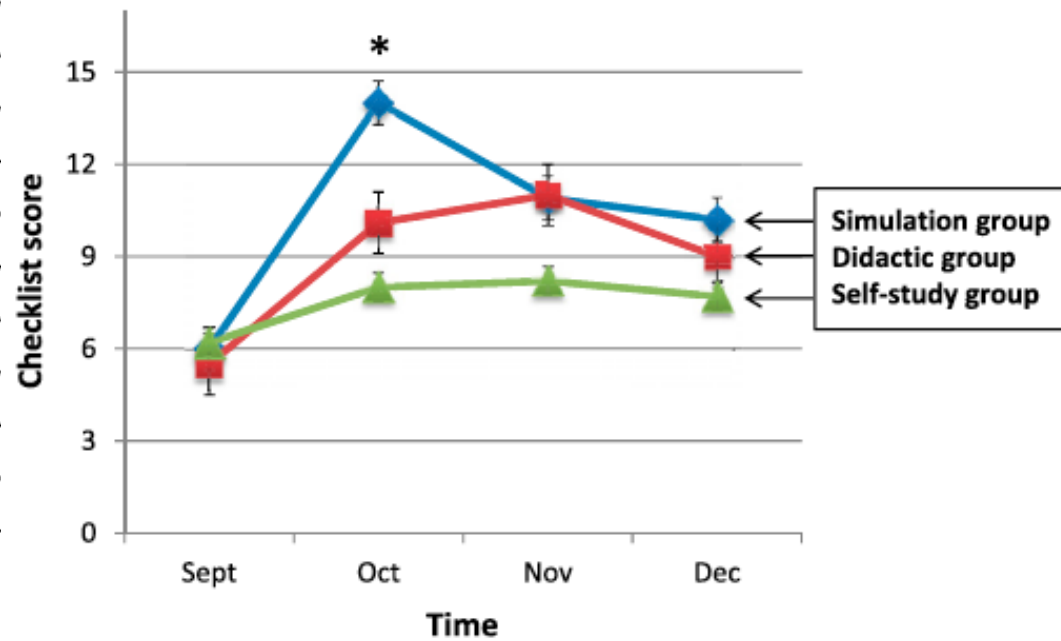
# Clear Graphs for Posters

**A** Longitudinal effect of training modality on team performance during simulated resuscitation

◆ Simulation-based training    ■ Didactic    ▲ Self



**B** Longitudinal effect of training modality on team performance during simulated resuscitations





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# Before you Go

- Do:
  - Practice, practice, practice
  - Take business cards
  - Bring handouts that summarize your poster
  - Bring a pad and pen
  - Adjust your expectations
- Don't:
  - Wait until the last minute
  - Make your poster alone
  - Be unprepared to summarize your poster
  - Check your poster in baggage

# At the poster session

- Do:

- Dress professionally
- Set up early
- Meet your poster session organizers
- Ask for input from your poster viewers
- Look for collaborations, reagents, techniques, etc.
- Pass out business cards liberally

- Don't:

- Abandon your poster
- Look disinterested
- Talk and not listen
- Argue

# Oral Presentation: Slides

- Make slides clear
  - Big rooms: Big text, dark background, light text
  - Smaller rooms: Big text, light background, dark text
- Acknowledge others during the talk
- May require a financial disclosure slide
- Never put presentation in your luggage!

# Effective Powerpoint presentations

- Use slide show animation sparingly, but effectively
- Maximum 6-8 lines per slide
- Use 4-5 bullets per slide
- Include your own tables, graphs (better!) if possible
- Check spelling (by hand)
- Health Sciences & Human Services Library offers course in effective power point presentations



# Oral Presentation: The Talk

- Find out the rules: Most meetings allow 10 minutes for slides and 5 minutes for questions
  - Spend about 1 1/2 slide per minute
    - 30 seconds for a simple slide
    - 2 minutes for a complex slide
- Some write out their presentation and read it
  - Helps if really nervous

# Oral Presentation: The Talk

- Practice, practice, practice
  - Speak slowly and toward the microphone
  - Time your presentation
  - Practice questions
- Rehearse with peers
- Utilize HSHSL Presentation Practice Studio
  - Reservation required
  - <http://www.hshsl.umaryland.edu/services/studio/index.cfm>

# Oral Presentation: Questions

- Be confident: After all of your work, you are an expert in the field.
- Repeat the question back to the audience before answering
  - Think before answering
- If you don't know the answer
  - Ok to say "I don't know"
  - "Thank you for the interesting question!"



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# Navigating the Publication Process or How to get a scientific paper published

# Keys to Successful Manuscript Submission

- Selection of Journal with best fit (scope)
- Writing an abstract that will grab reviewers' interest (and want to review the entire article!)
- Easy to interpret figures, use tables sparingly
- Request likely favorable reviewers
- Following author instructions!

# How to Get Started?

So you want to tell a story

- What is the major message?
  - Do all co-authors agree?
  - Does the evidence support the conclusion?
  - How novel, important, etc, are the findings?
- Who do you want to read your story?
  - A general audience
  - Specific specialty

# Selecting a Journal

- Check the journal titles of the references you plan to cite
- Check the instruction to authors online or print of specific journals for scope and acceptable submission formats
- **Journal impact factor**: measure of the frequency with which the average article in a journal has been cited in a particular period
  - <http://scientific.thomson.com/products/jcr>
- Page and reproduction charges
- Turnaround time for review and publication

# Selecting a Journal

- HSHSL Publication Strategies:  
<http://guides.hshsl.umaryland.edu/c.php?g=94054&p=609191>
- Journal search engines
  - [JANE: Journal/Author Name Estimator](#): enter your title and/or abstract and Jane will find the best matching journals.
  - [Journal Citation Reports](#) to evaluate and compare journals using citation data such as
    - Most frequently cited journals in a field
    - Highest impact journals in a field
  - [Edanz Journal Advisor](#): enter your abstract, the Journal Selector identifies a list of journals that publish in related areas
  - [Elsevier Journal Finder](#): Enter your title, abstract and field(s) of research to find Elsevier journals that match scope



# Authorship

## THE AUTHOR LIST: GIVING CREDIT WHERE CREDIT IS DUE

**The first author**  
Senior grad student on the project. Made the figures.

**The third author**  
First year student who actually did the experiments, performed the analysis and wrote the whole paper. Thinks being third author is "fair".

**The second-to-last author**  
Ambitious assistant professor or post-doc who instigated the paper.

Michaels, C., Lee, E. F., Sap, P. S., Nichols, S. T., Oliveira, L., Smith, B. S.

**The second author**  
Grad student in the lab that has nothing to do with this project, but was included because he/she hung around the group meetings (usually for the food).

**The middle authors**  
Author names nobody really reads. Reserved for undergrads and technical staff.

**The last author**  
The head honcho. Hasn't even read the paper but, hey, he got the funding, and his famous name will get the paper accepted.

# Authorship

- **Author**: someone who made substantial contribution to a scientific investigation
- 3 criteria
  - **Scholarship**: significant contribution to study concept, design, conduct, and/or analysis, data interpretation
  - **Authorship**: participates in writing, reviewing, revising manuscript
  - **Approval**: Approves the manuscript prior to submission

# Authorship

- Lead Author
  - Assumes overall responsibility for the manuscript
  - Serves as corresponding author
  - Involves co-authors and obtains approval for submission
  - Responsible for scientific integrity of manuscript contents

# Authorship Order

- Authorship order should be collective discussion of all authors
- Usually in order of contribution
- Earlier the author in list, the more writing they should have done
- **First author**: person who did most of the work (and writing)
- **Last author**: Usually senior author who obtained the grant, intellectual lead for project, approves final draft; usually **corresponding author**
- Equal contributions for co-authors: can add footnote indicating “contributed equally to the work”

# Manuscript format

- IMRAD: introduction, methods, results & discussion
- Reporting guidelines for clinical studies:
  - Randomized controlled trials:  
<http://www.consort-statement.org>
  - Systematic reviews and meta-analyses:  
<http://www.consort-statement.org/Initiatives/MOOSE/moose.pdf>
  - Observational studies in epidemiology:  
<http://www.strobe-statement.org>

# Common Order for Writing Paper

- Construct tables and figures
- Write methods section
- Write results section
- Write introduction
- Write discussion
- Add references
- Develop title
- Write abstract
- Revise!

# Figures and Tables

- Check journal instructions for formats and number limit
- Often additional charges for color figures, so use only if necessary
- Figures best for showing relationships
- Do not show same data in both table and figure formats
- Descriptive figure legends

# Methods

- Provide sufficient detail for methods could be replicated
- Provide source of materials or reagents
- Use past tense
- Sub-headings may be helpful for organization



# The Introduction: “Introduces” Question



- Presentation: from General to Specific
- What is known about topic
  - Current knowledge about your research area
  - Brief (1 -3 paragraphs) account of most pertinent/important work in field
- What is unknown
  - How you will add to what is known
    - address limitations/challenge literature/expand others' findings
- Research Question/Hypothesis
  - What question/hypothesis does paper address?
  - Identify experimental approach

# Results

- Order the same as for methods
- Refer to tables and figures constructed
- Do not duplicate results in text, tables, and figures
- Use past tense

# Discussion

- Select key findings to discuss
- Go from specifics to general: place study findings in context of literature
  - Include up to date references
  - Include citations of literature with opposing findings or conclusions; possible explanations
- Include discussion of study limitations
- Implications of results for field

# Titles: Indicative vs. Informative

- Indicative title: states subject
  - e.g., A Comparison of Drug A and Drug B in Obsessive-Compulsive Disorder
- Informative title: states conclusion
  - e.g., Drug A Better Than Drug B in Obsessive-Compulsive Disorder
- Note: Most journals use indicative titles
  - Check Instructions to Authors/previous issues
- ok to “hint” at main result/conclusion
  - E.g., “The Effect of A on B: Significance of C”

# Abstract: Well Written Abstracts “Signal” Topics

- (Intro) Question
  - To determine whether . . . we
- Methods (Experiment)
  - To test the hypothesis that . . .
  - To answer this question, we . . .
- Results
  - We found . . .
- Answer
  - We conclude that . . .
- Implication
  - These results suggest . . .

# Writing Tips

- Just get started!
  - “Don’t let the perfect be an enemy of the good”! (G. Rubin “The Happiness Project”)
  - Write first draft; remember there will be multiple drafts before the final product
- Set aside time to write
- Limit distractions!
- Set a schedule for paper completion and stick to it!  
(share with co-authors for completion of their sections)

# Writing Tips

- Paragraph: contains one idea, stated in 1<sup>st</sup> sentence (topic sentence)
- Length of sentences and paragraphs
- Order of sentence: subject, verb, direct object
- Verb tense

# One Idea per Paragraph, Stated in Topic Sentence

- 1<sup>st</sup> sentence in each paragraph
- Reader should be able to read first sentence of each paragraph and have general sense of paper
- Topic sentence provides summary/overview of paragraph
- Every sentence in paragraph supports topic sentence



“Brevity is the Soul of Wit”  
Shakespeare

- Aim for short sentences (20 words average)
- Paragraph length: average 150 words

# Verb Tense: Research Paper

- General principle: present tense indicates information has been published (accepted as “fact”)
- Introduction
  - Present tense
- Methods and Results
  - Past tense
- Discussion
  - Present, present perfect (has/have been) or past tense

# Use Active Voice Whenever Possible

- More precise, less wordy
  - Compare examples:
    - People are considered to be at higher risk for developing cirrhosis if they drink excessive amounts of alcohol. (passive)
    - Heavy drinking is a risk factor for cirrhosis. (active)

# Instructions to Authors

- **Read and follow carefully**
  - Specific formatting instructions
  - Journal specific reference style
  - Will avoid delays in acceptance
- Read other published articles from selected journal for style



# Submission Checklist

- Final draft reviewed carefully for grammar and spelling
- All authors have also reviewed and approved the final draft
- Critiques of internal reviewers have been incorporated in the final draft
- Have carefully read and followed all instructions to authors
- Cover letter to editor
- Copyright release signed by all authors if required by journal
- Submit required number of copies (if paper submission)

# Cover Letter

- Statement that manuscript read and approved by all authors
- Statement that work is original and not under consideration by another journal
- Name, address, and contact info for corresponding author
- Statement of financial or other relationships that might lead to a conflict of interest

# The Peer Review Process

- **Peer review**: unbiased, critical assessment of scholarly work
- Specific review process in instructions for authors
  - May suggest names of potential reviewers
  - May provide names of persons that you do not want to review because of conflict of interest
  - May be reviewed initially by editorial board for level of interest before being sent for review

# Overview of review process

- Potential reviewer contacted by journal
- Given authors, title, abstract, and time frame for review
- Reviewer agrees to review paper (or declines)
- Reviewer receives paper
- Reviewer performs review
- Reviewer submits review to editors



# Overview of review process

- Editors examine reviews, obtain additional reviews if needed, and make decision
- Decision goes to author, with comments from reviewers
- Reviewer may be informed of decision; may receive copy of comments sent to author
  - Asked if willing to review revision

# Major Considerations

- Quality and Importance of the Science
- Appropriateness for the specific journal (within the scope of the journal)

# What the Reviewers Evaluate

- The importance and novelty of the work
  - Does the work make a substantial or incremental addition to knowledge in field?
- The appropriateness of the materials, methods and experimental model systems
  - Were state -of -the-art methodologies used?
- The rigor of the experimental design (including the inclusion of appropriate controls)
- The quality of the data
- The appropriateness of the statistical analyses
  - Often a statistician is asked to review this section specifically

# What the Reviewers Evaluate

- The rigor of the interpretation of the data
  - Are all possible interpretations considered and discussed?
- Are limitations of the study acknowledged and discussed
- The value of the discussion of the data
- The validity of the conclusions drawn in the paper
  - Are the conclusions supported by the data presented?

# The reviewer may also be asked to comment on

- The length of the paper
- The writing quality
- The clarity, accuracy, and completeness of the figures and tables
- The accuracy and adequacy of the introduction which frames the area of the research, of the discussions of prior and related work, and of the citations to the literature
  - Tip: If request a specific reviewer, don't leave out important references written by the reviewer!

# Possible ethical issues identified

- Lack of statement that the study had been reviewed by an IRB
- Concerns about the ethics of studies using animals
- Concerns about the ethics of studies using human subjects
- Undisclosed conflicts of interest on the part of the authors
- Failure to acknowledge or consider related literature or data that conflict with the authors' findings or viewpoint

# Possible Editorial Decisions

- Reject
  - Due to low priority for journal (outside scope)
  - Major flaws in study or considered low importance
- Recommend major revisions (depends on what is required)
- Recommend minor revisions (should be very happy!)
- Acceptance! (rare on first submission)

# Rejection: Why?

- Outside scope of journal
  - Do your homework on journal selection prior to first submission
- Flawed study design or statistical analysis(unlikely addressable)
- Have not conveyed clearly what the study adds to the field (writing clarity)
- Failure to follow author instructions



# Dealing with Rejection

- Remember that reviewer suggestions are meant to help you improve your manuscript!
- Remember that the review process is not adversarial
- Give yourself a few days to complain, and then get to work on the next steps!



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# Next Steps

- Appeal decision by letter to editor (low yield strategy)
  - Still need to respond carefully (and politely) to reviewer comments
- Revise and re-submit the manuscript to same journal
- Revise and submit to another journal
  - Still incorporate suggested changes of first set of reviewers



# Submitting Revised Manuscript

- Carefully read all editorial and reviewer comments-  
Can they be addressed?
- If requests major new experiments, decide whether is feasible vs submitting to another journal
- Pay particular attention to the same comment by 2 or more reviewers
- Incorporate suggested changes in revised manuscript

# What if you disagree with reviewer?

- If reviewer asks for something already in paper, state that you “emphasized” the point that the reviewer requested
- If you disagree, include evidence (citations) in your response
- If the comment is the result of reviewer misunderstanding your wording, re-write for clarity

# Submitting Revised Manuscript

- Letter to editor should address each point by point
  - List each comment from the reviewers verbatim followed by response
  - Make it easy for editors and reviewers to find the revisions in the text of manuscript (give page and line numbers)
  - Be polite and professional
  - If reviewers are complimentary, then address with “thank you for kind comments” ...

# Submitting a Revised Manuscript

- Ask a mentor or internal reviewer to read the response for tone (don't be confrontational or arrogant) and adequacy of response
- Submit the required format of original (track changes indicated) and revised manuscript and figures
- Note any editorial requests for journal style changes



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# Publication Timeline

- Manuscript writing/internal review
  - Journal submission, assignment of associate editor and reviewers
  - Reviewers submit comments, editorial decision
  - Revision and re-submission
  - Second review and acceptance
  - In press to publication (check recent articles in journal)
- 3 months
  - 2-4 weeks
  - 4 wks to 2-3 months
  - 2 wks-2 months
  - 2 weeks
  - 2- 6 months

# Acceptance Letter!

Time to Celebrate!

