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Keys to Writing Successful NIH Research, Fellowship, and Career Development Grant Applications

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Take-Home Messages

- Writing research proposals is an invaluable element of high quality research
- Writing research grants is a teachable, learnable skill
 - Often not approached as such because of the focus of research training on informal mentoring
 - Effective grant writers (i.e. mentors) often can't explain or deconstruct why they write the way they do and why it works
- Don't let writing proposals hold you back!

Outline

- Introduction to the NIH Grant Review Process
- The components of NIH proposals
- Tools to help as you write
 - Rhetorical patterns of effective grants
- Proposal writing as an interactive and even group activity
- Answer ANY questions you might have – the most important part!

Why so much focus on grant reviewing before talking about grant writing?

- In science we write for reviewers. To be a successful writer you have to start from an understanding of:
 - What reviewers are used to seeing
 - What they want to see
 - The criteria they are using to judge what they read
 - Their likely approaches to their task
- Your task is to turn the reviewer into your advocate:
 - Make the work of the reviewer as simple as possible
 - Convince them your work is VERY important
 - Convince them you know what you are doing and you can conduct the research you propose

Writing for different types of reviewers

- The expert, someone who knows as much, or more, about the topic as you do
- The sophisticated non-expert
- The skilled scientist who knows almost nothing about your specific topic
- The technical expert – e.g. a biostatistician or epidemiologist
- A non-scientist who may still have a lot of input into review decisions and outcomes
- **KNOW YOUR REVIEWERS!!!** You are writing for **THEM**.

The NIH proposal submission and review process – Research Proposals

1. A scientist comes up with a research question, an hypothesis to test
 - Might be out of the blue, a new idea
 - Might be in response to an announcement by NIH of an area they would like people to study
 - Request for Applications – RFA
 - Program Announcement – PA
2. Following highly prescribed guidelines, you write a proposal
3. Electronically submitted to NIH
4. It is assigned to one NIH Institute based on scientific discipline/Institute mission
5. It is assigned to an Initial Review Group – IRG – might be Institute-specific or topic-specific

Research proposal submission continued

6. ~4 months later peer review begins
7. Assigned to 3 reviewers – primary, secondary, reader
 - Assigned by Scientific Review Officer (SRO) – NIH person leading the review process
8. Reviewers read proposals from electronic link to NIH eRA Commons and compile comments
9. Comments and initial scores submitted at least a few days before group meets
 - Until a reviewer submits comments they can't see scores or comments from others
10. Just before meeting, SRO and Chair of IRG confer and identify the bottom ~50% based on scores – those are not discussed but comments already written go to PI who submitted the proposal

Research proposal submission continued

11. IRG meets – discusses proposals
 - Proposals grouped and discussed by stage of career
12. After discussion, every member of the panel gives confidential score, not just those assigned to them
13. One paragraph summary of discussion also prepared
14. Proposals within the IRG are rank ordered to get a Percentile Ranking – normalizes among groups that have different absolute rating behaviors
 - Will not apply for Special Emphasis Panels or IRGs with small numbers of proposals
15. Reviews and scores go to the Program Officer of the Institute it was assigned to for potential funding
16. Potential funding decisions reviewed by the National Advisory Council for the Institute – meets 3 times/yr

NIH Information and Videos on Grant Review

- Recently created videos worth spending 20 minutes viewing....
- <http://cms.csr.nih.gov/ResourcesforApplicants/InsidetheNIHGrantReviewProcessVideo.htm>
- Guidelines for Reviewers
- <http://cms.csr.nih.gov/PeerReviewMeetings/ReviewerGuidelines/>

Fellowship (F) and Career Development (K) Review

1. Similar with a few exceptions
2. Some institutes have separate panels for training proposals
3. Obviously different review criteria
4. Review timing shorter to get feedback faster
5. ALL criteria and sections addressing them are equally critical – low score on one can doom proposal even with excellent scores for other criteria
6. The percentage of submitted proposals that get funded is generally higher than with R grants

“Recent” changes in the NIH grants and their review

- The review criteria and scoring system changed 3 years ago
 - In theory, designed to put more weight on Impact and Significance – importance of the work
- Review criteria are changed in subtle ways
- Page lengths for most proposals substantially changed as of January 25, 2010
- Minimal changes in emphasis and review of fellowships and K awards

New Criteria

- Overall Impact – the score that matters
- Core Review Criteria
 - Significance – may be global or within a field
 - Investigator(s)
 - Innovation
 - Approach
 - Environment

Significance

- **Significance.** Does the project address an important problem or a critical barrier to progress in the field? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

Investigator(s)

- ***Investigator(s)***. Are the PD/PIs, collaborators, and other researchers well suited to the project? If Early Stage Investigators or New Investigators, do they have appropriate experience and training? If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)? If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project?

Innovation

- ***Innovation.*** Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions? Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?

Approach

- **Approach.** Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed? If the project involves clinical research, are the plans for 1) protection of human subjects from research risks, and 2) inclusion of minorities and members of both sexes/genders, as well as the inclusion of children, justified in terms of the scientific goals and research strategy proposed?

Environment

- ***Environment.*** Will the scientific environment in which the work will be done contribute to the probability of success? Are the institutional support, equipment and other physical resources available to the investigators adequate for the project proposed? Will the project benefit from unique features of the scientific environment, subject populations, or collaborative arrangements?

New Scoring System/Process

- Assigned reviewers give scores to each criteria – 1-9, NO decimals
 - Assumes limited ability of us to differentiate into more than 9 categories of merit
 - In practice, reviewers seldom use 8 or 9
- Overall score called Impact Score – 1-9
- Impact Score need not align with individual criteria scores – not an average – often one criterion trumps others
- After discussion everyone assigns Impact Score which is the only one that counts

New Review Template

- Bulleted list of reviewer comments on strengths and weakness for each criterion
- Potential to significantly impact reviewer behaviors
- Much quicker to prepare and read – not necessarily easier to decode

Page Limits and Grant Types

- R01 and some others – 1 page Specific Aims plus 12 page Research Plan – used to be 25
- R02, R13, R21 – 1 page Specific Aims plus 6 page Research Plan – used to be 12
- K08 and K23 – 12 pages for Candidate Information and Research Strategy – used to be 25

Page Change Implications

- Specific Aims page continues to be critical first impressions
- Overall writing style must be very compact and crisp – no wasted words!
- Less focus on Background – very targeted historical perspective
- Preliminary data must be streamlined if you have a lot
- Carefully choose details given in the Approach section – potentially broader brush than in the past
- Important to make impact/novelty/innovation very obvious but it must be legitimate! – Critical to the field if not a direct health impact

Grant Sections – what you need to accomplish in each

- Specific Aims – 1 page
 - One page synopsis of the proposed research
 - Starts from setting the context – a funnel with very steep sides
 - What is the problem or need? What is known – from other’s work to your own? What new information do you hope to uncover? What is the question you are asking and the hypothesis you are testing?
- Bulleted list of Specific aims – what you will do
- Impact Statement
- Crystal clear to the reader why what you are proposing is important and what you will do
- **Often make or break for reviewer enthusiasm!**

Research Strategy – 3 Sections

- Significance
 - Used to be called Background and Significance
 - Much less emphasis on Background but builds the context behind the question and proposed research
 - Preliminary Data might come in here but probably not
 - Likely 1-2 pages of 12 page R01
 - Also think Importance

Research Strategy – Innovation

- Innovation
 - New section – new emphasis
 - Hard to know what to include and how much weight reviewers will put on this section
- Either not included or lower contribution to training proposal
- Also think Novelty
- Sometimes hard to separate from Significance

Research Strategy – Approach

- Approach
 - This is the section where you say exactly what you plan to do, organized by the Specific Aims
 - Specific Aim 1, Specific Aim 2, Specific Aim 3
 - Preliminary Results should be in this section too organized by the Aim they apply to
 - If preliminary data sets up the entire approach it can be provided as a beginning section
 - Sometimes a section on methods that apply to the entire project but usually in each Aim
 - OK to refer back to previous Aims

Preliminary Results

- Where to include not strictly specified
 - Best to think of “When does the reader most need to know?”
 - May be best to mention in more than one place
 - Often first mention them in Specific Aims
 - Must keep them compact – no room for large numbers of tables and figures

F32 Award Sections and Page Limits

- <http://grants1.nih.gov/grants/guide/pa-files/PA-11-113.html>
- Specific Aims – 1 page
 - Differences of opinion on whether or not it should include the career development aims as well as research aims
- Research Strategy – 6 pages
- Respective Contributions of Trainee and Sponsor – 1 page
- Selection of Sponsor and Institution – 1 page
- Training in Responsible Conduct of Research – 1 page
- Goals for Fellowship Training and Career – 1 page
- Activities Planned Under This Award – 1 page
- Doctoral Dissertation and Other Research Experience – 2 pages
- Sponsor(s) and Co-Sponsor(s) – 6 pages
- Biographical Sketch – 4 pages

K Awards – the K Kiosk

- <http://grants.nih.gov/training/careerdevelopmentawards.htm>
- Be SURE to determine any unique requirements or idiosyncrasies for K awards at the Institute you are applying to
 - Talk to the Program Office well in advance
 - Likely only K01 or K99/R00
- Be SURE to read the instructions very carefully
- ALL sections of the application must be strong – any one that is weak is likely to drag down the rest
- A unique blend of capturing how great you are but how you still need extended support to be greater
- Never view a K award as an ‘end’, always as a means to an end – your successful independent career
- Critical to make clear the thrust of R01 level proposal you likely would submit by the start of last year (up to 5 years)

K Award Sections and Page Limits

- Specific Aims – 1 page
 - Differences of opinion on whether or not it should include the career development aims as well as research aims
- First 3 items of Candidate Information and Research Strategy – 12 pages
 - Candidates Background, Career Goals and Objectives, Career Development Training Activities During the Award Period
- Training in Responsible Conduct of Research – 1 page
- Statements by Mentor, Co-Mentor, Consultants, Contributors – 6 pages
- Description of Institutional Environment – 1 page
- Institutional Commitment to Candidate's Research Career Development – 4 pages
- Biographical Sketch – 4 pages

Online Tools for Grant Writing

- Depending on time we will either view this or have everyone view on their own...
- <http://www.northwestern.edu/climb/resources/written-communication/index.html>

Proposal writing very valuable and it should not be a solo endeavor!

- Crafting written proposals is an essential part of good science
 - Forces you to think beyond doing experiments to doing research
 - Written thoughts much more available for discussion and refinement of thinking
 - Requires making logic models that drive an approach clear to the reader
 - Best when it can be an engaged, iterative process
 - At Northwestern using Grant Writers Groups
 - Recently adding auditory approaches too

What else would you like to know?

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