Proposal Writing

The Business of Science
Science is a Business?

- Hopefully not for you, not right now, but.....

- ALL research endeavors in our field whether in academia, industry, or wherever, require resources
  - Equipment
  - Animals
  - Drugs
  - Cell lines
  - People (even students)
Science is a Business?

- To get these resources, someone usually has to **convince** someone to give them these resources
  - (or the money to get these resources).
- Usually through some sort of a proposal
Proposal Writing

A Persuasive Writing exercise

- To make a CONVINCING argument for your ideas
- NOT Science Fiction
  - (but pretty close….because it doesn’t exist yet)
- To tell the story of your ideas
- (IT HAS TO START WITH A GOOD IDEA!!)
Proposal Writing

Your Research

What is already known (Past and Present)

Knowledge Gap

What we WANT to know (Future)
Proposal Writing

- Start with your good idea(s)

- Now get other people excited about it.

- COMMUNICATE the ideas...through the proposal.
  - Don’t be surprised if in the process of writing down your ideas, you revise – and hopefully improve – these ideas
Proposal Writing

- What does a Proposal Consist of?
- Aren’t there lots of different formats?
Proposal Writing

- BMP Faculty has decided to adopt the NIH R01 format
- The R01 format has 4 sections:
  - Specific Aims
  - Background and Significance
  - Preliminary Data
  - Research Design and Methods
Specific Aims – 1 page!

- What does the research AIM to do?

- Be Specific; But be concise and to the point.
  - Cure Cancer – Good aim, but not specific
  - Cure Colon Cancer – getting warmer, but not there yet…

- Some reviewers think this is the most important part of the proposal
  - If the reviewer is not excited after reading the specific aims, the methods will not excite them either
  - Stimulate the interest of the reader so that they are excited to read on.
  - You want them to think:
    - How *will* they do that?
    - I would like to see what they plan to do to solve that problem…. 
Specific Aims – 1 page!

- Begin aims with a brief (2-3 sentence) summary of the problem/issue addressed in your research.
  - Refer to the significance of the proposed research here.
  - (NO references here….that will come later).

- Think of your aims as experiments
  - Possibly to test your overall hypothesis(es)
  - Discussed further
Specific Aims

Since your aims are a "to do" list, present them in active language:

- "to quantify", "to determine", etc.
- Avoid vague language that leaves your reviewer uncertain as to exactly what it is you are proposing to do, for example, do not write "to study"
Specific Aims

- A frequent question is how many specific aims should a proposal include?
- Typically three or four
- Don’t give a laundry list of aims
  - May appear too ambitious
Specific Aims

- Aims should have a common theme – testing a hypothesis.

- A hypothesis is an educated *prediction* about the outcome of your study.
  - You may not be right, but you should be able to *determine* if you are right!
  - Hypotheses must be *testable*.

- The point of your research proposal should be to develop experiments designed to test your hypothesis.

- If you are doing development work (developing a new method or a new device), how can you tell if it is “better” than the existing methods or devices? How would you test that?
Specific Aims

- The Overall goal (aka a long-term goal)
  - The final component to include in specific aims.
  - Provides a sense of not only what you wish to accomplish in the proposed research, but how this piece fits into your future plans.
Specific Aims

- Finally, your aims should be the first piece you write.
  - Remember – 1 page!!!

- In fact, it can be very helpful to draft the aims, then circulate them for review.

- Important, because your aims are the basis for your proposal

- So
  - Begin work on your proposal early and draft the aims first
  - Circulate them (fellow students, etc.)
  - Incorporate feedback
  - Then draft the proposal.
Specific Aims

- Examples.....
The first purpose of this section is to demonstrate your understanding of your field by critically analyzing the pertinent work of other investigators leading up to your proposed work.

"Critical" means that you are able to appreciate the contributions of others and identify:
- What has been done
- What has not yet been done (Every work has limitations).
- Identifying the "gaps in our understanding".

Next, describe how your work will:
- Contribute to the “knowledge gap”.
- Overcome the limitations of current work.
Finally, make certain that the significance of your proposed work is clearly shown.

This is not the same as showing that the health issue/disease to which your research relates is significant.

NOT the significance of the Disease itself.

Rather, describe the impact of your research on the disease or health issue in question
- Convince your reviewers that your proposed research addresses an important clearly defined question pertaining to health/mechanisms of disease.
Preliminary Studies

- In “Written Qualifying Exams”,
  - Not be expected to have any prelim data, so you can skip this section.
- In “First Oral Exam”,
  - You will be expected to have some prelim data for this section.
Preliminary Studies

- This section establishes your ability to carry out the proposed studies.
- Demonstrate what studies you have completed and submitted for publication (if any);
  - or at least presented at conferences.
- Studies presented should be RELEVANT to the research question being investigated
  - (Not what research you did for In-N-Out while an undergrad).
- Remember – you are building a case here, telling your story…
Research Design and Methods

- Longest section of the research plan;
  - approximately half of the pages are devoted to it.
  - Important section

- Purpose is to explain how you will carry out your specific aims.

- So, organize this section by aim;
  - Begin with a brief description of your overall approach,
  - Then describe the experiments to be conducted to achieve each aim in consecutive fashion.

- BTW – not just Methods, but “Research Design and Methods”
Research Design and Methods

- The design is the way in which you conceptualize your experiments
  - Provides Rationale for your approach
  - You could have designed your project several different ways – why this one?
  - Show thoughtfulness to readers

- Methods are a detailed discussion of exactly what you will do to carry them out.
  - Make sure you provide your reviewers with sufficient detail to evaluate your work.
  - DO NOT ASSUME reviewers already know all of the details.
  - DO ASSUME they are experts in the field
  - DO **NOT** ASSUME they are experts in **YOUR** portion of our field.
Research Design and Methods

➢ As you describe your experiments....Provide the rationale for each one.
➢ You could just describe what you are doing, but BETTER to describe WHY you are doing it.
➢ Help the reader by using sentences such as:
  • To accurately model the source, we....
  • To assess beam collimation, we will first determine..
  • To *further* extend the verification of the source models, we propose a set of measurements and simulations of surface dose using actual patient data.
Research Design and Methods

Include a data analysis section.
- Do NOT simply list names of stat tests performed
- Describe what types of data will be recorded,
- How they will be analyzed
- What they will mean in terms of your hypotheses.
Another very important part is to provide a discussion of the potential limitations and how you plan to deal with them.

Discuss technical problems that may arise and what alternate plans you may implement:

- what if something doesn’t work?
- If specific aim 2 is highly dependent on developments in specific aim 1, then what happens if things in SA-1 don’t work out?
Research Design and Methods

- End this section with a timeline
  - Could be mostly graphical
  - Some are more narrative

- Communicate:
  - That your experiments are doable in the proposed time
  - That you have a plan for carrying them out.

- Please NOTE:
  - Timeline is not a contract
  - NOT a commitment
  - Timelines do slip.....
  - Provide your BEST, but reasonable, estimate to carry out each experiment
Good example
Research Design and Methods

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- What they will mean in terms of your hypotheses.
Grant Writing References

- http://www.ninds.nih.gov/funding/write_grant_doc.htm
- http://grants.nih.gov/grants/grant_tips.htm