Auckland Medical Research Foundation
est. 1955

Writing a successful grant application takes a sound research idea, time, planning, collaboration and hard work.

There are several tools available to guide you through the process.

The Auckland Medical Research Foundation (AMRF) have collated a few articles or links to get you started, or to refresh your approach to grant writing. They are by no means exhaustive, and some may be funder-specific, but they will give you an idea of the process to go through and the required level of detail and polish that can increase your chances of a successful application.

In addition to this, the Foundation recommends that you:

- Apply via the AMRF Portal www.funding.medicalresearch.org.nz
- Read the guide to applicants carefully each time you apply in case they have been updated
- If you are unsure of anything, contact the AMRF on 09 923 1701 or amrf@medicalresearch.org.nz
- Prepare your application well ahead of time
- Adhere to the specific guidelines for each application
- Seek guidance from researchers who have been successful in obtaining funding from the Foundation
- If you are using experimental animal models in your project, ensure you include sufficient detail to demonstrate that you have designed your experiments appropriately. The ARRIVE guidelines will help you to cover all relevant points https://www.nc3rs.org.uk/arrive-guidelines
- If you are applying to fund a randomised controlled trial the CONSORT guidelines will help you cover all relevant points http://www.consort-statement.org/
- Ensure that any co-applicants on the application have a clear and identifiable role in the project
- Prepare your CV(s) carefully. Include as much information as possible within the limits of the MSI CV template
- Where required, chose your nominated referees or letters of support carefully, and ensure you contact them to gain their approval prior to submitting your application
- Get it read by someone in your field and more importantly, someone outside your field. Allow sufficient time to them to read it and to take their comments on board
- Submit it to you host institution's Research Office on their due date
- After submission, be available to make changes recommended by the Research Office, and by the AMRF

Web links:

http://www.hfsp.org/funding/art-grantsmanship (also in PDF format below)

https://www.insight.mrc.ac.uk/2015/10/05/12-top-tips-for-writing-a-grant-application/

Articles (PDFs below):

Kraicer J. (1997). The Art of Grantsmanship. http://www.hfsp.org/funding/art-grantsmanship

Hardavella G, Karampini E, Jacinto T, Saad N. (2016) How to submit a successful funding application. *Breathe*, 12(1):73.

Barker L, Rattihalli R, Field D. (2015). How to write a good research grant proposal. *Paediatrics and Child Health*, 26(3):105.

Wisdom J, Riley H, Myers N. (2015). Recommendations for Writing Successful Grant Proposals: An Information Synthesis. *Academic Medicine*, 90(12): 1720.

Open secrets about writing successful grant proposals: Notes for researchers and research managers. (2013). Research Africa. https://www.acu.ac.uk/publication/download?publication=528

Koppelman G, Holloway J. (2012). Successful grant writing. *Paediatric Respiratory Reviews*, 13:63.

Brown M, Sayers R. (2012). How to apply for a research grant. *Surgery*, 30(9): 467.

The Art of Grantsmanship

By Jacob Kraicer

Writing a successful grant application is an art. Although the science is primarily being evaluated, presentation and respect for the requirements of the funding agency are key aspects that can make or break an application. In this article, Jack Kraicer, former Director of Research Grants at HFSP provides guidelines on preparing grant applications from the moment of conception to the submitting the final proposal.

---

1. INTRODUCTION

"Grantsmanship is the art of acquiring peer-reviewed research funding"

The objective of these guidelines is to assist both new and veteran investigators to optimize their chances of successfully competing in a peer-reviewed grant application competition. It is a competition. With success rates falling to 50% or below, the difference between success and failure often results, not just from the quality of the science, but from the quality of the grant application. In all probability, the quality of science of the applications in the 10% below the cut-off for funding by an agency is not significantly different from that in the 10% just above the cut-off. "Grantsmanship" can make the difference.

The art of "grantsmanship" will not turn mediocre science into a fundable grant proposal. But poor "grantsmanship" will, and often does, turn very good science into an unfundable grant proposal. Good writing will not save bad ideas, but bad writing can kill good ones.

Why am I qualified to give advice ? First, I was successful in obtaining peer-reviewed funding and I served on a number of national and international reviewing bodies for some 30 years. But perhaps more relevant is the fact that I was responsible for the administration of a peer-reviewed research grants program for four years. During this time some 1600 research grant applications were processed.

My comments, suggestions, and recommendations are based on this experience, plus documents and discussions listed in the acknowledgements. They are relevant to most peer-reviewed research grant applications to most granting agencies. The information required, formats, and review processes are generally similar.

2. BEFORE YOU START TO WRITE

Read the Guidebooks, Guidelines, and Application Forms carefully and follow them exactly. Make sure that you have the latest versions.

- Make sure that your proposal "fits" with the mission of the agency and that your objectives match with those of the agency. Make this "match" explicit in your written application.
- If you have any doubts or questions, contact the relevant granting agency person, who will welcome your questions and answer them. They really do want to help.
- Find out the median funding level for the agency. This will allow you to formulate a reasonable budget.
- Find colleagues who have served on, or have received grants from, the agency. They can give you "insider" information on how the agency works, and what "sells".

Begin to formulate / clarify your ideas.

- Do you have a clear, concise and testable hypothesis ?
- Are your objectives and aims coming into focus ?

- What questions are to be addressed ?
- Can you define and design specific experiments that will test directly your hypothesis?

Start the process early (see timetable suggested by Tutis Vilis (section 3.2), which I have modified slightly).

Put together and write up your recent work and submit it to appropriate peer-reviewed journal(s). Do this well in advance so that the work can appear in your application as "published", "in press" or "a submitted manuscript". Most granting agencies will not accept a manuscript "in preparation". Your track record, as judged by publications, is an important criterion in the assessment.

Carry out appropriate preliminary (pilot) studies, so that their results can be included in the application. This is especially important for new applications. It will also establish for you, and for the reviewers, whether the experimental approaches are feasible and where the pitfalls may be.

Find and study previous grant proposals of colleagues that have been successful. Consider these as models.

Find out, if you can, who are the members of the review committee and focus accordingly.

Identify essential and appropriate investigators who wish to collaborate with you.

Discuss ideas with colleagues in the same and relevant fields. Just going through the process of explanation and discussion will help to clarify and focus your ideas, and to identify possible gaps in logic.

3. THE APPLICATION

3.1 General

- Read the general instructions CAREFULLY and follow them EXACTLY.
- Successful applications must be "a joy to read" and must stand out from the ever-increasing competition.
- Make the display pleasant and attractive.
- Use appropriate type size, font, spacing and margination.
- Do not go over the maximum number of pages allowed (many agencies will not accept applications that have one page too many).
- Send the instructed number of copies.
- If attachments and/or appendices are not allowed, do not submit them. They will not be distributed to reviewers. Similarly, if reprints are not required, do not send them (they will be discarded).
- Do not submit additional information after the deadline (unless explicitly allowed).

- I was astonished to find that in one agency, about 25% of research grant applications were incomplete and required that the applicant submit additional information urgently. This does not make for a good beginning. "A sloppy application = a sloppy scientist"
- Polish your application extensively. Make the application well-focused, clear, well organized and accurate.
    - You want the reviewers to be your enthusiastic champions and advocates. A luke-warm review is fatal.
    - Remember that the reviewers are doing the reviews as a task over and above their daily mandated activities, and are often unpaid. They may be overwhelmed with applications and manuscripts requiring reviews. They often carry out the reviews under less-than-ideal conditions (evenings, weekends, holidays, at meetings, or even on the way to review committee meetings). They may wait until the last minute to begin their review.
    - Reviewers often do their reading in bits-and-pieces. Have your application so organized so that it can be read in this way. You do not want them to have to go back to the beginning after each break.
- Pay attention to the agency's objectives and criteria. It is a waste of time to apply to the "wrong" agency.
- Do not rely on your computer's spell checker. Use a dictionary. "If you can't get the spelling right, how are you expected to get the research right ?".
- Avoid abbreviations, acronyms and jargon (that the non-expert may not understand). If you use abbreviations, then define them when used for the first time.
- Assume that you are writing for a reviewer in a somewhat related field, rather than for an expert directly in your area.
- Remember that many agencies, even national ones, send applications for review abroad. Use language that will be easily understood by those for whom the language is foreign.
- Aim the application at both the expert in the field and at the generalist (see subsequent sections).
- Extensive and intensive internal peer-review is essential.
- Ensure that a late draft (not an early one) is examined by at least two colleagues who have experience with, and are successful in, the peer review process : a) in your direct scientific area to check relevance, accuracy, ambiguities and quality of science, b) a "generalist" to check for clarity, and c) someone who is a good editor.
- Make sure that the (late) version they receive is free of mechanical errors (spelling, typos, grammar, etc.) ; it is not their task to make these kinds of corrections. If they are distracted by mechanical errors, they may fail to identify fundamental problems.
- Give the internal reviewers enough time to do a thorough job.

3.2. Timetable (from Tutis Vilis at Survival Skills with slight modifications)

1 year before the deadline:

Start thinking of interesting projects. Try to find a balance between something "sure" and something truly innovative and even risky.

- *These might be side issues of what you are currently working on.*

- *Imagine what the possible outcomes might be.*
- *Start reviewing the literature.*
- *Discuss your ideas with others. Just going through the process of trying to explain things to others is a great way to clarify things for yourself. Don't be disappointed if they do not share your enthusiasm. But listen to their criticisms.*

Complete as many of your current experiments as possible ; write up the papers and submit them for publication.

- *It can easily take 6 months to have a submitted paper accepted, longer if there are several revisions.*
- *A most important element of your application is your track record.*
- *What counts most in your track record is published papers in peer-reviewed journals.*

9 months before the deadline:

Obtain preliminary data.

- *These will greatly strengthen your proposal.*
- *A reviewer can think of a hundred reasons why something that you propose will not work. These objections vanish if you can show that you have done it.*

You may need to submit a small application to your local institution to obtain funds to do the preliminary experiments.

- *Getting this support will enhance your application.*

6 months before the deadline:

Write an initial draft of the main proposal section.

- *This can take a month of very intensive work.*
- *This section may best be done in one continuous block of time; 3 to 6 hours per day each day of the week.*
- *Block this time off in advance.*
- *You will get nowhere, working a few hours a week.*

5 months before the deadline:

Obtain comments from your colleagues.

- *These are people who are willing to spend hours reading and rereading your grant, not someone who returns it with the word "fantastic" on the front cover.*
- *Sit down and talk to them about their comments.*
- *Pay attention to what they failed to understand. Revise.*
- *Get more comments. Revise, etc.*

4 months before the deadline (even earlier for some institutions):

Submit your proposed experiments for approval to local committees where appropriate: animal care, human ethics, safety, etc.

2 months before the deadline:

Reread the guidelines and your application.

Take the instructions seriously. Do what they ask.

Work on the other parts.

- *Get quotations for equipment.*
- *Get letters of confirmation from collaborators.*
- *Work out the budget.*

1 month before the deadline:

Put together what looks like the final version: on the official forms, with figures and references.

- *Give this to your colleagues for additional review.*
- *There is nothing like seeing the whole package. Obvious flaws suddenly become apparent at this stage.*

2 weeks before the deadline:

Type the final version.

- *Proof read it.*
- *Have it proof read by someone who has not seen it before.*
- *Do not trust the spell checker.*

Get all the necessary signatures.

1 week before the deadline:

Get the necessary copies made.

- *The copy machine will probably be occupied by others with the same deadline or it will have broken down.*

2 days before the deadline:

Send it out by express mail / courier.

- *Get some sleep.*

3.3 First / Title Page

Fill it in completely and accurately and ensure that all signatures are obtained (in my experience, up to 10% of applications have something missing from this page).

The TITLE of your project is important.

- It sets the first impression.
- It is often used, with the Abstract, to route the application to the appropriate review committee(s) and reviewers.
- It should be descriptive, specific and appropriate, and should reflect the importance of the proposal(s). But it should not be so specific as to require changes with each renewal (it helps to maintain the same title for renewals). One way to achieve this is to have a two part title ; the first general and the second more specific (eg "The control of secretion of growth hormone : mechanism of action of somatostatin"). The phrase after the colon may then change in subsequent renewals, while the part before the colon will remain unchanged.

3.4 Abstract / Summary of Proposal

THE ABSTRACT SHOULD SERVE AS A SUCCINCT AND ACCURATE DESCRIPTION OF THE PROPOSAL EVEN WHEN IT IS SEPARATED FROM THE APPLICATION. IT MUST STAND ON ITS OWN.

- This is probably the most important section in your application. Take it seriously . Write it last. Work on it extensively after the bulk of the proposal has been fine-tuned. It is the first part that is read, and this sets the first impression.
- It is often used to route the application to the appropriate external reviewers, grants committee, and to the primary reviewer(s) in the grants committee.
- It must be understood by both experts in your field and by "generalists".
- The primary reviewer(s) read the entire application for which they are responsible, but others on the review committee **may only read the abstract**. (see also Appendix - the process in the review committee).The abstract may be the only part of the application that is read by all the members of the grants committee who are not primary reviewers, even though ALL members may have to give their independent scores (given equal weight to the scores of the primary reviewer(s)).
- Review committee members often study the application (and prepare written reports, if required) weeks or months before the meetings. They then quickly review all the abstracts just before the meetings in order to recall the essentials.
- The contents: to include hypotheses, objectives, approaches, research plan, and significance.
    - State the hypotheses to be tested. Give the long-term objectives.
    - State the specific aims.

    - Make reference to how the proposal is directly related to the mission and objectives of the agency to which application is being made.
    - Describe concisely the research design and methods.
    - Tell why the proposal is unique, important, significant, and worth supporting.
- Stay within the allotted space. But it is not necessary to fill this space. When you have nothing more to say, then stop.

3.5 Recommended External Reviewers (if requested)

- Give this some thought. They are often used.
- They need not be of Nobel Award stature, but they should be recognized experts in the field. Also, they should be tolerant of, and sympathetic to, your hypothesis.
- If the application requests their "fields of expertise", be specific (eg "ion channel/patch clamp/receptor-ligand interactions" and not "cell physiology").
- They must, of course, have an "arms-length" relation with the applicant (as usually defined by the guidelines of the agency).
- Most agencies will also honour a request by the applicant that certain named reviewers NOT be used. They will usually do this without requiring specific reasons (check with the agency).

3.6 Proposed Research

3.6.1 General

- Keep the proposal confined to the space allotted.
- The proposals must be focused, original, novel, innovative, and of course feasible.
- Try to find a balance, in the proposal, between something "sure" and something new, innovative and/or risky.
- Set out alternative strategies in case the original ideas fail.
- Write and rewrite : work and rework the application.
- Use of diagrams, cartoons and figures is often helpful (a picture is worth a thousand words). But note that copies will not appear in colour.
- Again, make it a joy to read. You want the reviewers to become your advocates and not your adversaries.
- Never state or imply that a study will be carried out "because it has never been done" or "there are no data on …". This may be so because it is trivial.
- State clearly what is novel, and what is merely confirmatory.
- State explicitly how the proposal relates to the mission, objectives and priorities of the agency.
- It is useful to organize the presentation with appropriate headings and sub-headings, using a simple and obvious numerical classification.
- Don’t forget to cite potential external reviewers and committee reviewers where appropriate. But don’t be excessively flattering.

3.6.2 Specific

- A useful plan is to break the proposal into the following headings, which I will expand, in sequence.
- Hypothesis and Long-Term Objectives
- Specific Aims
- Background and Significance : Current State of Knowledge
- Progress / Preliminary Studies
- Research Design and Methods
- Timetable
- Strengths and Weaknesses

3.6.2.1 Hypothesis and Long-Term Objectives

- A testable hypothesis-driven proposal is best ; a proposal that is primarily descriptive is less favourably received.
- Begin with the stated hypothesis, and tie this in with the long-term objectives. What is the proposed specific research intended to accomplish ? What is the significance and relevance of the research?

3.6.2.2 Specific Aims

- Distinguish these from 3.6.2.1. The Specific Aims are the specific projects, studies and items that will be undertaken in order to fulfill the long-term objectives.
- Put them in a logical and sequential order. Indicate priorities.

3.6.2.3 Background and Significance : Current State of Knowledge

- This should answer 3 questions ; what is known, what is not known, and why is it essential to find out.
- Begin with a brief outline of the highlights in the background review. State where your own previous contributions (if any) fit in.
- Then critically evaluate the relevant literature: not just an uncritical compendium or list.
- Discuss fairly all sides of a controversy, disagreement, and/or discrepancy in published results. But be careful since a participant in a controversy may be your reviewer.
- Identify specifically the gaps and contradictions that you will clarify. Carry this into the rationale for your proposal.
- Emphasize the importance and relevance of your proposal in bridging your hypotheses and long-term objectives to the background review.
- Integrate your previous findings within the background to give the reviewers a sense of your relevant contributions.

3.6.2.4 Progress (as related to Background and Significance)

- This will differ if this is a renewal or a new application.
- If a renewal:

- Remind the reviewers of the start and end dates of the previous award. You must establish your credibility of excellence in research, and that the proposal will continue the high quality of your research.
- Summarize your previous hypotheses, long-term objectives and specific aims, and give a succinct description of progress. Emphasize especially the most important and relevant findings.
- It is appropriate to describe how your specific aims may have changed as the work progressed.
- Incorporate all publications, manuscripts submitted or accepted, and abstracts (if permitted), of work carried out during the term of the grant.
- In as subtle a way as possible try to convince the reviewers that your recent contributions were outstanding and of great importance. How has your work significantly advanced knowledge in the field? And how will the proposal continue this record of achievement and excellence ?
- Don't complain about previously low or inadequate funding. This is self-defeating.
- If a new application:
    - You need to convince the reviewers of your excellent and relevant training, and that you already have substantive preliminary data and/or pilot studies.
    - Summarize your relevant previous work, highlighting your unique qualifications and skills. Tell how these will assist you in the successful carrying out the proposed studies.
    - Review your preliminary studies and results. Present the actual data. This will help establish your experience, competence and credibility.
    - List your publications and manuscripts submitted or accepted (if this is permitted).
- For both:
    - If allowed, list all of your publications, abstracts and other retrievable material related to your proposal. Do not submit these if not asked for.

3.6.2.5 Preliminary Data / Studies

- These should be included either in the Background, in Progress, or as a separate section and is of great importance. Tie it directly to your hypotheses and long-term objectives.
- Describe preliminary data that are relevant and pertinent. Show the actual data.
- This is especially important in a new application in order to document the credibility, experience and competence of both the proposal and the proposer.
- *Note added by HFSP: this is excellent advice but for HFSP Research Grants we deliberately do not require preliminary data in order to encourage innovative thinking and to support new departures for the investigators*

3.6.2.6 Research Design and Methods

- The Specific Aims have stated what you propose. Now you must describe how you propose to fulfil the Aims.
- Be focused and clear. Put the Aims in a logical and sequential order. Also consider a brief opening paragraph describing the relationship of each Specific Aim to each other and to

the overall Objectives. It is useful to break this section down, beginning with each stated Specific Aim (plus a one-sentence rationale for each aim?). Then outline the design and methods to accomplish each Specific Aim, and explain why the proposed approach was chosen.

- Then consider a plan something like this:
- Number the research designs and methods to correspond to the numbers of the Specific Aims.
- Use sub-numbering within each part when describing several methods applicable to the same Specific Aim.
- Distinguish clearly between overall research design and specific methods.
- Do not repeat identical procedures that apply to more than one Specific Aim.
- Reference, but do not describe well-known or standard procedures. But do describe procedures that are new or unlikely to be known to reviewers.
- For new methods, explain why they are better than existing methods.
- Discuss relevant control experiments (This is often lacking).
- Explain the processes for data collection, analysis and interpretation.
- Discuss potential difficulties and limitations of the proposed procedures and give alternative procedures to achieve the aims. This will prevent potential criticisms by reviewers and may, in fact, "save" your application. State clearly possible weaknesses and/or ambiguities and respond (i.e. preempt the criticisms).
- Provide a brief tentative sequence and timetable for the project. List them in order. Be realistic. Consider doing this using a diagram or table. Clearly define priorities.
- Document all proposed collaborative arrangements, including letters from collaborators confirming the specifics of the arrangement. The role of collaborator(s) should be clearly defined. Biographic sketches (if allowed) are useful. Otherwise relevant experience and expertise should be included in the collaborator's letter.

3.7 Budget

- In most agencies, the members of the review committee are required to recommend an appropriate budget, independent of the scientific merit of the proposal.
- The budget generally stands alone, separate from the rest of the application. Unlike the research proposal, everyone on the review committee is now an "expert", and all participate actively.
- The budget is usually considered last, after the merits of the proposal have been decided, and a score has been given.
- Often, review committee members are under an obligation to reduce the budget. Therefore, make sure the budget is well documented, realistic, appropriate and justified. Do not inflate, overbudget, or underbudget.
- Check carefully whether the agency supports certain items (eg secretariat assistance, travel, purchase of books, etc.). Do not request items that are not allowed.
- Give sufficient details for each item to make it difficult and unreasonable for the reviewers to arbitrarily suggest major cuts.
- For equipment, document convincingly why the piece is essential (not just "nice to have" or "faster and better"), and why the specified model is required.
- For personnel:

    - Make sure they are allowed.
    - Specify the unique and essential role that each will play, and state how their qualifications are matched with the role.
    - Avoid "to be named" if possible.
- For travel, specify who will travel and whether they will be presenting a paper. Also justify a request for more than one meeting per year for any one person.

3.8 Other Grants Received and/or Pending

- Be honest and complete. The agency can verify this information from independent sources.
- Be careful if stating "no overlap". It may be more accurate to state "There are certain similarities in the systems and/or methods but there is no overlap in specific aims or objectives".

3.9 Appended Documents

- Make sure that all that are required are included. If allowed, include material that is supportive but not integral to the contents of the application. But the application, without appendices, must stand on its own.
- Do not include documents if they are not required:
    - They will not be distributed to the reviewers.
    - A common ploy is to attempt to extend beyond the page limit for the "Proposal" or the "Summary of Progress" by including an Appendix. This Appendix, unless specifically allowed, will not be distributed to the reviewers. This may leave a "gap" or "hole" in your application if your refer to the Appendix in your text.

3.10 Publications

- Unfortunately many reviewers tend to "weigh" or "count" publications, rather than assess the quality, significance and contribution of the applicant.
- Aim for a good number of first authored publications in first-order peer-reviewed journals.
- A high ratio of abstracts / full-length papers is not well received
- Other kinds of publications (books, chapters, reviews, non-peer reviewed articles) may not impress the reviewers.

4.COMMON ERRORS MADE

4.1 By New Applicants

- The proposal includes a lifetime’s work and is unrealistically ambitious. There are no clearly defined priorities and the timetable (if present) is unrealistic, with no sense of what can realistically be accomplished during the term of the grant.
- The literature and background reviews are uncritical. They read like an undergraduate review.

- There are no results of pilot studies or other preliminary data.
- The time listed to be spent on research should be at least 50%, and preferably over 75%. Anything less than 50% may be unacceptable (a smaller percent effort is usually acceptable for established investigators).
- The budget is unrealistic.

4.2 By Established Investigators

- The application is fragmented and disjointed. Different parts were obviously written by different junior colleagues and then hastily assembled by the applicant.
- "I don't have to go into detail. Trust me and examine my track record. Rely on my reputation". This no longer works.
- The proposals tend to be too cautious and do not venture into new and unexplored areas. They tend to be "more of the same".

5. APPENDIX

Outline of the Review Process

Granting agencies differ in the processing of applications. The following general scheme applies to most.

The cycle begins with the deadline for receipt of applications. Most agencies will reject applications that arrive after the deadline.

The secretariat then examines each application, looking for obvious irregularities including:

- Missing critical information or signatures
- Inappropriate format (type size, spacing, margins, etc..)
- Number of pages exceeding that allowed
- Application does not "fit" with the mission / objectives of the agency
- Missing sections
- Applicant does not qualify
- Extra (not required) information is included.

Depending on the seriousness of the irregularity, the application may be rejected, or further information will be solicited.

The applications are then assigned to external reviewers. These are chosen from names recommended a) by the applicants, b) by members of the review committees and c) from the database in the agency. The external reviewers are asked to submit extensive written reviews, which are made available to the members of the appropriate review committee. Both the external reviewers and review committee members (see below) are asked to follow a format such as this in their reports:

- A concise summary of the proposal (no more than a single paragraph) emphasizing the significance of the proposed research.
- An evaluation of the work done previously as presented in a progress report (if applicable).
- An assessment of the strengths and weaknesses of the proposal, including your opinion regarding:
- originality of the hypotheses presented and the significance of the questions asked
- feasablility
- relationship to the previous work done by the applicants
- appropriateness of the critical review of the literature
- scientific and intellectual environment
- applicant's knowledge of the field as reflected in the literature reviewed
- appropriateness of the research plan and methodology
- significance of the work conducted previously and the potential of the proposed work to elucidate new and important knowledge
- appropriateness of the budget
- Most agencies aim for at least two external reviews for each application.
- Each application is usually assigned to two members of the review committee for detailed analysis (the primary reviewers). They may or may not be experts in your field. They may not be required to submit written reports. Only the two primary reviewers may be required to study the entire application. The other members of the review committee may not receive the entire application. They may only receive the abstract/summary pages.
- At the meeting of the review committee:
- Each application may receive no more than 15 minutes of discussion.
- The two primary reviewers introduce each application and give their evaluations. The external reviews are analyzed and comments made. The others on the committee then participate in discussion. A Final Score and/or Rating is made, and a rank order decided on the basis of scientific excellence.
- All then participate in the discussion of budget and a final recommendation is made.
- The members may know the global budget available to their committee. Demands for funding often far outweigh the funds available. Thus many very good proposals will fall below the cut-off. There will be painful discussion concerning the "trade off" of size of budget per application vs. number of applications funded.
- The recommendations of the review committee are then reported to the "higher body" which usually accepts the rank order decided by the review committee but argues further about budget. This becomes most difficult when it is seen that the cut-off is too high, with many very good applications being rejected.

6. ACKNOWLEDGEMENTS

"Stealing from one source is plagiarism, while stealing from many is research"

I incorporated ideas freely from a number of sources:

1. Reif-Lehrer, Liane: Grant Application Writer's Handbook, Jones and Bartlett Publishers, Boston MA, USA, 1995. This book contains excellent advice for both new and seasoned

grant application writers, some of which has been incorporated herein. Although aimed primarily with the National Institute of Health and the National Science Foundation in mind, much of the advice can be applied universally.

2. Profs. Tutis Vilis and Jane Rylett in the Department of Physiology at the University of Western Ontario have prepared guidelines for applicants based on their extensive experience. Many of their suggestions are incorporated.
3. Colleagues both in Europe and North America have examined this document and have provided useful criticisms.
4. A number of applicants, external reviewers and members of review committees have provided (inadvertent ?) fodder.
5. But I take full responsibility for all errors, omissions, opinions, and recommendations.

A FINAL REQUEST

This is a work in progress. If you have any criticisms, suggestions or items to be added or deleted, I welcome your comments.

Jacob KRAICER, MD, PhD
Professor Department of Physiology
Faculty of Medicine
University of Toronto Medical Sciences Building
Toronto, Ontario
CANADA M5S 1A8
Tel: (416) 946-3686
Fax: (416) 978-4940
E-mail: j.kraicer@utoronto.ca

Strasbourg, 5 May 1997

Georgia Hardavella[1,2], Elena Karampini[3], Tiago Jacinto[4,5], Neil J. Saad[3,6]

georgiahardavella@hotmail.com

[1]Dept of Respiratory Medicine, King's College Hospital, London, UK. [2]Dept of Respiratory Medicine and Allergy, King's College London, London, UK. [3]Dept of Respiratory Medicine, Guy's and St Thomas' NHS Foundation Trust, London, UK. [4]Instituto and Hospital CUF Porto, Porto, Portugal. [5]Centre for Research in Health Technologies and Information Systems, Faculty of Medicine, Porto, Portugal. [6]National Heart and Lung Institute, Imperial College London, London, UK.

How to submit a successful funding application

Doing science

Cite as: Hardavella G, Karampini E, Jacinto T, *et al*. How to submit a successful funding application. *Breathe* 2016; 12: 73–77.

"You never get a second chance to make a first impression..."

Harlan Hogan

Historically, there has always been a magic wind selectively pushing funding application packs to land on young fellows' desks. Following the first wave of enthusiasm, this has almost always come with a complimentary package of anxiety and sleepless nights about how to fill in the application and trying to find out what needs to be done.

Here, we try to offer some recommendations on how to deal with funding applications and increase the chances of them being successful.

Before submitting your application

Identify the funding opportunity

To identify the right funding bodies or calls for application you first need to be aware that they exist! A practical way to get this information is to subscribe to email updates from several funding bodies or the relevant department of your institution that disseminates these updates. This will make you aware of when calls for applications are due to start. This will increase the size of your inbox; however, it will provide you with valuable information that will help you plan ahead. Once you've identified a call for application or a funding body, read the guidance notes very carefully and make sure the call applies to you or your research interest. If you are in doubt, contact the project officer or funding body for clarification. It could be worth contacting them with a brief summary of your project/idea and asking whether this suits the purpose of the call, as this gives you an *a priori* confirmation as to whether or not your project is relevant.

Discuss with your boss and colleagues

After you've found an opportunity that you think is applicable to your research and you've got a good idea of what is expected of the application, discuss it with your line manager or colleagues with whom you would like to submit the application. Do you think it is feasible to submit the application in the allocated time? Why do you really think this is the right funding opportunity for you? Your supervisor and other colleagues can help you in answering these questions, and as you get more senior you will be better able to answer these questions independently.

@ERSpublications
How to submit a successful funding application: "You never get a second chance to make a first impression!" http://ow.ly/XgmbJ

Discuss with your research and development office

Contact your institution's research and development (R&D) office. They provide valuable support to funding applications and they can guide you throughout the process. Some institutions will even have allocated people who will go through your application before submission and will provide valuable feedback. They will be able to help you in obtaining ethical approval for your study and estimating the costs of the project. Some institutions have access to clinical trial units, and in this case should you decide to carry out your trial under them, you would benefit from a lot of support and expertise.

Networking

Speak with more senior colleagues in your group and at conferences. Most senior researchers will have invaluable experience in submitting funding applications, will know of smaller funding bodies or will be able to direct you to poorly advertised calls. Senior researchers will also be able to help you in submitting the application and can give you tips and pointers, which are not advertised or widely known. Speaking to senior researchers about your research, even when you are not in the process of submitting an application, might result in joint projects or they might invite you to participate in a project they have already planned.

Develop relationships with key people when possible. Communicate with them about your work periodically, even when you are not in the process of submitting an application. This may help you create new collaborations and learn about future funding prospects, as well as increase your chances for a successful proposal. If you feel this is beyond your reach, ask your boss or a relevant person from the R&D office to use their contacts for this.

Multidisciplinarity: the more the merrier

Break your project down into smaller parts and try to identify experts in the field for each bit and approach them to collaborate with you. Funding bodies would like to see a collaboration of people that have specific expertise and "know what they are doing". Some people fear that including more people in the funding application might dilute their idea and result in them losing credit. Our answer is "the more the merrier" as long as you select your collaborators appropriately and you clarify the conditions of the collaboration so that everyone gets appropriate credit for their work. The "solo flyer" approach is not an option if you want to submit a successful funding application. Regardless of how good you may be, you cannot claim expertise for all aspects of the research that is included in your funding application. As stated above it is really important to set up collaborations with experts from each field and bring everyone together to increase the chances of a successful outcome.

Organising your writing approach

Your writing approach should be aim to address the three "P"s: Persuade, Promise, Plan.

Read the funder's guidelines

Once you have decided that a particular call is appropriate for your project then you need to roll-up your sleeves and get going. Study the funder's guidelines carefully and in depth, note their priorities, eligibility requirements, formatting details, deadlines and review criteria. Follow the guidelines explicitly both in content and format. If possible, get hold of previous successful applications to the same funding body and review them, but do not duplicate them.

Writing the abstract

Every proposal should have an abstract. This forms the initial impression of the work and plays a big role in whether the application is funded. This is the first part of your work with which to persuade the reviewers. Some reviewers will rely heavily on the abstract to influence their "bird's eye view" and it is therefore considered one of the most important elements of a grant application. To present an overview of the project, the abstract should summarise the importance of the work, the hypothesis and major aims/objectives of the proposal, the methods to be followed to achieve these objectives and the potential impact of the work. You should aim to write the abstract last even though it generally appears first in the application. Its length will depend on the funder's guidelines. Pay extra attention to the layperson's abstract if one is included in the application as the lay members of the funding committee will base their decision on it. Request feedback from patients and members of public that sit on the patient advisory committee of your institution or from lay friends and if they understand then you know that your lay summary is successful. Sometimes the layperson's summary can be more challenging than the scientific one, as the importance of the project needs to be explained in simple lay language.

Writing the research proposal

This section includes a comprehensive explanation of the proposed research and is addressed to other specialists in your field. It is the heart of the proposal and the main focus of attention for the technical reviewers. It needs to be a balanced

combination of promise and plan. When writing the scientific proposal, it is helpful to have a checklist for the summary, introduction, problem statement, objectives, methods evaluation and budget. In this way, you can be confident you have not omitted anything and that everything has been presented in a systematic way.

Be explicit about the hypothesis the research method rests upon and be as detailed as possible about the schedule of the proposed work. A timeline detailing the projected sequence of major tasks gives the funder assurance that the investigator is capable of careful planning and that the work will be accomplished in an efficient and feasible manner. If you are applying for clinical research it is always useful to include the patient's pathway.

Be specific about the means of evaluating the data, conducting the analysis and determining the conclusions as well as the anticipated impact of your work and the difference it will make to current practice. Statistics can be really challenging and it would be helpful to include a statistician on the team to offer their expertise. Although this is a moment to shine, always remember not to promise what you cannot deliver but to deliver more than you promised.

Demonstrate how patients and members of public have been involved in the development of the funding application as this will add great value to your work and will be appreciated by both the lay and scientific members of the panel .

Try to imagine the questions or objections of a "hostile reviewer" and show that the research plan anticipates them. Throughout the application write clearly, succinctly, follow an outline and support your assertions with references or data. If you have preliminary data available, then this is the time to include them in your funding application. This will add great value to your application as it strengthens your hypothesis and the feasibility of the proposed project. Last, but not least, be clear about the ways your results will be disseminated.

Finance

In most grant applications the budget section stands alone, separate from the rest of the application. Check carefully whether the specific funding call supports certain items (*e.g.* secretarial assistance or travel expenses). Do not request items that are not allowed and provide sufficient details for each requested item to make it difficult for the reviewers to arbitrarily suggest major cuts. Remember that funding bodies are looking for projects that offer the very best value for money. Cost estimates need to be as accurate as possible to cover the expenses proposed in the project. Try not to over- or under-estimate costs. The budget should be developed with your departmental research administrator. This person is key to a successful application as he or she will oversee the finance section of your application, and for many funding calls, will have to authorise your application prior to its consideration by the funding body. The research administrator may also refer you to others who may assist on issues such as the use of animals, potential conflicts of interest, proprietary material, biological hazards and research ethics. Funding bodies usually prescribe the budget format that should accompany the grant proposal, including the specific cost categories that should be identified. Typically a project's budget is divided into:

- Personnel salaries and wages (this should include academic, technical and administrative support staff as well as external contributors, *e.g.* statisticians)
- Equipment (*e.g.* laboratory/office equipment with a justification for their use)
- Consumables (*e.g.* laboratory supplies, animals, glassware, chemicals and office supplies)
- Travel (*e.g.* conference fees and subsistence)
- Services (*e.g.* publication costs, computer use/data storage, data analysis and service contracts)
- Other (*e.g.* tuition fees, patient/participant reimbursement and indirect costs associated with university operations, if applicable)

Before submission

Proofread and make it shine

Once all the information has been entered onto the application form then it is the time to make it shine. Review your proposal carefully. Check the requirements again and confirm that the proposal meets all of them. Always ensure that, for instance, you are using the required terminology (*e.g.* activities, tasks or milestones). Moreover, confirm that the proposal sections don't exceed the maximum allowed number of characters – modern electronic submission systems are very rigid and don't allow exceptions. Remember to verify the references you have cited and make sure they are properly mentioned in the main text and adequately described in the appropriate section. Proofread the proposal, as nothing looks worse than a proposal full of typos!

Reality check

Two important sections to verify in detail are the budget and the timeline. Does your budget have all the expenses accounted for? Don't forget to apply using the format required by the funder, including overheads, travel expenses and acquisition of material. Does the timeline match up with the planned research protocol and the funder's rules? Are all the activities described, including centres and responsible individuals? This is very important, as an unrealistic or inadequate budget or timeline is a major cause for funding refusals.

If you are submitting figures, flowcharts or visual descriptions of the proposed activities or tasks as appendices to the proposal, always double check their readability. Ensure they are practical and easy to understand, try to use the same visual patterns and colour codes, and ensure they have proper legends. Remember that the figure may be very clear to you, but you need to make sure that the reviewer or the evaluator of the proposal also understands it, and don't forget to mention the figures in the main text of the proposal.

The best way to ensure that the proposal is well understood by the reviewers is to distribute it to other members of the team and also to colleagues who haven't participated in the work or who work in a different department, discipline or field of research. Ask them read and provide feedback on the proposal. Then, ask them questions to see if they fully understood your objectives and research plan. Try to have them explain back to you what you are trying to accomplish – if they can't do it, are you sure the reviewers will? They will not fund a proposal that they cannot comprehend.

Knowledge exchange, dissemination and impact

In the proposal, you typically have a section where you have to describe how you will disseminate the scientific outcomes of the project, in a manner appropriate for the type of grant you are aiming to achieve. Try to be realistic, and check that all the outcomes are accounted for. Consider the number of manuscripts you are planning to produce, as well as conference papers. Are you going to disseminate the results to the general public? If so, don't forget to mention how you plan to accomplish this.

Submitting your proposal

Don't leave submission until the last day. There is a variation of Murphy's Law in play here: the less days remaining to finish the submission, the higher the probability that errors will occur. Plan to submit with time to spare to account for problems with your computer, the internet connection, with corrupt files or with the submission system. All of these issues can really happen (and have happened before), so be sure to plan ahead and allow time for submission.

Table 1 offers a brief overview of basic advice to consider when submitting funding applications.

After submission: now what?

Initially, there is the relief that you have managed to submit on time! Some funding applications have two rounds of submission. During the first round there are submissions from everyone that meets the eligibility criteria; however, only the ones that score highest will be able to make it into the second round of submission. At this particular point in time and while everything is still fresh in your memory, we would recommend that you note any particular points that you feel would benefit from more clarity and link them to potential references and comments. This is easier while things are still fresh, therefore, creating this list may save you from additional trouble when the reviewers' comments come back in a few months.

Proposal accepted or invited for resubmission?

Well done and let the games begin!

An invited resubmission is very encouraging and of course allows time to reflect on the reviewers' comments and address them carefully. Read each one of the comments several times to ensure you understand the reviewers' perspective and go through them all in detail. Start by answering the questions in a very explicit way and base the answers on evidence. The notes that you might have kept after the first submission may be useful at this point if they coincide with the reviewers' comments. Disseminate the comments to the rest of the team and request their feedback. A brief face-to-face meeting, where possible, is useful as

Table 1 *Summary of basic things to do and not do when writing a funding application*

Do	Don't
Read the funder's submission guidance and eligibility criteria carefully	Use unexplained jargon
Use a writing approach that addresses the three "P"s: Plan, Persuade, Promise	"Wrap up" mentality
Work as a multidisciplinary team	"Solo flyer" approach
Involve patients and members of public	Ignore reviewers'/colleagues' feedback
Get other people to read your proposal	
Network effectively	
Leave plenty of time to prepare	

it will shed light to most of the answers and will help you formulate a response. Before resubmitting the response make sure you get final sign-off from the other team members as it is important to include everyone's thoughts and expertise.

Rejection: life is not always bright

If your proposal was rejected you should consider this as an opportunity to reflect on the reviewers' comments, learn from them and use them for the benefit of improving your proposal.

Go through your proposal and try to address the comments one by one and interpret them carefully. On some occasions this may mean that you need to fundamentally restructure your proposal, should this be the case, just be brave and go ahead. It is always helpful to have a team meeting and go through the comments one-by-one to ensure that everyone has a good understanding and can provide their feedback.

Resubmission

Resubmission can be really challenging for a proposal that has already been rejected once. In this case you could resubmit to a different funding body, unless of course the initial funding body has suggested that you resubmit to them after making major structural changes to your first submission. Regardless of whether the first or the second case applies, resubmission needs to be even better thought-out and well-structured than it was the first time round. It is very possible that your submission will be reviewed by more or less the same panel of experts regardless of whether you are submitting to another funding body or not.

Therefore, this is not a case where you could quickly without much effort to see the bigger picture and address all issues "wrap up" your old submission and resubmit it, as the reviewers would spot this straight away and your chances of success will be minimised. By contrast, if you engage all members of the team in the resubmission after digesting and addressing all comments from the previous round, then your chances increase significantly and your new proposal will express your professionalism and integrity in this process.

Even though securing funding through a grant proposal can be a long and difficult process, this should not put you off and you can minimise this by using a systematic approach. As you can see, there are no magic wands in this process but there is a lot of hard work!

We would suggest that you never get down to your last funding application. If you have more than one idea, do not hesitate; write them up and follow the same process to submit them for funding. Given that rejection rates can be high, it would be best to try out a whole set of ideas. In this way, even if you get rejected by one funding body you can still anticipate responses from others!

Conflict of interest

None declared.

Suggested reading

1. Caudri D, Bjerg A, Saad N, *et al*. Doing science: how to get credit for your scientific work. *Breathe* 2015; 11: 153–155.
2. Hardavella G, Bjerg A, Saad N, *et al*. Doing science: how to optimise patient and public involvement in your research. *Breathe* 2015; 11: 223–227.
3. Medical Research Council. Guidance for applicants. www.mrc.ac.uk/funding/guidance-for-applicants/ Date last accessed: February 10, 2016.
4. Resource Centre. Writing a funding application. www.resourcecentre.org.uk/information/writing-a-funding-application Date last updated: November, 2015. Date last accessed: February 10, 2016.
5. The Writing Center, University of North Carolina at Chapel Hill. Grant Proposals (or Give me the money!) http://writingcenter.unc.edu/handouts/grant-proposals-or-give-me-the-money Date last accessed: February 10, 2016.

How to write a good research grant proposal

Lisa Barker
Rohini R Rattihalli
David Field

Abstract

This article aims to provide a step-by-step overview of the process of applying for research funding and will be most relevant to either a new academic joining a group or a young clinician wanting to establish their own research. The article covers the steps involved in preparing, writing and submitting an application. Included is a description of the different types of funding available, how to choose the right funding body, a discussion of the various people who should be involved in developing the research proposal (including the role of patient and public engagement in research) and the sources of support available to help the new researcher take their ideas forward. A checklist is provided to reiterate the key points.

Keywords funding; patient and public involvement; public engagement in research; research grant; research proposal

What's new?

This review provides an update on the process of writing a research grant proposal. As well as being generally updated there are two new topics:

- Evidence of public engagement in research (PER)/patient and public involvement (PPI) is now expected by the majority of funders and this is discussed and some guidance and further reading is suggested
- The impact of any research proposal is now a major issue following its inclusion in the process by which Universities' research is assessed. The review now includes some advice on how to maximize potential impact

This article is aimed at the reader who is a trainee academic, or a young clinician wanting to establish their own research. The authors have a clinical research background but most of the issues in applying for funding are common to both clinical and basic science research.

Preparation

Getting started

Carrying out research is expensive, even the simplest project will entail a lot of man hours whilst for more complex projects the costs can run into millions of pounds in staff and equipment costs. As a result, getting a research idea funded is time consuming, testing and highly competitive.

For those at the start of their career in research there are broadly two types of funding available:

1) Fellowships: These are designed to support the individual to have funded time in order to develop both research skills and, eventually, their own research programme. Depending on the body awarding the Fellowship, exactly what is covered in any award will vary. Some fund an individual's time to work with an established research group and gain training (and perhaps make project grant applications with that group – see below). Others include an element of funding that should enable a project (submitted as part of the application) to be completed during the fellowship and provide the basis of a PhD thesis. Many issues raised in this article are also relevant for Fellowship applications. However one important difference is that the academic strength of the individual applying and the standing of the group with whom he or she intends to work are also important parts of the assessment process for Fellowship applications. Demonstrating that the applicant has some previous research experience and publications will enhance the chances of success. Similarly joining an established and successful research group will also enhance the potential for success compared to an application involving a team without any such track record.
2) Project grants: These are grants designed to fund a specific piece of work. If successful the funds will go to the main applicant and the institution for which he or she works. In terms of the clinician or researcher with an idea that they wish to pursue this is the best route. The emphasis here, in terms of success, is the importance of the topic, the feasibility of the project, its cost and, in the view of those assessing the project, the likelihood of its successful delivery by the individuals involved. The various sections below focus on the issues to be considered when seeking funding by this route although, as mentioned above, many are relevant to other types of application such as a Fellowship.

Get help

This is definitely the first step. The process of getting funding is highly competitive and complex. It is important to have advice through all aspects of the process. The nature of the help required in developing a grant application varies over time and the various types of support needed are discussed below. The best place to start is with an established researcher or research team who are active in the same field. They will be in a position to advise on either how you can work with them to develop a proposal or alternatively assess the best way to take forward your own idea(s).

Defining the research question

Whether the grant application is intended to support your own research idea or is a spin off idea from a group you have joined,

Lisa Barker *BMedSci BMBS MRCPCH is a Senior Clinical Fellow in the University Hospitals of Leicester NHS Trust, Leicester, UK. Conflict of interest: none.*

Rohini R Rattihalli *MBBS MRCPCH is a Specialty Trainee in Paediatric Neurology in Bristol Children's Hospital, Bristol, UK. Conflict of interest: none.*

David Field *DM FRCP(Ed) FRCPCH is Professor of Neonatal Medicine in the University Hospitals of Leicester NHS Trust, Leicester, UK. Conflict of interest: none.*

deciding on "the question" is crucial and needs the most time and thought. The research question will evolve as a result of reflection following a thorough literature review, discussions with the other members of the research team and input from collaborators. The research question will usually also be modified in the light of practical considerations such as numbers of potential study participants and costs. Once the question is set it defines all other aspects of the project from the duration of the project to the data to be collected and how it is to be analysed.

It is important to remember that the question will also be reviewed by those who assess the grant. The reviewers will look specifically at the relevance of the question and the feasibility of the project it defines. The reviewers will also look at the issue of feasibility in relation to the applicants and their previous track record and ask 'Is this the right institution(s) for this research?' Therefore in developing the question it is important to consider the expertise of the applicants and whether the skills of additional individuals are required.

Choice of funding bodies

Identification of funding bodies: every funding body has its own research priorities and it is very important that you read the "scope" of the funding the organization aims to provide. For example, the National Institute for Health Research (NIHR) essentially funds clinical research that is likely in the short term to have an impact on patient care. However the details of the various streams supported by NIHR vary. At the time of writing the NIHR have grants known as NIHR Programme Grants for Applied Research. These support research that will have practical applications for the benefit of patients typically through improved healthcare or improved healthcare delivery that will occur within three to five years of a programme's end. In contrast, the BUPA foundation provide medical research grants for clinically relevant medical research projects aimed at increasing medical knowledge and effectiveness in patient care. It is important to check the maximum amount of support available and the maximum duration of any award as such constraints may further limit the number of suitable funding streams available.

Finding a source of funding

There are a number of online resources which provide lists of funding bodies, for example; the Research Councils UK website (www.rcuk.ac.uk) and the Vitae website (a not-for-profit UK based charity aimed at supporting researchers, https://www.vitae.ac.uk). Funding bodies can be national and international and can be broadly categorised as government funding bodies, learned and professional organizations, charities and trusts and, finally, "Industry".

There are other considerations that may not be immediately obvious. For example in the UK research grants from NIHR bring additional funding to the host NHS Trust and similarly funding from the UK Medical Research Council (MRC) brings additional funds to the host University. Advice from peers, collaborators and your supervisor regarding the most appropriate funding bodies for the type of research is indispensable.

Fellowships: where the application is for a Fellowship many of the same principles apply. Check the type of individual (e.g. clinical vs non-clinical) the Fellowship is designed to support. Check any particular stipulations either about milestones that should have been achieved before applying or that must be achieved whilst in receipt of the Fellowship.

Designing the research methodology

Having decided the question, the broad nature of the project to be undertaken should be clear; however a great deal of detail normally remains. The nature of this "detail" will vary depending on the type of project but some examples of aspects to be considered are given below:

- What type of study: In terms of clinical studies there are a range of study designs. These vary from the gold standard randomised trial to purely qualitative studies. Studies involving mixed methodologies are also becoming more commonplace. If you are part of a research team advice on this sort of issue can often come from individuals within the team. The National Institute for Health Research has funded a network of Research Design Services (NIHR RDS) across England with the aim of increasing the volume and quality of successful research grant applications. They can provide help with aspects of study design as well as some of the issues listed below.
- Public engagement with research (PER): Funding bodies often want details of how patients and the public have been involved in developing the research concept and if not will ask for justification of why not. PER is the involvement of patients and/or the public in the design and development of the study. It is also known as patient and public involvement (PPI). PER is to 'generate dialogue and trust between research and society in order to inspire and inform the public, enhance quality and impact of research and contribute to the future UK economy and well-being of society' (Research Councils UK). The aim is to lead to more relevant research questions, more ethical recruitment procedures, more study participants, and research findings that are more likely to have influence and lead to improvements. Consider involvement of people with particular health conditions, living or working in certain areas, or with interests that relate directly to the research. Local Research Design Services (RDS) often keep details of people willing to be involved or have contacts with local groups and organizations that could be useful.
- Sample size: Sample size calculations are a way of demonstrating that the size of study you are planning has a reasonable chance of answering the question you have posed. To be performed adequately it requires some background information (for example about the estimated rate of an adverse outcome you want to influence). It should be performed with the help of a statistician. Funding bodies typically expect to see a statistician as part of the team or perhaps an individual from another discipline with recognized statistical expertise.
- Consent: In general all research studies involving patients requires the consent of the patient before they are entered into the study. Whilst there are one or two exceptions to this you should proceed on the basis that consent will be

required. For grant applications it is generally not necessary to have developed any written materials for patients (such as participant information sheets and consent forms) before the application is made. However it is important to be able to describe the consent process that you will be in your study and any special factors such as seeking consent from teenagers who will have a right to withhold their consent even if their parents agree to the child joining the study.

- Recruitment: In recent years many clinical studies have found it increasingly difficult to meet planned recruitment targets. Be clear about how you intend to optimize recruitment. Include any pilot work you have done to show that potential recruitment targets are realistic.
- Complying with legislation and regulations: Certain aspects of research are subject to legislation for example studies on animals, human tissues or medicines. Other aspects are subject to established international practice such as the management of clinical trials. It will be important in any application to demonstrate both an awareness of the legislation/regulation and also how it will be complied with. For almost all studies there is an issue of how data will be safely handled and stored. The data protection officer for your institution should be able to help provide details of the various physical and electronic protection systems that are employed locally.
- Oversight: Funding bodies are keen to see how progress will be monitored and will often ask for a timeline, which should include key milestones. In addition it is usually helpful to describe how day to day management of the project will be performed and by whom. Some funders like there to be an independent oversight committee sometimes called a 'Steering Committee' and sometimes a 'Reference Group'. It is good practice to recognize the potential need for these roles depending, of course, on the nature of the study. Similarly for some clinical studies a Data Monitoring Committee is necessary to ensure that effects emerging during the research (especially in randomized trials) are not simply left to the end of the planned recruitment if clear benefit or harm was apparent before that time.

People

- Applicants/Collaborators. Funders are keen to have reassurance that if they award a grant, the assembled team has the necessary skills to deliver the project. The applicants should be the group that when considered together are able to provide that reassurance. For some projects the risks of failure relate to wider concerns such as: Will patient recruitment be sufficient? Will the clinical teams provide sufficient samples? These concerns relate to whether enough clinicians will collaborate (i.e. join the study) to make it viable. To allay these fears signed letters from individuals who have agreed to recruit patients/collect samples can be very helpful.
- Specialists: The important role played by statisticians in developing applications has already been highlighted above; however for certain types of study other specialist help is essential. This might include pharmacists (in a variety of drug trials), psychologists and health economists.

Considering these wider aspects of the project are essential in putting together the right overall team of applicants.

Planning/Timelines

Writing a funding application takes time and it is very important to be aware of the timelines when identifying the funder to be approached. For some funding bodies there is a two stage process with only an outline being submitted at stage one. The funding body then reviews the outline and decides if the application appears to have sufficient strength to merit the submission of a full application. Full applications made either through this route or as a first step are also sometimes screened by a small group to confirm they meet the requirements of the funding body and some are rejected without further review of the project itself. However, for most funding bodies full applications are sent out for review by external experts. The number of reviews sought varies from perhaps three to ten and for very high value applications international review is the norm. For some organizations the results of these reviews form the basis of the decision to fund or not. In other cases the applicants are given a chance to respond to issues raised by the reviewers and these additional comments are then available for the committee to consider when deciding whom to fund. For projects lucky enough to be funded there is then often a further delay whilst a contract is established with the host institution. It is not unusual for nine or even twelve months to elapse between the initial application and money becoming available. Where a grant is to be shared by multiple institutions, and complex subcontracts have to be established this delay can be considerably longer.

Of course all this follows the long process of producing the application and so the time from initial idea to funding can easily reach 2 years, even if all goes smoothly. It is important for those coming into research to appreciate the time involved in getting started and how this fits in with other aspects of career development. This is another area where support from a supervisor/experienced mentor can be very helpful in making progress.

Costing

Most funding bodies have an upper limit on the amount of money that can be awarded to any one project. Cost becomes an inevitable consideration when developing the project. In order to produce a reliable estimate of the overall cost it is necessary to consider every aspect of the work that is planned. The main categories of costs will be salaries, equipment, consumables, and travel expenses. The relative contribution of each element will vary enormously between projects. Each project will have other significant costs that relate just to that study, such as: fees for lay representation, advertisements and refreshments for participants, venue hire for steering committee meetings etc. Although some funders will meet costs not anticipated at the time of a successful application this cannot be guaranteed and it is much better to get the initial costing right. There will be some costs such as registration fees for higher degrees or service delivery costs which may not be met by the funding body. An example of service delivery costs would be the time taken up each time a doctor spends time trying to recruit a patient. In the UK, these service costs are met through either the Clinical Research Network (part of NIHR) or the relevant hospital Trust/Board. The Clinical Research Network should be able to provide advice

about the extent to which this type of funding will be available if the application is successful. Such arrangements will clearly vary from country to country.

Completing the financial section of the form can be daunting. Whilst many institutions run short courses on this topic it is often better to get help from either your host institution or the local branch of the Clinical Research Network as the language can be very confusing.

There are three categories of expenditure that are recognized under full economic cost (the system used by UK Government funders such as the Medical Research Council):

1. Directly incurred cost — the expenditure incurred for a project and only that project. These costs include (but are not limited to) cost of research staff and other staff dedicated to the project, travel and subsistence, consumables, equipment, subcontracts, etc.
2. Directly allocated cost — the cost of resources used by a project that are shared by other activities and based on estimates (e.g. principal and co-investigator costs, estates costs).
3. Indirect costs — non-specific costs charged across all projects and are based on estimates (e.g. human resources and finance services, library costs etc. incurred by the host institution).

Charities typically fund only the directly incurred costs.

Once the costing has been completed most host institutions will want someone from their finance team to check the entries before the form is "signed off" by the head of the department and the finance officer. Justification will need to be provided to the funding body for all costs. 'Is the amount of funding asked for justifiable?' is a question that virtually all funding bodies ask their reviewers to address. Such questions often come towards the end of a long application form. It is important that adequate time and effort is made to explain why the various items of expenditure are needed.

Training

For some projects it will be necessary to deliver training to collaborators. The nature of this can vary hugely. For example, all collaborators in a clinical trial should receive training in Good Clinical Practice (GCP) and the trial should be conducted in a way that complies with this international standard. Alternatively a study that is to recruit patients on the basis of a particular ultrasound assessment of their cardiac function requires all the collaborators to be trained to use a particular approach to assessment. Irrespective of whether the training is necessary to meet a particular clinical governance standard or is integral to the validity of the study it should be made clear in the proposal how this is to be delivered and funded.

Of note, for Fellowship applications the training that will be available to any successful candidate usually needs to be described in detail as it is seen as a key element of such an award.

Writing the application

By the time the application is written the key components of the project should have been confirmed and set down in a protocol. This should mean that completing the application is about describing the work to the funding body and not about designing the project. Make sure you spend adequate time on the sections describing the strengths of the team, their roles and experience in the topic area.

No two applications forms are the same. The type of questions and the expected amount of detail varies not only between funders but also depending on whether the application is for a fellowship or a project grant. The application must be clear and concise and demonstrate your study as being carefully considered and well planned. Define any terminology as your proposal will be seen by people who are not necessarily familiar with your speciality.

Fellowship applications typically include questions such as career intentions and proposed formal training during the fellowship. For these applications the opportunities for generic training in research are viewed with as much importance as any project that forms part of the application.

Impact

In the case of research grant applications, 'impact' refers to the benefits the research will have on knowledge, society and the economy. Many application forms require an impact statement or impact summary. This is scored by the reviewers as part of the application process. An impact statement reviewed as excellent could give the application an advantage over otherwise similar proposals. Equally, a weak impact statement could serve as a negative factor. An impact statement should be specific to your research project and should contain clear and concise details about deliverables (scientific, economic and/or other benefits for society that will be produced by your study). It should also include when and how these will be delivered and how the strengths and experience of your team will contribute to the anticipated impact being delivered.

Wider review

No matter how carefully an application is put together there is always the danger that the team will miss either some flaw in what they are proposing or alternatively fail to fully exploit the potential of the project. It is for these reasons that some form of external review is recommended before the project is considered for funding. However for some small sub-specialties this type of review is difficult to achieve.

Permissions

In terms of making an application for funding it is not necessary to have in place all of the relevant permissions. However applying for these (e.g. ethics approval) should not be delayed for too long as the process (depending on the nature of the project) can be lengthy and involves the development of all the materials to be shared with patients/participants. It is important not to ignore ethical considerations in the grant application as if a study raises particular ethical concerns it may make a funder reluctant to take on the project, even if it is otherwise seen as valuable. In these circumstances informal discussions with the Chair of the local ethics committee can be helpful in agreeing an appropriate way to proceed. Recognizing in the application any potential ethical issues and how you intend to deal with them can reassure the funding body that you are realistic about the challenges.

Next steps

Before submission of the application read and re-read it to ensure that there are no errors (use the spell check!) and check that start dates are realistic (see Planning/Timeline Section above). Make sure you are aware of the details of the funding bodies application process as this will give you information about the next steps after your application is submitted and what to expect e.g. when feedback by reviewers might be available so that you can respond before a funding decision is made.

It is a good idea to have a plan for if your application is successful (have you started writing study documents, commenced the ethics application process etc.) or unsuccessful (have you identified any other relevant funding bodies).

Checklist for a grant application:

Preparation

- Generic:
  - Is this the right funding body (amount of funding, duration of funding, priorities of funding body)? Read the rules and guidance.
  - Are all the right people involved in this study (collaborators/specialists/lay involvement)?
  - Is the background work optimal (pilot data/thorough literature review)?
  - Timelines: Allow yourself plenty of time. Preparation and application takes a lot of thought and time.
- Study design:
  - Has the methodology been discussed with relevant experts (statistician, local RDS)?
  - Have you involved patients and the public in the study design (PER)?
  - If relevant, have you thought of ways to optimize recruitment?
- Costs:
  - Does the amount fall within the remit of the funding body?
  - Are you aware of the process and timelines of University/NHS finance departments?
  - Have you considered how clinical costs not covered by the grant will be met?

Writing the application

- Have you highlighted the importance of the research topic, the strength of the research team and the University?
- Would a pre-submission wider review of the application be relevant?
- Do you need letters of support (from lay representatives/local Research Network/clinicians who have agreed to recruit patients)?
- Have you thought about ethical issues likely to be raised?
- Have you considered relevant legislation and regulatory issues (e.g. data handling and storage)?

Next steps

- Check the details and ensure they are correct e.g. realistic start date and all sections are completed.
- Ensure that the application is clear, concise and systematic with maximum impact.
- Make a plan for what happens next if you are successful or unsuccessful.

Role of the funding source

No external funding received for writing this article. ◆

FURTHER READING

Clinical research networks http://www.crncc.nihr.ac.uk.

Medical Research Council funding sources http://www.mrc.ac.uk/funding/.

NIHR research design services http://www.rds.nihr.ac.uk.

Oliver S, Liabo K, Stewart R, Rees R. Public involvement in research: making sense of the diversity. *J Health Sci Res Policy* 2015; **20:** 45–51.

Research Councils UK www.rcuk.ac.uk.

Vitae https://www.vitae.ac.uk.

Wellcome trust funding sources http://www.wellcome.ac.uk/Funding/index.htm.

Recommendations for Writing Successful Grant Proposals: An Information Synthesis

Jennifer P. Wisdom, PhD, MPH, Halley Riley, MPH, and Neely Myers, PhD

Abstract

Purpose
To provide a detailed account of the nature and scope of recommendations for promoting faculty grant proposal success in academic medical settings.

Method
The authors searched relevant scientific databases for articles related to techniques that promote faculty research proposal success, published from 2000 through June 1, 2012. They applied standard information synthesis procedures for sifting abstracts, scrutinizing full texts, and abstracting data.

Results
The search identified 1,130 abstracts, which the authors narrowed to 83 for in-depth review. Of these, 53 unique articles fit the inclusion criteria. From these articles, the authors extracted 10 recommendations for writing successful grant proposals: (1) research and identify appropriate funding opportunities; (2) use key proposal components to persuade reviewers of project significance and feasibility; (3) describe proposed activities and their significance persuasively, clearly, and concisely; (4) seek review and feedback from colleagues; (5) establish a study design that is simple, logical, feasible, and appropriate for the research questions; (6) develop a timeline for the proposal process; (7) select a novel, high-impact project; (8) conduct an exhaustive literature review; (9) ensure that budgets are reasonable; and (10) consider interdisciplinary collaborations.

Conclusions
These findings highlight that further institution-level development and interventions to support faculty grant writing success are warranted. Future research should employ more rigorous evaluation methods to move the field toward a stronger evidence base for determining which specific faculty development activities help increase funding.

The United States supports an enormous research enterprise and spends more money than any other country on research and development; this investment is of incredible importance to global science.[1,2] In recent years, economic constraints have prompted major funding agencies (such as the National Institutes of Health [NIH], the world's largest source of funding for medical research) to slash budgets.[3] Researchers working in medical education settings know that clinical revenue and academic performance are aligned,[4] but only 2% of all U.S. physicians report research as their main professional activity.[5] The many physicians with competing clinical or teaching responsibilities seeking to pursue research may benefit from assistance in obtaining research funding. Institutions must support these faculty in their work to write successful grant proposals in this challenging funding climate.

One-quarter of academic health science faculty have reported considering leaving academia.[6] Difficulties obtaining research funding, identifying mentors, securing protected time, and garnering institutional support are all barriers to faculty retention.[7] Physicians, assistant professors, and those in clinical departments are leaving academic health centers at higher rates than PhDs, associate professors, and those in basic science departments.[7] Research grant proposal success is an important aspect of faculty development,[8–10] and an inability to secure extramural funding is a major discouragement for faculty.[11]

Institutional faculty development efforts that focus on research may facilitate the advancement of evidence-based clinical science and the receipt of research funds in academic health center settings. Although excellent materials exist to promote faculty grant proposal writing success, the literature is scant, and the prioritization of tasks for writing successful proposals is not well documented. A practical approach to increasing extramural funding success for academic health science faculty is needed and should be grounded in evidence. Thus, we performed a review of the literature and information synthesis to address the research question, "What promotes faculty grant proposal success in academic medical settings?" The answers may help institutions develop effective interventions that promote research faculty success.

Method

Search strategies

We conducted this literature search in summer 2012 with the support of a research librarian. We searched the Cochrane database and CSA Illumina (a database repository that includes the following databases: ERIC, IBSS, PAIS Archive, PAIS International, PILOTS Database, Social Services Abstracts, and Sociological Abstracts). We also searched Ovid MEDLINE, PubMed, EBSCOhost, and CINAHL. We chose Cochrane and CSA Illumina because they include literature from across the health sciences

J.P. Wisdom is professor of health policy and management and associate vice president for research, George Washington University, Washington, DC.

H. Riley is fellow, Association of Schools and Programs of Public Health, Washington, DC.

N. Myers is assistant professor, Department of Anthropology, Southern Methodist University, Dallas, Texas.

Correspondence should be addressed to Jennifer P. Wisdom, George Washington University, 2121 Eye St. NW, Suite 601, Washington, DC 20052; telephone: (202) 994-2995; e-mail: jpwisdom@gwu.edu.

Acad Med. 2015;90:1720–1725.
First published online July 21, 2015
doi: 10.1097/ACM.0000000000000811

professions. We sequentially searched each of the databases to account for the substantial overlap between them. The exact search terms for each database were a combination of standardized medical subject heading search terms and free-text keywords. We combined our search terms for grant proposals (*grant submission*, *grant writing*, *grant proposal*, *grant submitting*) with those for postbaccalaureate medical education settings (*higher education*, *colleges*, *universities*, *graduate programs*, *graduate schools*, *schools of public health*, *medical schools*, *nursing schools*) and those related to health sciences faculty (*professional development*, *university faculty*, *professors*, *academics*, *academia*, *research*, *research development*, *training support*).

Inclusion criteria, article selection, and data abstraction

We included articles that provide recommendations for writing successful research proposals for faculty in graduate-level medical education settings across the health professions. We included only articles published in journals between January 1, 2000, and June 1, 2012. Included articles offered recommendations for faculty on how to increase research productivity or success, or they described programs within universities to improve either university research infrastructure or faculty research productivity and success. Given the focus on securing funding resources for academic health science faculty in the United States, we excluded articles from foreign institutions and articles that were not written in English.

We then applied standard information synthesis procedures (e.g., identifying relevant information and assessing validity), first, to sift through the 1,130 abstracts the search initially uncovered and, then, to scrutinize the full papers selected and abstract the relevant data. After applying the inclusion/exclusion criteria, eliminating duplicates, and reviewing abstracts, we selected 123 abstracts for article review, and then 83 articles for in-depth review. Team members (H.R., N.M.) independently reviewed the full text of these 83 to determine whether to include them in the final review. Fifty-two articles were selected for inclusion. Two authors reviewed 10% (n = 5) of the 53 articles to establish a consistent standard for data extraction. Interrater reliability was 94%. The first author (J.P.W.) resolved any disagreements and made the final decisions for inclusion. An additional team member (N.M.) then independently abstracted the pertinent data from the remaining studies. All pertinent recommendations, defined as any statement by the authors that suggested how faculty might improve their chances of earning research funding, were extracted from each article.

Results

We initially identified 1,130 abstracts. On the basis of our review of abstracts, we selected 83 articles for closer scrutiny. After reviewing these, we selected 53[12–64] for inclusion in our review. The spreadsheet initially contained 445 discrete recommendations, which we condensed, on the basis of their similarities, into the 10 major recommendations described below. The number of recommendations per article ranged from 1 to 17. Table 1 presents the 10 recommendations for faculty who are writing research proposals (listed in order of frequency) distilled from the 53 articles we reviewed.

Generally, articles did not describe their recommendations as based on evidence; rather, recommendations were described as "lessons learned," "tips," and even "trade secrets."[21] The authors of one exceptional article based their recommendations on their review of 66 NIH applications submitted to one clinical research study section.[12]

1. Research and identify appropriate funding opportunities

There are thousands of private and public funders; applicants should research them to understand the goals, missions, projects, and current staff of each.[12,13,17,20,21,26,28–30,34,37,38,40,41] In many cases, faculty can contact a representative at the funding organization (e.g., a program officer) to ask if a project is a good fit given the organization's interests.[12,17,18,22,23,36,39,42,44] Once faculty decide to apply for funding from a particular organization, they should attend carefully to the funding organization's proposal instructions and review process.[12–22,24,25,27–29,31–33,35,36,39,43] Successful proposals use the funding organization's suggested structure (e.g., subheadings),[22,27,29] language (e.g., special terms),[21] and format (e.g., font).[14,15,17,35,36] Linking the funding agency's priorities, mission, and language, as well as the emphasis of the specific grant announcement to the proposal sections, is key.[13,16,21,24,28,31–33] The proposal must appeal to non-subject-matter-expert reviewers who will read the proposal quickly.[15,19,20,25] Faculty should

Table 1

Recommendations for Writing Successful Grant Proposals From a Synthesis of the Literature, 2000 to 2012

Recommendation	Articles, no. (% of 53) that mention the recommendation
Research and identify appropriate funding opportunities.	33 (62)
Use key components of the proposal to persuade reviewers of the project's significance and feasibility.	32 (60)
Describe proposed activities and their significance persuasively, clearly, and concisely.	30 (57)
Seek advice from colleagues to help develop, clarify, and review the proposal.	30 (57)
Keep the study design simple, logical, feasible, and appropriate for the research questions.	29 (55)
Develop a timeline that includes time for possible resubmission to guide the grant proposal process.	25 (47)
Choose a novel, high-impact project with long-term potential.	21 (40)
Conduct an exhaustive literature review to clarify the present state of knowledge about the topic.	13 (25)
Ensure budgets request only essential items and reflect an honest portrayal of the funding that the team needs to successfully carry out the work.	10 (19)
Consider interdisciplinary collaborations.	8 (15)

study examples of funded grants from a funding organization when planning and preparing their proposals.[14,15,18,25,31]

2. Use key components of the proposal to persuade reviewers of the project's significance and feasibility

If the applying faculty member has any preliminary data (e.g., from a pilot study) indicating, for example, prior research productivity and success, proof of concept, the appropriateness of the research site or population, or preliminary results, he or she should include the data in the proposal to demonstrate the viability of a grant application.[14,15,20,22,24,29,31,38,40,45–52]

Faculty should communicate the complementary strengths of all faculty, mentors, collaborators, and consultants who will be involved in the funded project in a way that demonstrates not only the qualifications, content and methodological expertise, and contributions of each team member but also his/her ability to collaborate.[15,20,22,25,34,38,39,43,45,49,50,53,55] A description of the host and collaborating institutions or organizations should document facilities, space, equipment, and laboratory resources[15,32,34,43] and clarify that the setting can accommodate the proposed activities and is supportive of the faculty.[15,19,22,32,34,43,49,55]

The description of the research design should include a timeline for study startup, data collection, data analysis, and manuscript or other product preparation to demonstrate how the work can be completed within the proposed project period.[20,21,26,27,37,47,48] The proposal should include a short section on potential limitations, methodological strengths and weaknesses, alternative strategies, and contingency plans if the study activities do not proceed as intended.[20,22,24,46,47,54] The proposal should include comprehensive yet concise (one-page only) letters of support from the proposed host institutions, collaborators, and data collection sites that state the letter writer's strong professional position, planned contribution, expected level of compensation, and knowledge of and enthusiasm for the project; ideally, these letters should be signed and on institutional letterhead.[14,17,22,39,46,51,53,56] Applicants should be prepared to provide documentation of ethical and regulatory compliance (e.g., for human subjects research) by the institution, faculty, and study staff—even if such information is not explicitly required in the proposal instructions.[14,29,32,37,51,52]

3. Describe proposed activities and their significance persuasively, clearly, and concisely

Faculty applying for grants should carefully consider the language used in their proposals.[13–26,45–51,59] Faculty must use persuasive language to convince the reviewers that the proposed study is significant and innovative and that it contributes substantially to knowledge in the field.[18,20,22–26,29,33,36,38,39,45,46,48,50,60] Faculty can describe the significance of the project by either highlighting deficits in existing knowledge[29,38,39,48] or providing quantitative data on the incidence, prevalence, and sequelae of a problem.[18,26,36] Innovation can be communicated by highlighting, for example, how the project provides a novel approach to a long-standing problem or why it represents an enlightening perspective or conceptualization.

In addition to being persuasive, proposals should be well written, concise, and clear.[16,19,22,24,46,49,50] The narrative should be coherent, fluid, and easy for the reviewer to read.[12,17,20,21,60] Proposals should be free of spelling, grammatical, and syntax errors.[13,14,18,23,25,45,47,48] Faculty should limit their use of jargon and acronyms in their proposals, and they should ensure that the proposal's formatting makes the text easy to read (e.g., adequate paragraph breaks and white space).[15,26,51] The summary or abstract is usually the first section of the grant and must be particularly appealing and succinct[20,22,38,49,59]; the authors of several articles recommended revising this section last to ensure the largest impact.[19,24,26,38,53]

4. Seek advice from colleagues to help develop, clarify, and review the proposal

Faculty seeking to submit grant proposals should seek advice—both at the planning and writing stage—from their colleagues and other people in their professional network to ensure that the proposal is as strong as possible.[12–15,17–19,21–23,25–32,34,38,42,45,48–53,57–59] Mentors and colleagues who have previously received or reviewed grants or who have topical expertise may be especially valuable advisors.[15,38,55] Faculty should actively network or work with others from whom they can learn,[30,31,34,42,48,58] including senior faculty[13,32,52] and peers.[21,28,29,31] Faculty should allow enough time during the proposal process to be able to solicit feedback from colleagues, including a statistician or methodological expert[15,22,32,51,57] and a reader outside the field.[18,19,27] Faculty can ask these colleagues to read the proposal for feedback both to improve the study design, methodological approach, proposal clarity, and writing style and to help identify and eliminate errors and confusing text.[12,14,23,25,26,30,45,49,50,52]

5. Keep the study design simple, logical, feasible, and appropriate for the research questions

Faculty working on grant proposals should focus on their research questions and the best study design for answering those questions.[15,16,18–23,29,32,37,46,49–53,60–62] They should include two to four study aims or objectives,[12,14–17,19–22,24,26,32,33,37,48,51,54,61] and these should be clear, concise, and realistic given the time and resources proposed.[12,14,15,19,22,24–26,37,48,51,54] The research questions and study aims should drive the methods proposed.[15,19,21–23,29,32,37,49,50,52,61,62] Each section of the proposal should reinforce the interrelationship of the study objectives, specific research questions, methods, and anticipated outcomes.[15,19–23,25,39,46,54] All objectives and aims should suggest a course of action (and complementary specific activities) that will be feasible with and acceptable to the proposed population.[16,17,20,21,32,33,54,61] Approaches to data analysis that are especially well planned or innovative may be particularly praised by reviewers.[16,18]

6. Develop a timeline that includes time for possible resubmission to guide the grant proposal process

Grant writing takes time, and faculty should plan accordingly.[12,16,18,21–23,26,27,29,30,38,39,43,47,48,50–53,57] Proposal writing requires protected time and entails multiple steps, multiple drafts, and multiple reviewers.[16,21,26,30,48,57] A timeline developed in advance that includes institutional deadlines and time for review is essential.[18,22,27,32,38,39,47,51,53] Applicants should start writing early.[12,23,29,50,52] Faculty should be prepared to revise and

resubmit,[23,25,28,29,31,43,46,50,51] and they should recognize that reviewers' comments are not a personal attack.[25,31,43] Being persistent is a key to grant success.[23,28,29,31,43,46,50,51]

7. Choose a novel, high-impact project with long-term potential

Research that produces findings that have substantial implications or that will affect multiple people over a long time are more likely to be funded than local, short-term projects.[12,15–17,19–21,23,24,29,30,33–37,46,48,52,62] The proposal must consistently articulate what the project will accomplish.[15,20,21,30,46] The chosen project should be innovative and focus on an area of high, current scientific interest.[24,26,36,47,52,63] A good research problem addresses ongoing clinical challenges, translates knowledge into practice, or conducts outcomes research.[17,19,29,33,34,37,52] The proposal should indicate how the project fits into a longer-term research direction for faculty.[23,30,35,48]

8. Conduct an exhaustive literature review to clarify the present state of knowledge about the topic

A well-written proposal includes a well-written, thorough review of the literature.[12,16,17,19,21,22,27,29,32,37–39,56,60,63] Faculty should critically highlight how the proposed research fits into, and begins to bridge gaps in, the current literature.[19,21,22,29,38,39] Literature reviews also expose potential conceptual frameworks that the faculty can use to structure their own study activities.[16,17,59,62]

9. Ensure budgets request only essential items and reflect an honest portrayal of the funding that the team needs to successfully carry out the work

Research proposals should include a transparent, realistic, and fiscally responsible budget.[14,16,26,29,30,36,46,50,51,55] Costs and the importance of all funding requested should be clearly presented, accurate, and specific.[16,29,50,51,55] A realistic budget linked with a proposal that does not propose more work than that budget can handle is best.[14,26,30,36,46]

10. Consider interdisciplinary collaborations

Faculty should consider working with colleagues from multiple fields.[31,41,42,44,54,58,60,64] Brainstorming project ideas with colleagues from multiple disciplines may be a good way to build a research team.[44,58,64] Funders, such as the NIH, value interdisciplinary work, and participation in such work may help to jumpstart a junior faculty member's career.[31,42,54]

Discussion and Conclusions

Through our review of the literature, we have synthesized data[65] to provide a detailed account of the accumulated wisdom surrounding successful research funding proposals. Although scholarship is an important focus of recent faculty development initiatives,[9] we believe this is the first attempt to review and synthesize recommendations for applying for research funding. Our review also highlights that, seemingly, there is no single comprehensive source of evidence-based strategies for writing successful funding proposals. The one article[12] that reported evidence from the comments of grant reviewers did not present substantially different recommendations from those articles that provided recommendations based on the authors' experience; a larger evidence base could determine the soundness of expert opinion recommendations.

This information synthesis suggests that faculty research funding proposal success may be within the reach of faculty who have the time, organizational skills, support of colleagues/collaborators, resources, and resilience needed to submit (and resubmit) a well-written, focused proposal. Success may be more likely if the proposal is easy to read, is reviewed by a variety of colleagues until all agree that the project is clear, and describes research that has the potential to make a lasting, substantial scientific contribution. This finding suggests that much of faculty members' resources for success can be cultivated among their colleagues and in their communities using existing resources, as long as faculty exercise good time management and networking skills.

This information synthesis also suggests that universities may be able to facilitate the success of faculty research proposals through specific research infrastructure, as some have already done.[66–68] Institutions may help by offering research development support (e.g., helping faculty to develop a timeline to guide activities required for grant submission), templates of the common grant requirements that funders seek (e.g., a list of institutional resources), and/or a repository of successful grant proposals from faculty members willing to share. In addition, preformed, presubmission peer review networks within the university may strengthen proposals and reduce faculty effort required to identify appropriate collaborators and reviewers. Offering proposal writers a professional editor who can ensure that the proposal is easy to read and lacks errors may be a good investment, particularly for faculty for whom English is not a native language. Institutions that offer seed funding to junior faculty may also help them get the preliminary data they will likely need to write a strong proposal.

Further research on interventions that enhance the success of faculty research funding proposals is needed. Does seed funding reduce the overall time to award? Do training courses for early faculty or peer review networks reduce the time from initial submission to reward by eliminating the need for multiple resubmissions? If so, what aspects of the training courses and networks are most effective? What is the role of mentorship in the process of researching, writing, and (re)submitting grant proposals? Some research has been conducted in these areas,[12,66,69] but more is needed to help universities better support faculty who are preparing grant proposals. A program of research on the factors facilitating successful grant proposals should address several critical issues:

1. Clarifying how to accurately and quickly measure whether a particular activity (e.g., researching funders, developing a timeline, conducting a literature review) has occurred;
2. Identifying the most effective strategies for promoting these activities (e.g., written instruction, classroom instruction, mentoring, online resources); and
3. Developing comprehensive training and support programs that include these (and possibly other) activities and conducting trials with faculty to identify their effectiveness and eventually tease apart which activities and training techniques are most effective.

Documenting the occurrence and studying the effectiveness of some activities (e.g., linking the aims to proposed activities and

outcomes) will be easier than for others (e.g., considering interdisciplinary collaborations). A comprehensive program of research is a challenging endeavor given the variation among different funders and changing priorities in the research environment.

There are some limitations to this study. Many of the articles we included provide advice for applicants that remains hearsay; many recommendations have not yet been proven through rigorous evaluation to be effective. By excluding book chapters or training materials, we may have overlooked some potential sources of data. In addition, a different array of search terms may have produced different results. However, our initial identification of 1,130 abstracts from 2000 to 2012 is likely to have captured the bulk of the most current recommendations, which we have distilled into 10 useful recommendations for faculty grant proposal writing success.

In conclusion, these findings suggest that promoting faculty development in research proposal writing success at the institutional level may be very feasible. We have synthesized the accumulated wisdom of a more than a decade of articles on how health sciences faculty might write successful proposals for research funding. Institutions can use our 10 recommendations to innovate faculty development interventions that ease faculty members' burden of successfully finding research funding in the currently challenging economic climate, which will, in turn, promote further sponsored research in the academic medical setting.

Acknowledgments: The authors appreciate the insightful comments of the anonymous reviewers.

Funding/Support: None reported.

Other disclosures: J.P. Wisdom and H. Riley completed much of this work while they were at Columbia University, and N. Myers completed this work when she was at George Washington University. H. Riley is a 2013 participant in the Association of Schools and Programs of Public Health (ASPPH)/Centers for Disease Control and Prevention (CDC) Public Health Fellowship. The work conducted for this publication was completed prior to her fellowship, has no relationship to the fellowship whatsoever, and was not funded by ASPPH or the CDC.

Ethical approval: Reported as not applicable.

References

1 The Royal Society. Knowledge, Networks and Nations: Global Scientific Collaboration in the 21st Century. 2011. http://www.interacademies.net/File.aspx?id=25069. Accessed April 27, 2015.
2 Battelle. 2014 global R&D funding forecast. December 2013. http://www.battelle.org/docs/tpp/2014_global_rd_funding_forecast.pdf?sfvrsn=4. Accessed April 27, 2015.
3 National Institutes of Health. About NIH. http://www.nih.gov/about/. Reviewed February 2, 2015. Accessed April 27, 2015.
4 Wartman SA. Toward a virtuous cycle: The changing face of academic health centers. Acad Med. 2008;83:797–799.
5 American Medical Association. Physician Characteristics & Distribution, 2012. Chicago, IL: American Medical Association; 2012.
6 Ries A, Wingard D, Gamst A, Larsen C, Farrell E, Reznik V. Measuring faculty retention and success in academic medicine. Acad Med. 2012;87:1046–1051.
7 Liu CQ, Morrison E. U.S. medical school full-time faculty attrition. AAMC Analysis in Brief. 2014;14:1–2. https://www.aamc.org/download/369006/data/faculty-attrition.pdf. Accessed April 27, 2015.
8 Gomez-Cambronero J, Allen LA, Cathcart MK, et al. Writing a first grant proposal. Nat Immunol. 2012;13:105–108.
9 Leslie K, Baker L, Egan-Lee E, Esdaile M, Reeves S. Advancing faculty development in medical education: A systematic review. Acad Med. 2013;88:1038–1045.
10 DeCastro R, Sambuco D, Ubel PA, Stewart A, Jagsi R. Batting 300 is good: Perspectives of faculty researchers and their mentors on rejection, resilience, and persistence in academic medical careers. Acad Med. 2013;88:497–504.
11 Pololi LH, Krupat E, Civian JT, Ash AS, Brennan RT. Why are a quarter of faculty considering leaving academic medicine? A study of their perceptions of institutional culture and intentions to leave at 26 representative U.S. medical schools. Acad Med. 2012;87:859–869.
12 Inouye SK, Fiellin DA. An evidence-based guide to writing grant proposals for clinical research. Ann Intern Med. 2005;142:274–282.
13 Wescott L, Laskofski M. Grant writing tips for translational research. Methods Mol Biol. 2012;823:379–389.
14 Falk GW. Turning an idea into a grant. Gastrointest Endosc. 2006;64(6 suppl):S11–S13.
15 Bordage G, Dawson B. Experimental study design and grant writing in eight steps and 28 questions. Med Educ. 2003;37:376–385.
16 Blanco MA, Lee MY. Twelve tips for writing educational research grant proposals. Med Teach. 2012;34:450–453.
17 Barnard J. Keys to writing a competitive grant. J Pediatr Gastroenterol Nutr. 2002;35:107–110.
18 Penrod J. Getting funded: Writing a successful qualitative small-project proposal. Qual Health Res. 2003;13:821–832.
19 Urrutia R. Academic skills: A concise guide to grant writing. Pancreatology. 2007;7:307–310.
20 Vivar CG, McQueen A, Whyte DA, Armayor NC. Getting started with qualitative research: Developing a research proposal. Nurse Res. 2007;14:60–73.
21 Brock MV, Bouvet M. Writing a successful NIH mentored career development grant (K award): Hints for the junior faculty surgeon. Ann Surg. 2010;251:1013–1017.
22 Koppelman GH, Holloway JW. Successful grant writing. Paediatr Respir Rev. 2012;13:63–66.
23 Pierce LL, Larsen PD. The Rehabilitation Nursing Foundation celebrates 20+ years of funded research. Rehabil Nurs. 2010;35:135–140, 160.
24 Setiati S. Tips for making a good research proposal. Acta Med Indones. 2004;36:43–47.
25 Pullen RL Jr, Mueller SS. Preparing successful grant proposals. Am J Nurs. 2012;112(1 suppl):21–22.
26 Koren G. How to increase your funding chances: Common pitfalls in medical grant applications. Can J Clin Pharmacol. 2005;12:e182–e185.
27 Wurmser T. Advance your nursing agenda with philanthropy and grant writing. Nurs Manage. 2006;37:35–36, 38.
28 Wurmser T, Hedges C. Primer for successful grant writing. AACN Adv Crit Care. 2009;20:102–107.
29 Schilling LS. Ten things I learned while writing my last research grant. Pediatr Nurs. 2003;29:150–151.
30 Schleipman AR. Navigating the biomedical research system as a full participant: Strategies and opportunities for the nuclear medicine technologist. J Nucl Med Technol. 2007;35:170–175.
31 Lisanti P, Talotta D. Tips for writing a NAON research grant proposal. Orthop Nurs. 2000;19:61–65.
32 Beitz JM, Bliss DZ, Whitney JD. Preparing a successful grant proposal—part 1: Developing research aims and the significance of the project. J Wound Ostomy Continence Nurs. 2005;32:16–18.
33 Devine EB. The art of obtaining grants. Am J Health Syst Pharm. 2009;66:580–587.
34 Kaplan K. Funding: Got to get a grant. Nature. 2012;482:429–431.
35 Kugler C, Fischer S, Russell CL. Preparing a replication study. Prog Transplant. 2006;16:15–16.
36 Pierce LL. Twelve steps for success in the nursing research journey. J Contin Educ Nurs. 2009;40:154–162.
37 Bierig SM, Coon P, Korcarz CE, Waggoner AD. The research grant process: A reference guide for cardiovascular sonographers. J Am Soc Echocardiogr. 2005;18:264–267.
38 Lusk SL. Developing an outstanding grant application. West J Nurs Res. 2004;26:367–373.
39 Pullen RL Jr, Mueller SS. How to prepare a successful grant proposal. Nurse Pract. 2010;35:14–15.
40 Rosenzweig JS, Van Deusen SK, Okpara O, Datillo PA, Briggs WM, Birkhahn RH. Authorship, collaboration, and predictors of extramural funding in the emergency medicine literature. Am J Emerg Med. 2008;26:5–9.
41 Harper FD. Writing research reports and scholarly manuscripts for journal publication: Pitfalls and promises. J Negro Educ. 2006;75:322–340.
42 Rekow ED. Leveraging your research—mapping our future. J Dent Res. 2006;85:583.
43 Bliss DZ. Letters of support for a research grant proposal. J Wound Ostomy Continence Nurs. 2010;37:358–359.

44 McGovern V, Kramarik J, Wilkins G. Career benchmarks from the Burroughs Wellcome Fund's early faculty career development awards. Acad Med. 2013;88:1732–1739.

45 Thompson JC. Lessons from a life in research: Getting things straight. Pharos Alpha Omega Alpha Honor Med Soc. 2002;65:20–25.

46 Berger AM, Moore TA. Effective grant writing. J Infus Nurs. 2011;34:167–171.

47 Chung KC, Shauver MJ. Fundamental principles of writing a successful grant proposal. J Hand Surg Am. 2008;33:566–572.

48 Daniel BV, West JK, Daniel GE, Flowers P. Grant writing as a funding source and collaborative endeavor. Coll Stud Aff J. 2006;25:199–208.

49 Walsh MM. Lessons learned from grant writing: Establishing a track record for funding and involving community providers in implementation. J Dent Hyg. 2009;83:212–213.

50 Sandler RS. Writing clinical research grant applications. Inflamm Bowel Dis. 2002;8:196–200.

51 Colwell JC, Bliss DZ, Engberg S, Moore KN. Preparing a grant proposal—part 5: Organization and revision. J Wound Ostomy Continence Nurs. 2005;32:291–293.

52 Granger NA, Calleson D. Finding support for educational projects in anatomy: Tips, tools, and lessons learned. Anat Rec B New Anat. 2005;282:13–17.

53 Nolan MT, Wenzel J, Han HR, Allen JK, Paez KA, Mock V. Advancing a program of research within a nursing faculty role. J Prof Nurs. 2008;24:364–370.

54 Powell K. Tag teams. Nature. 2005;437:590–591.

55 Berger DH. An introduction to obtaining extramural funding. J Surg Res. 2005;128:226–231.

56 McBride AB. Toward a roadmap for interdisciplinary academic career success. Res Theory Nurs Pract. 2010;24:74–86.

57 Whittemore R. Top 10 tips for beginning a program of research. Res Nurs Health. 2007;30:235–237.

58 Weinert C. Are all abstracts created equal?? Appl Nurs Res. 2010;23:106–109.

59 Bliss DZ. Writing a grant proposal: Part 6: The budget, budget justification, and resource environment. J Wound Ostomy Continence Nurs. 2005;32:365–367.

60 Todd RF 3rd, Miller DM, Silverstein RL. Hematology grants workshop—2001. Hematology Am Soc Hematol Educ Program. 2001:507–521.

61 Antonakos CL, Kazanis AS. Research process in the health sciences: A focus on methods. Res Theory Nurs Pract. 2003;17:257–264.

62 Sherrill JT, Sommers DI, Nierenberg AA, et al. Integrating statistical and clinical research elements in intervention-related grant applications: Summary from an NIMH workshop. Acad Psychiatry. 2009;33:221–228.

63 Grey M. Top 10 tips for successful grantsmanship. Res Nurs Health. 2000;23:91–92.

64 McCormick CB, Barnes BJ. Getting started in academia: A guide for educational psychologists. Educ Psychol Rev. 2008;20:5–18.

65 Goldschmidt PG. Information synthesis: A practical guide. Health Serv Res. 1986;21(2 pt 1):215–237.

66 Sajdyk TJ, Sors TG, Hunt JD, et al. Project development teams: A novel mechanism for accelerating translational research. Acad Med. 2015;90:40–46.

67 Havermahl T, LaPensee E, Williams D, et al. Model for a university-based clinical research development infrastructure. Acad Med. 2015;90:47–52.

68 Byrne DW, Biaggioni I, Bernard GR, et al. Clinical and translational research studios: A multidisciplinary internal support program. Acad Med. 2012;87:1052–1059.

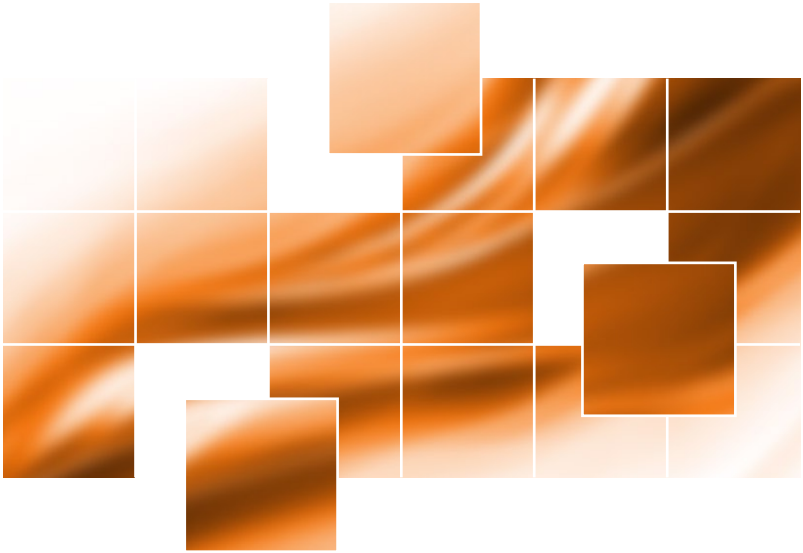
69 DeCastro R, Sambuco D, Ubel PA, Stewart A, Jagsi R. Mentor networks in academic medicine: Moving beyond a dyadic conception of mentoring for junior faculty researchers. Acad Med. 2013;88:488–496.

Part 2

A research manager's notebook

Open secrets about writing successful grant proposals

Notes for researchers and research managers



a Research publication

Contents

Introduction

Writing a research grant proposal can be fun; that is, if you know what you're doing.

Words are like bullets. Aim well and you will hit your target cleanly. Say what you want to do simply and directly, and explain how your research will benefit the world.

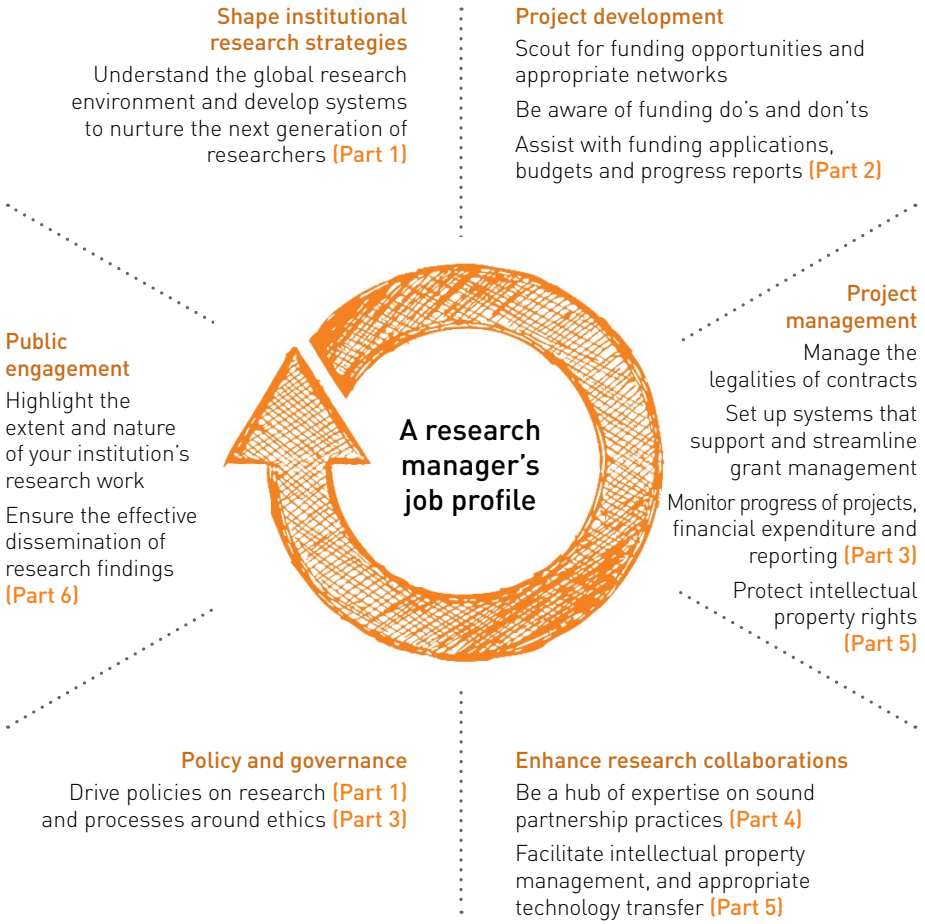
Use your brain power. Find out all you can about potential donors and their research interests. Donors look to fund promising, novel ideas: ideas that make them understand the world in new ways; ideas that make them believe that the world can change for the better, and that by helping you, they can help to make change happen.

Bring a good attitude. Being passionate about your work and what you hope to achieve always helps, but remember that an expert will read your proposal. Look for what you can do that is unique in terms of opening up new knowledge, as opposed to conforming to what seems trendy, or repeating work that has already been done. Blend skill and focus to create a winning proposal.

This book is the second in a series of six in which research managers based mainly in Africa and the Caribbean share their insights and provide practical guidance. Writing research-grant proposals is an important part of being a researcher. There is simply no way of avoiding the fact that, initially, you have to put down your ideas and work out what you will need to do to complete your research. This task can't be done for you. But writing a good proposal requires in-depth understanding of your field, an ability to write simply and clearly, and an ability to persuade people. These are skills that anyone can learn. This part of the notebook contains hints and tips from successful researchers, research managers and funders. Read on to learn from them...

> Remember, this is what research is: donors give you money so that you can put science to work to solve local and global problems.
>
> - Annemia van den Heever, Director of Research Development, Stellenbosch University

Research management: The skills in brief



This diagram illustrates the core skills that research managers need, and shows which book in the series contains more information on each skill. (In designing this diagram, we also drew on the core-competency framework developed by the Association of Research Managers in the UK and the US Society for Research Administrators.)

The funding cycle for an emerging researcher

1 Identify a funding opportunity

- Use a funding database, such as *Research Professional*
- Consult the research management office at your institution
- Monitor the websites of potential donors and institutions
- Interact with colleagues both locally and globally on email, in seminars and conferences, and seek out opportunities for partnership
- Scan relevant journals and magazines
- Ask foreign embassies if they provide information on research funded by their countries

2 Assess the opportunities you find

- Filter research grants and eliminate any that don't really fit with your research priorities
- Where there is a good fit, find out more about the donor's objectives via their website
- Make a checklist of what the donor requires and another list of your needs; then compare the two lists and check if there is enough overlap
- Find out if the funder accepts unsolicited proposals, or responds only to applications they receive after issuing a specific call

3 Develop an appropriate application

- Write a rough draft of your proposal, including the problem/s you are addressing, your objective, your methodology or process, budget, likely impact, etc.
- Include only the information that the donor asks for
- Consult colleagues and mentors about your concept and budget, and the general feasibility of your research project, as well whether the application is well written
- Match your language to the language that the funder uses, then cut, prune and omit needless words; revise, revise, and revise the application again, improving it each time, until it is the best you can make it
- Have someone else check your spelling and grammar

4 Submit your application

- Submit the application using the means that the donor requests (online or hard copy)
- Never submit late without first checking if late applications will even be considered
- Inform anyone you have listed as a referee that you have included them
- Thank everyone who helped you

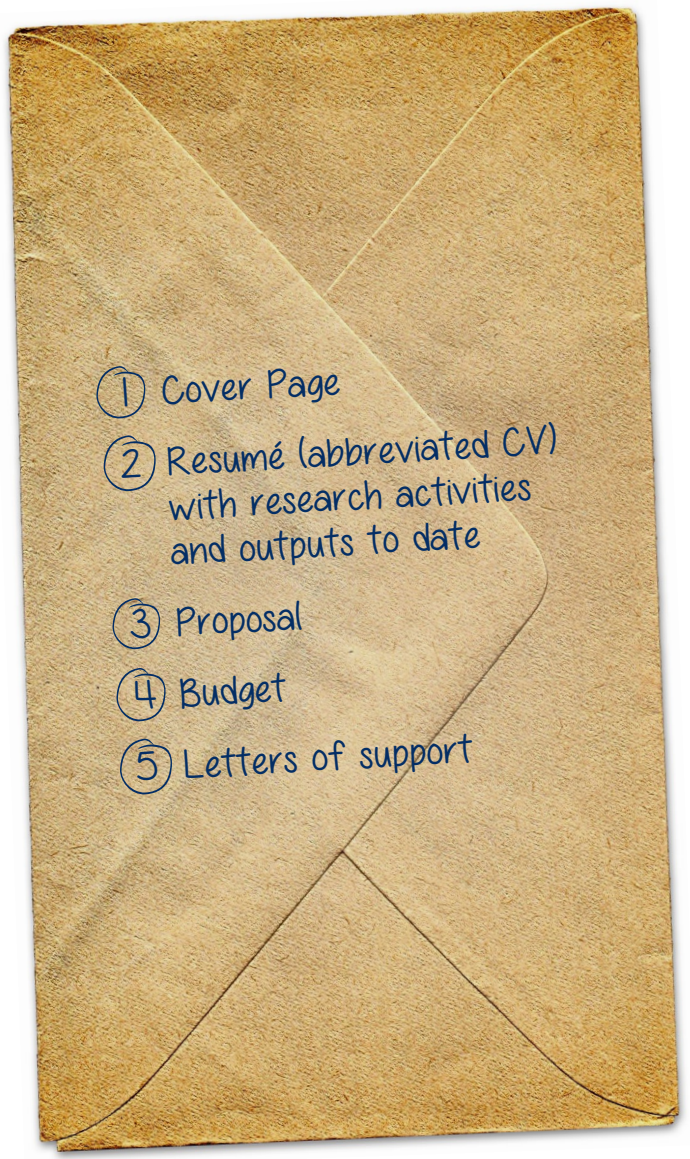
5 Follow up

- If you are successful, first thank the funder
- If you aren't successful, start again from point 1
- Reflect on the process and make sure you learn from what went well and what didn't go so well so that you can make sure that it all goes more smoothly next time

6 Research and write

- Conduct your research, and remember to include the writing of research reports in the schedule

An example of standard documents to include in an application



An overview of research funding: some useful background

Research needs funding. It needs other resources too, but without funding, research can't happen. Generally, governments are expected to fund research through universities and other research institutions, but the governments of many developing countries have too many other priorities and too few resources to fund research adequately. Even some middle-income countries, which have fairly well-funded institutions, cannot afford to fund all of the regional or cross-regional collaborations that are necessary when researchers attempt to address problems that exist at a global scale. So, researchers worldwide often have to seek research funding outside of their institutions, or outside of even their countries. And competition for such funding can be fierce.

Prior to the mid-2000s, funding agencies (also known as donors) tended to fund NGOs and development projects. Since then, donors have increasingly funded research institutions, or researchers who work with NGOs.

Different agencies tend to have different areas of focus, but collectively they tend to prioritise research related to problems that most of us would agree are important. These include poverty alleviation, climate change, sustainable agriculture, food security, clean energy and water, economic development, health, education at all levels, enhancing governance, peace and democracy, etc.

> The direction that research is taking in the European context is to focus on the basic challenges: health, food, climate, water, marine resources. We need new and innovative solutions for this - it is no longer all about industrial development. There is a need at a global level to increase research and researchers. Ironically, producing more people for a 'smart' or 'knowledge economy' increases competition not equity. But hopefully, through competition, we will get excellence.
>
> - Declan Raferty, Head of Research Support, Dublin City University

So where does donor money come from exactly?

Some of the world's richer nations, such as the USA, Canada and Germany, etc., have state-run agencies that fund international research. For example, the world's biggest funder of health research is the US government's *National Institutes of Health*.

However, most of the agencies that support research in the poorer nations are trusts and foundations established by large corporations or wealthy individuals. There are literally thousands of such organisations worldwide that fund research, some of which have massive annual budgets, and others that spend relatively small amounts in very focused and specific ways. Some large corporations give a percentage of their annual profits to foundations they establish. Other trusts and foundations are set up to manage a single lump sum, which they invest in various ways. They then use the capital earned from their investments to fund projects of their choice.

The *Wellcome Trust*, for example, is the world's second largest funder of health research. This trust was established in the UK in 1936 to administer the fortune of pharmaceutical magnate, Sir Henry Wellcome, and according to its *website*, currently spends about £600 million each year supporting 'the brightest minds in biomedical research and the medical humanities'. Similarly, *Google.org* and the *Bill and Melinda Gates Foundation* use profits earned via their businesses, which they have reinvested in stock markets or in other businesses, to fund research and other development-related projects. On a different scale, *Oxford University*, like most universities, has funds from which it is able to provide fellowships for eligible students from anywhere in the world.

The difference between a grant and a donation

Annamia van den Heever, Director of Research Development at Stellenbosch University in South Africa, describes a donation as 'disinterested benevolence' in response to a request. In other words, a donation is requested and the donor hands over some funding with no expectation of receiving anything in return, except, perhaps a brief report on how the money was spent.

Grants are very different. They have to be applied for, and all applications go through a strict and formal selection process to get approved. Most research funding is allocated via grants. Therefore, it is important to understand how grant-making processes work, and how to complete a successful research-grant proposal or application.

Finding out about research grants

The most effective way to search for research funding in Africa and the Caribbean is through *Research Professional*. As part of Research Ltd, *Research Professional* collates information from donors worldwide, and advertises over 12 000 funding opportunities each year. Researchers at subscribing institutions can streamline their search for funding, using filters and alerts to ensure that they are kept informed of all the grants that are made available in the fields they are working in. This has led to many successful grant applications, as funding opportunities 'find' you.

If your institution has a research-management office, helping researchers to identify likely funding opportunities is probably one of their roles. Ask them if they can offer you any guidance and help.

Journals and magazines specific to your discipline may contain notices about grant opportunities. Of course, you can also use a search engine, such as Google, but this does not offer a good filter for research funding, and will be time consuming.

In recent years, many funders have become increasingly keen to fund cross-disciplinary collaborations within universities, or interdisciplinary work between universities, as a way of enhancing the relevance and reach of the research they fund. So asking for recommendations and advice from peers and colleagues can be a good idea, but be aware that project teams tend to guard such information quite jealously.

The local embassies of high-income countries are also worth visiting; sometimes they run funding programmes or have information about donors in their own countries who are seeking to fund research in your area. If this is the case, ask the person who is responsible for this work at the embassy to add you to their mailing lists.

> Given the trend that favours partnerships for research and funding, common objectives are important, and then funding acts as a kind of glue between partners.
> – Declan Raferty, Head of Research Support, Dublin City University

National contact points and European Commission funding

The European Commission is one of the world's largest funders of research and innovation. The Commision puts out calls for proposals under specific programmes, such as the Seventh Framework Programme (FP7) (which ran from 2007 to 2013), and the Horizon 2020 initiative (which will run until 2020). Applying for these funds can be intricate and sometimes difficult. So the European Commission has encouraged countries to establish so-called national contact points, where researchers can find information, guidance and support related to their application. Some countries have several national contact points, and each one is responsible for a different discipline or field of study. They are appointed on the basis of having knowledge and experience of participating in EUC-funded research programmes, as well as an understanding of their country's research strengths in the disciplines for which they are responsible. The national contact points often have information about other funding opportunities too.

For a list of names of individuals and organisations who have agreed to act as national contact points for countries in Africa, the Caribbean and other developing countries, see *Community Research and Development Information Service* (CORDIS). This list should be regularly updated, but many countries maintain their own lists of national contact people, too. So if you don't find a helpful contact person via CORDIS, ask your colleagues if they know of other local contact people who might help you.

What to look out for in calls for research-grant proposals

The following examples show different types of information required by individual donors as well as the different ways you are asked to apply. Look out for how well the advertisements 'match' your work and check whether or not there are any restrictive criteria or a specific application form that you have to use.

The Wellcome Trust invites applications for its new investigator awards in medical history and humanities. These support world-class researchers who are no more than five years from appointment to their first academic position but can already show that they have the ability to innovate and drive advances in their field of study. Research in medical history and humanities should address the important questions at the interface of science, medicine and the wider humanities including the social sciences and the arts. Research questions must be historically grounded, but interaction with the wider medical humanities is encouraged.

Applicants must be based in the UK, Republic of Ireland or a low- or middle-income country, and should have an established academic post at an eligible higher education or research institution.

Funding is worth up to £200,000 over a maximum of five years to cover research expenses; travel, subsistence and funding for collaborative activities; capacity-building and public engagement initiatives, and research leave; and research, symposia and dissemination activities. The award does not include salary costs.

Closing date 06 Sep 13

Deadline information: Optional CV details check due 19 July; main application 6 September 2013. This call is repeated once a year.

Note the criteria attached to this application!

Note that the advert gives no detail on how to apply for this grant other than saying that 'applications are invited'.

First find out from the donor if there is an application form, or if a general grant proposal would be ok

Each year the Royal Numismatic Society awards research grants from its various prize funds. The Price, Lowick, Kreitman, CNG, and Marshall funds are all administered in the same way. These are available to Fellows and non-Fellows alike, and the field of numismatic research which each fund encompasses is listed below. The grants are usually less than £1000, but larger grants will be considered. Awards are usually made in April or May of each year. It is important that the comments of referees are received before the deadline and it is the applicant's responsibility to ensure this.

There is one standard application form which should be used for all applications for RNS funds. All fields of this form should be completed and word limits should not be exceeded.

Completed application forms should be sent by 1 March each year to either: rns_secretary@hotmail.co.uk or RNS Research Grants, The Royal Numismatic Society, c/o The Department of Coins and Medals, British Museum, Great Russell Street, London WC1B 3DG.

Please note that applicants are responsible for ensuring that references reach the Society by the closing date. The awards should be announced within two months of the closing date.

Look out for the detailed instructions in the advertisement

The Harold Hyam Wingate Foundation invites applications for its developing countries grants. These grants give support to organisations working in developing countries for projects in the foundation's priority fields such as music and the arts. However, the foundation especially welcomes applications to address the particular problems of water supply. The foundation is willing to consider projects that may not qualify for public funding or attract other major funding bodies. Only charitable organisations are eligible.

Deadline information Deadlines on: 24 June 2013, 2 September 2013, 9 December 2013.

Award type Directed grants to institutions, research groups etc; Development (Africa/Caribbean)

Since only charitable institutions are eligible for this grant, you would have to partner with a local NGO to qualify

Choosing the right funding partner

Funders fund well-planned projects that closely match their own values and objectives.

Once you have identified a likely research grant, the first step is to make sure that you and the funder are a good match. Mine the internet for information about the donor. Work out what the value of their grant is, and find out what kinds of research they have funded in the past. If possible, try to meet or find out about their local representative. If there isn't a local representative, find out who is responsible for managing research grants made by that funder to projects in your country or region (the information on page 12 about national contact points might be helpful here too).

Simply completing grant application forms is often not enough. Obtaining a grant often depends on your reputation and the network of mentors and colleagues you have built up. Your institution's reputation also counts, so it is vital that you know your institution well – try to find out which funders have supported its research efforts in the past, and how that went.

The critical issue is not always the proposal. The critical issue is your networks and connections. Proposal writing comes at the end of a fundraising process, not the beginning... do your research, find the matches and the connections.

– Shelagh Gastrow, Executive Director, Inyathelo

Read the small print ... twice

Usually a call for research-grant applications comes with an application form. Before you begin filling in the form, read it and all correspondence that comes with it *extremely carefully*. As with any relationship, the devil is in the detail. Does the application form stipulate that the money is to be used only for data collection, and not for travel expenses? Does the form state that certain kinds of expenditure (such as the purchase of laboratory equipment or administrative salaries) will not be covered?

Now ask yourself: is this call for applications in line with the research project I have in mind? Will the funding help my research, and will my research help the funder?

Remember: a funder who puts out a call for research on *livestock in Kenya* is not going to be interested in a project that is researching livestock in *Namibia* or *sunflowers* in Kenya, no matter how well you write the proposal. The objective of your research must match the aims and objectives of the funder.

If you think you have found the perfect match, return to the application form.

Getting down to work

Don't write anything until you have read the form a few times and are sure that you know what you need to do. Remember that writing a research-grant proposal is an opportunity to show what you have to offer both the funder and society more generally.

Diarise the deadline

If you prioritise just one thing in the application process, let it be meeting the deadline. One of the most common reasons that applications fail is because they are not submitted on time. Submitting late is probably worse than not submitting at all; it creates an impression that you are unable to plan your work or prioritise your time; that you are unreliable and may not be worth supporting. So, before you do anything else, diarise the deadline and work backwards to calculate how much time you can spend on planning, writing, editing and having your application checked.

Make time to write

No successful research-grant proposal can be written in a day. Make sure you have plenty of time to gather your thoughts, collate all the information you need, and to write a clear and well-thought-out proposal. If you have never completed a funding application before, try to set aside about fourteen days over a period of about a month to pull all the necessary information together. If you are setting up a research consortium, with multiple research partners and several research sites, you may need more time. Either way, until you become highly experienced at writing such proposals, you will probably want to edit and change what you have written many times before you are satisfied that it is perfect.

Make a checklist of requirements

Make a list of all the forms and documents that need to be included in the final grant proposal package. Then tick them off when you have completed each one. Tick them off again as you put each one into the envelope you are going to send. If the application has to be submitted electronically, make a special folder for all the attachments that you are going to email or upload. Remember to keep a hard copy of the whole application for your own records.

> Focus your proposal on what the funder is offering and never add information that the funder has specifically noted should not be included. Adding in extras could jeopardise your chances of winning the grant, especially if there are lots of other applications and the funder has too much to read and many options to choose between.
>
> - Professor John Parkington, University of Cape Town

Play to your strengths

The reputation of your institution, as well as the qualifications and reputations of the individual researchers in your team, are really important. Make sure you obtain CVs from all members of your team, and are fully aware of their competencies and achievements so that you can summarise and highlight these if required to do so. Provide this information only if it has been specifically requested, and keep it short - about 150 words about each of the lead researchers in your team should be sufficient.

> Even if you don't need to submit CVs with the grant application, having information about your research team is worthwhile for all sorts of reasons, and will come in handy later in the process.

Persuading your readers

Think about who is going to read your research-grant proposal. Usually, a team of specialists reads all the proposals, and relays their opinions to a selection committee. The specialists' recommendations help the committee to reach a decision.

Like most of us, these specialists and selection-committee members suffer from having too much information and too little time. The more concise and to the point you can be, the more likely it is that your whole application will be read. Make sure that you provide only the information that is asked for. Don't get carried away and start adding information that you happen to find interesting.

Write clear, short sentences. Ideally, limit yourself to one idea per sentence. Try to avoid using adjectives and adverbs, which tend to be seen as fluff and often add little to what you are trying to say.

Don't see writing proposals as a waste of your time. Refining your application will enhance your ability to excel at other writing tasks such as research reports, journal articles, chapters in books, etc.

> Remember to give the funder exactly what they ask for in the application form. Don't be longwinded, and don't add in extras (especially long documents) that they haven't requested.

Speak their language

All funders have certain aims and values that reflect what they see as important, and indicate how they wish to make an impact on the world. Try to show how your work incorporates their own aims and values.

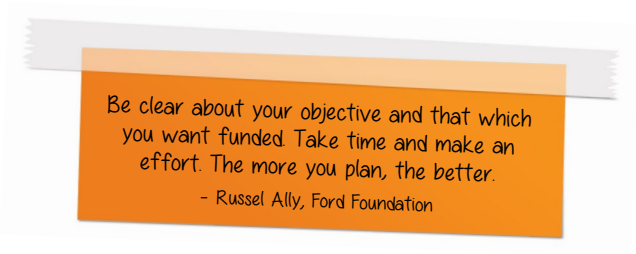
Look carefully at their websites, and any other information you can find about

them, and analyse the words they use. Some of the terminology and technical language in the application forms may be unfamiliar. With careful reading you can almost always work out what is required. Don't be too proud to circle (in pencil that you can rub out later) any words you don't know. Then *look them up* so that you are left with no doubt as to what each word in the application form means.

Note, also, that different funders use different words to mean the same thing. For example, instead of the word 'objective', funders might use words such as 'mission', 'research question', 'purpose', 'intention', 'goal', or 'target'. A good trick is to use the same words that the donor uses. However, make sure that you fully understand all the words you use. If you use technical terms out of context, the funders may think you don't know what you are talking about.

Here are some words that are used interchangeably in 'donorspeak':

- problem / need / context / issue / situation
- purpose / objective / mission / goal / outcome / vision / target
- activities / actions / project plan / research methods
- inputs / resources / finances / capital investment
- indirect costs / overhead costs / administrative costs / facility costs
- results / outputs / products
- impact / influence / uptake



Formulate a clear objective

Your objective is the first thing that a funder is going to read when considering an application. Therefore make sure that you conceptualise the problem you want to address and the objective of your research carefully and write this very clearly. Ideally, aim to capture your objective in one sentence. Never use more than three sentences or a short paragraph. One way to achieve this is to use SMART objectives, which will help to make your aims competitive, eye-catching and to the point. SMART objectives are objectives that are:

- **Specific** (detailed, pointed and not vague)
- **Measurable** (you can track its progress and measure how close you are to your goal)
- **Attainable** (the goal is reachable and circumstances exist for you to achieve it)
- **Realistic** (what you want to achieve is not a dream, you have calculated the time and effort involved and are clear about your intentions and your capacity)
- **Time bound** (there are deadlines, in particular a date to start and a date for completion)

To write a SMART objective takes time and much rewriting. Each time you rewrite, try to be more specific, more concise, until the words are crystal clear.

It could happen to you...

It is easy to see why the following objective passes the SMART test, and why the proposal earned $225 000 from the Global Agricultural Foundation* in 2012.

The problem: Agriculture is the backbone of Country X's economy and it is central to the government's development strategy, but although the agricultural sector employs more than 75% of the country's workforce, and accounts both directly and indirectly for approximately 51% of Country X's gross domestic product, little is known about the scale of livestock farming, livestock diversity or the distribution of livestock farms.

The objective: 'A team of eight researchers at the Livestock Research Unit of the Agricultural College of Country X will research the types and extent of livestock farming in the country. A comprehensive report will be published and an online database and website will be created. The project will be presented in its entirety four years after the start of the project at the sub-Saharan Agricultural Summit in Botswana in November of 2016.'

Note how directly the objective responds to the problem and how **S**pecific, **M**easurable, **A**ttainable, **R**ealistic and **T**ime-bound this objective is.

* The name of this organisation has been changed.

Base your action plans and outcomes on your objective

As soon as you have a SMART objective, your plan of action will probably flow from it quite logically. And once your plan is clear, the writing of the proposal should fall into place fairly easily too. In the plan, summarise the actions you will take to reach your objective, and list the people who will be involved in each part of the process. Any outputs or tangible products that will result from the research are an important part of the plan, and should be mentioned in your objective.

Calculate the costs

Once the actions and outputs are listed, you can work out how much the research will cost. Putting a budget together can be intimidating if you have never done one before, but budgeting is not a mystery – it is a skill that is relatively easy to learn.

Application forms often include a budget template to guide you. But, if not, familiarise yourself with your research institution's own budgeting processes, and use these to guide you instead. If there is no research-management office that can help, try to find someone in your institution's administration or finance department who can assist. See also the publication by ESSENCE on Health Research, *Five Keys to Improving Research Costing in Low-and Middle-Income Countries*, which is available online, and contains lots of advice and useful case studies.

Be guided by the value of the grant for which you are applying, and be realistic about what you ask for. If the grant excludes equipment, make sure that you don't include equipment costs in your budget.

Indirect costs, overhead costs or facility costs and administrative costs, are terms that funders use interchangeably. They refer to costs that can be linked to several projects simultaneously, and cannot be readily identified as being incurred solely as a result of a single project or activity. Make sure you know whether the grant you are seeking covers such costs and, if so, work out how to calculate them. The *Five Keys to Improving Research Costing in Low-and Middle-Income Countries* contains quite a bit of information about this.

Cost properly; don't cut corners or inflate costs, and don't forget to include the indirect costs.
- Shelagh Gastrow, Executive Director, Inyathelo

Explain the potential impact

To explain the impact of your work is to answer the question: how different will the world be if this research is carried out?

Impact is about measuring the significance of your research findings (outcomes), and working out how you will make your findings known (via outputs). In other words, if you can measure how widely researchers or policymakers in various economic, social, environmental, educational, policy or research arenas *respond to your outcomes and/or cite your outputs*, you will be able provide evidence of impact.

One helpful way of understanding the difference between impact and outcome is to consider the process of policy development. A policy document is an *output*, but the adoption of a policy can have a long-term *impact* and change behaviours.

Impact is difficult to measure as it can take a long time for the impact of an intervention to be felt. Because of this, some funders, but certainly not all, have stopped asking for impact measures to be included in funding applications. One mistake researchers make is to state the impact of research projects in terms that are too broad to be measurable. For example, one applicant claimed that the impact of a specific health intervention would result in 'a healthy community, free from infectious diseases'. Can you see how huge this claim is?

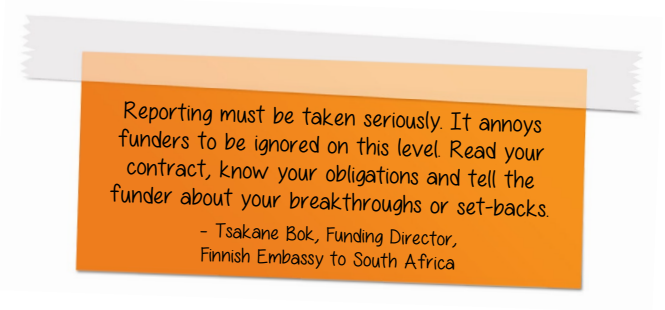
It may be useful to make the distinction between *qualitative* and *quantitative* assessments of impact. A *qualitative* assessment of impact includes a *description of specific outcomes* and changes that may occur as a result of the research taking place, and the findings being disseminated. A *quantitative* assessment of impact may be based on one or more *measures of outcomes* and outputs. For example, citation indexes and document-download statistics provide quantitative ways of measuring research impact. The website *Beyond Impact: Measuring Research, Making a Difference* offers some useful online resources related to this.

Include a summary

If your research-grant proposal is a long document, say more than six pages, include a very short summary of your research project on the first page. The summary should give a brief outline of your objective, planned outputs and the impact that your research will have. Make sure that the summary takes up less than a page.

Be prepared to submit ongoing reports

Grant money is often paid out in tranches over a period of time, say every six months over the life of the project, or on completion of certain project milestones. In almost all cases, reports have to be handed in according to agreed deadlines before funders can release the next tranche of funding.



Remember that funders also have networks, and they share information with one another. Make sure that you manage your reputation well when it comes to writing reports. If you fail to send in the necessary feedback, or if you compile them carelessly, you may lose out when it comes to your next funding application. Your institution's reputation may suffer, and you may even put your colleagues' future research projects at risk.

On writing

There is just no way around it: being an effective researcher includes mastering the skill of writing. Plans, proposals, papers and books all require you to write.

> Writing shouldn't be seen just as something you do at the final stages, or only as a way of explaining what research your have done. Writing can be a way of refining your thinking. It can help you to develop, clarify and test your ideas. Basically, writing should be done from the beginning of a research project.
>
> - Brian Martin, University of Wollongong, Australia

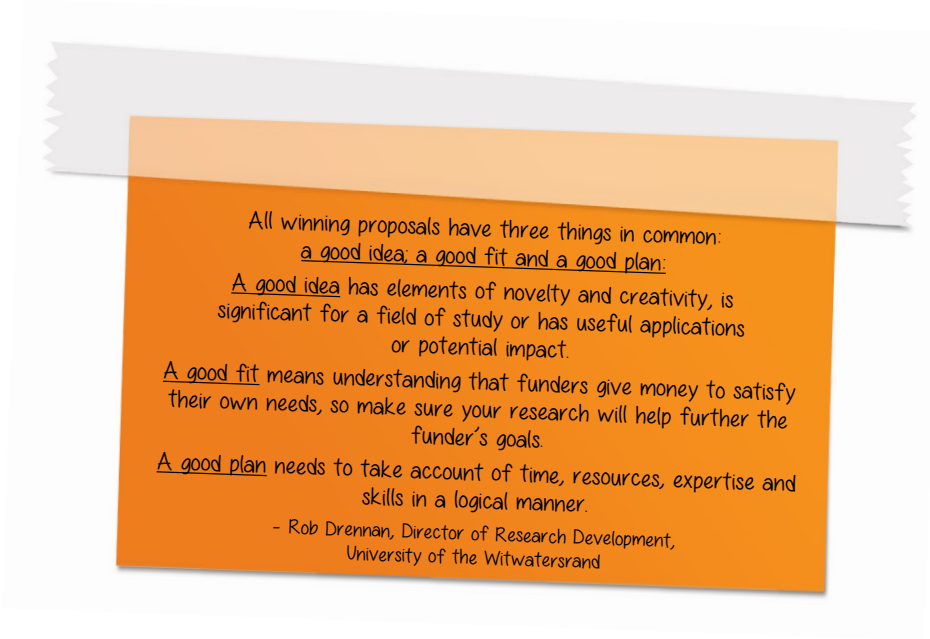
Most of us tend to 'binge write' in big blocks of time when our deadlines are nearly upon us, but many experts suggest that writing is a bit like fitness, the more you write the fitter you become. When writing a research-grant proposal you will need this writing fitness. So it can be good to get into a habit of writing 15 to 30 minutes every day. Keep the time short enough so that making time to write doesn't seem daunting. You'll be surprised how easy writing begins to seem, how polished your writing becomes, and how many more creative ideas come your way. Just remember that writing for yourself and writing for an external audience are very different things.

> You need to be able to express yourself to readers in a simple, accurate and interesting way. The content, format, sentence structure, vocabulary, language, punctuation and spelling all leave a lasting impression on the reader.
>
> - Robin Drennan, Director of Research Development, University of the Witwatersrand, South Africa

Remember you have to entice your readers into reading your entire document. You have to capture their attention and keep their interest throughout. A good proposal, like most good writing, is interesting, clear and persuasive.

Writing a winning proposal is done one word at a time. Some you will delete, some will stick. Slowly the proposal will grow until you have something you can be proud of.

Seven steps to writing a winning proposal



1 **Start with the problem** and explain how your research is going to be able to contribute towards resolving it. Provide the context (background) in which the problem exists in three sentences or less. Be realistic; don't be tempted to choose huge problems that you have no control over. Even if you do want to change the whole world, you have to start somewhere, and work one step at a time.

2 **State your objective**, that is, how the work you plan to do will address the problem you identified. Now make sure the objective is a SMART one. Be specific about what do you plan to do, as well as how, when, where, etc. List the outputs that you plan to generate. These are tangible products, such as a research paper, a laboratory report, a new drug, or a collection of artefacts – something that has a material form, that you can touch, and show to others.

3 **Clarify your methodology**; this will be discipline specific, but make sure your methodology is theoretically sound and appropriate to the problem you are trying to tackle.

4 **Work out who needs to be involved and what they will do** to make your objective a reality. This is a good place to include a simple Gantt chart.

5 **Calculate what the research will cost**: include all the time and the resources you need to complete the work.

6 **Describe the impact** your project will have. Say how you are going to monitor the work you are doing and what influence your research is going to have, locally or globally, and how you are going to share your results with others.

7 **Submit on time**, and in the way that the donor has stipulated. If the donor requires a hard copy, hire a courier to take it from your door to the donor's door. If the donor asks for an electronic copy only, do not bother them with a hard copy; send the application via email. If the donor requires the application to be filled in online, make sure you know how to do this long before the deadline arrives. Do what the donor stipulates.

To sum up

State the problem 1
It is important that this is written in an exciting way. The opening lines must capture the reader's imagination as this will be the first thing they read.

State your objective 2
Research-grant proposals often talk about an overall aim with many objectives. It is in this section that you list your proposed outputs. If one of your outputs is to publish your research, name the journals you plan to submit to otherwise it looks as if you haven't planned ahead.

Clarify your methodology 3
Generally, methodology is discipline specific and more significant for research related to the social sciences. Briefly justify your choice of methodology in relation to appropriate theory, but don't get long-winded. Remember the reviewers are experts in your field so you need to inform them, not educate them.

Work plan 4
Link this to your objective and demonstrate the feasibility of your project. Describe who will do what, when, and with what resources. Use a simple Gantt chart to show your schedule.

Budget 5
Create a budget by analysing the individual tasks needed to complete each objective. Proposal budgets directly reflect the depth of project planning and speak to the credibility of the researchers. Separate your budget into clear line items such as salaries, operating costs, capital costs, and indirect costs.

Consider your impact 6
Unless the funder states that this is not necessary, outline what you expect the results of your research to be and state how you will measure whether or not they are achieved.

Submit on time 7
Enough said already ☺.

This could be you...

A good tool for planning a project and for writing a proposal is Logical Framework Analysis, and many funders encourage applicants to use this approach. For more information, see the *Guide to the Logical Framework Approach*, which was developed by the EU, SIDA and others, and is available online.

If you are good at creating clear diagrams, consider creating an infographic to give funders a visual overview of how you see your research project. On the next page is an example of a diagram developed by Research Africa.

Theory of Change

Impact Level:
Impact is only evident after a long time

Pathways to Impact

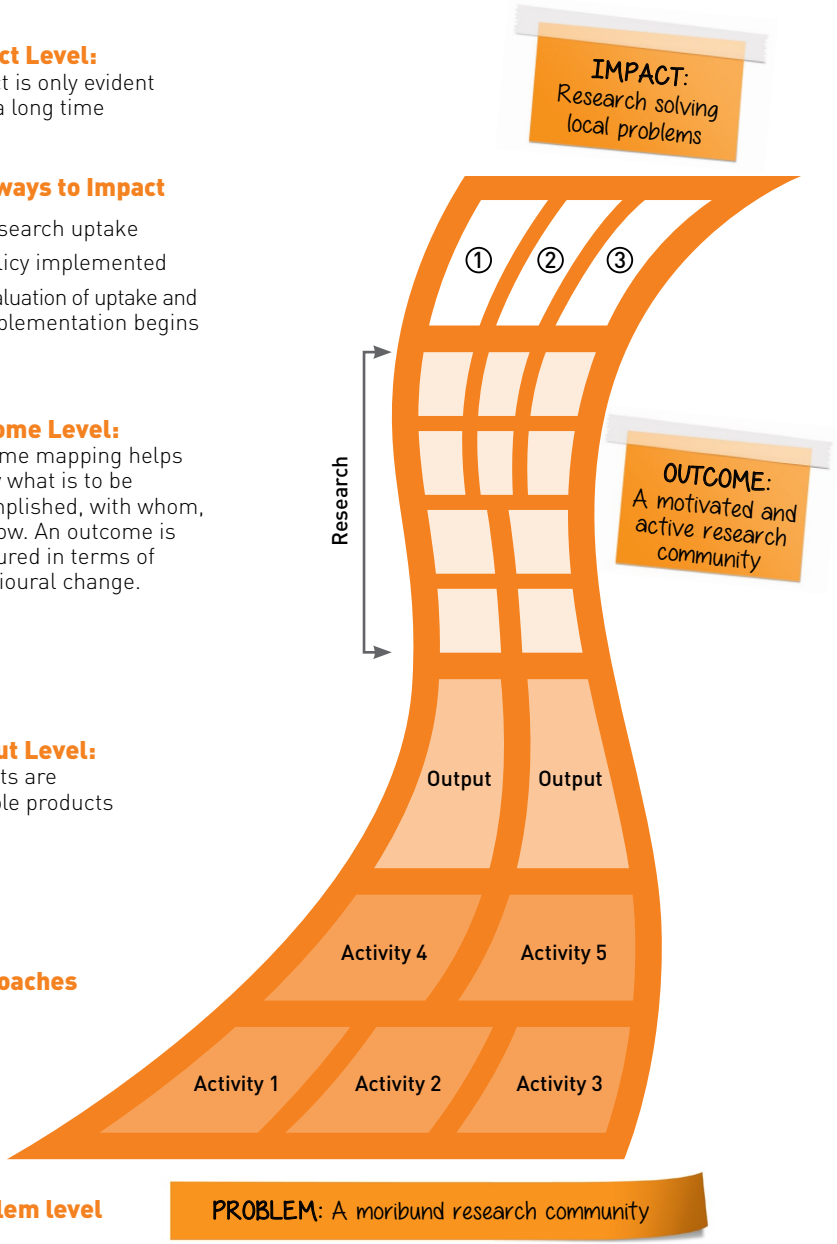
① Research uptake
② Policy implemented
③ Evaluation of uptake and implementation begins

Outcome Level:
Outcome mapping helps clarify what is to be accomplished, with whom, and how. An outcome is measured in terms of behavioural change.

Output Level:
Outputs are tangible products

Approaches

Problem level



Tips from the funders

Based on interviews with funders and listening to their conference presentations, here are some key points of advice directly from them.

- Funders don't see researchers, or their institutions, as beggars, so don't act like one.
- Funding organisations have their own strategic objectives. They have annual budgets for grants that they have to allocate, and they are most likely to spend their budgets on well-planned proposals that match their strategic objectives.
- Be open: state upfront whether or not you have additional funds from another source.
- Make sure that you have mechanisms for monitoring and evaluating your project in place, right from the start.
- Funders want to be able to trust you; they expect you to tell the truth, and to do your best to keep all your promises. However, if you run into problems, share important developments and communicate regularly. Remember that the funder is as invested as you are in the project, and they would much rather know the truth than not hear from you. Never ever hide away or avoid your funder, even if you have really bad news for them.
- Funders value organisations with proper systems and controls.
- Read your contract and know your obligations.
- Position yourself and your work carefully. Visibility is important, and so is leadership. Make sure that you plan a dissemination strategy for your research findings.
- Submit your application on time, giving the donor exactly the information asked for and no more.
- Your first task after receiving confirmation that you have won a grant is to say thank you. After that, be sure to acknowledge the support of your donor in all your outputs.
- In a face-to-face conversation with your donor, don't hog the conversation; listen to what the donor has to say.

The five most common mistakes grant applicants make: this couldn't be you, could it?

1. Failing to read the small print
One of the most common mistakes is not reading the application forms properly, says Ninette Mouton, research-grant manager at the University of Pretoria in South Africa. This leads researchers to apply for funds for aspects of research that are not covered by a particular grant. She advises researchers to write a list of points that the funders want, and another list of items not covered under the grant. Then check if your needs match up with those of the funder.

2. Fear of e-filing
Nthabiseng Motloi, research manager at the University of South Africa, says many researchers struggle with electronic submissions, which have become the norm nowadays. Some funder websites are not user-friendly, and technical errors can occur. 'Researchers get disappointed when the systems crash,' she says. 'Leave time for this part of the process: don't try to e-file your document at the last minute, and check if the research-management office at your institution offers e-filing support,' she adds.

3. Last-minute applications
'Some academics relax until just before the deadline. Then they get into a panic and this is when they make mistakes,' says another research officer. Taking time to prepare and write applications is key. Making sure you have enough time to send completed applications to friends or colleagues to proofread is also a great idea.

4. Confusion over costing
Bavesh Kana, a researcher at the University of Witwatersrand, in South Africa, notes that the financial aspects of a proposal can be particularly tricky. Proposals can be rejected if applicants don't understand terms such as 'direct and indirect costs,' he says. If you aren't certain about how to compile a budget, make sure you get help from someone who is.

5. Failing to ask questions
Some application guidelines are ambiguous and difficult to interpret even after the most meticulous reading. Jannan Dietrich, a researcher at the Perinatal-HIV Research Unit of the University of Witwatersrand, says that when this happens, researchers should contact the funders and ask them to clarify matters. 'Researchers have to build good relationships with funding agencies so as to get instant support when any queries arise,' she says.

Useful resources

Beyond Impact.org *Beyond Impact: Measuring Research, Making a Difference*. Available online, at http://beyond-impact.org/

Bill and Melinda Gates Foundation http://www.gatesfoundation.org

Collins Dictionary. Available online, at http://www.collinsdictionary.com/

Community Research and Development Information Service (CORDIS). Available online at http://tinyurl.com/c9mhdh5

ESSENCE on Health Research (2012) *Five Keys to Improving Research Costing in Low- and Middle-Income Countries*. Available online, at http://tinyurl.com/bpej5h4

EU, SIDA and the government of Serbia (2011) *Guide to the Logical Framework Approach*. Available online, at http://tinyurl.com/cc5yyck

Google.org http://www.google.org

National Institutes of Health – grants pages http://tinyurl.com/d82qzry

Oxford University – Grants pages http://tinyurl.com/cocfo7g

Research Professional. Available online at http://www.researchresearch.com

Wellcome Trust http://www.wellcome.ac.uk

Acknowledgements

Core Competency Framework diagram adapted from resources developed by the Association of Research Managers – UK Professional Development Framework and the US Society for Research Administrators.

Sandra Prosalendis, Munyaradzi Makoni and Claire Maasch for their skill and input in pulling together these quotes and sections of material into a cohesive whole. Mary Ralphs for her editorial expertise and Tracey Watson for the design and typesetting.

Quotes by Russell Ally, Takare Bok and Shelagh Gastrow were taken from a meeting held by the Southern African–Nordic Centre in December 2011 where these individuals spoke about tips when applying for funding.

Dr David Langley, Director of Research and Enterprise Development at the University of Bristol, for sharing his presentation, 'Current Trends in Research Management and Administration' from the RIMI4AC workshop held on 9 October 2012 at the Wellcome Trust, London.

Annemia van den Heever for contributing her presentation, 'Facilitating Research- Other Funding Sources: Grants from Foundations and Philanthropies' from the SARIMA workshop on Research Administration held in Pretoria on 13th February 2012.

Shariefa Kalokola for her contribution, published in Research Africa on 'The five most common mistakes grant applicants make'.

Dr Robin Drennan, Director of Research Development at the University of Witwatersrand for his inputs through his presentation, 'Writing a Winning Funding Proposal' from the SARIMA Training Course on Successful Grant Proposals, hosted by the University of Limpopo on 24 – 26 April 2013.

Professor John Parkington from the University of Cape Town for his inputs and quotes and willingness to be interviewed around the grant writing process.

Quotes from Dr Declan Rafferty of Dublin City University were taken during an Irish-African Partnership meeting at the launch of the East African Research and Innovation Management Association (EARIMA) on 22 September 2011.

First published in 2013 by Research Africa

Research Africa

Produced under the RIMI4AC Project funded by the European Commission's Africa, Caribbean and Pacific Science and Technology Programme.
Grant no. FED/2009/218782.

RIMI4AC

Paediatric Respiratory Reviews 13 (2012) 63–66

Contents lists available at ScienceDirect

Paediatric Respiratory Reviews

Research: from concept to presentation

Successful grant writing

Gerard H. Koppelman [1,*], John W. Holloway [2]

[1] Department of Paediatric Pulmonology and Paediatric Allergology, Beatrix Children's Hospital, Groningen Research Institute for Asthma and COPD, University Medical Center Groningen, University of Groningen, the Netherlands
[2] Division of Infection, Inflammation & Immunity and Division of Human Genetics, Faculty of Medicine, University of Southampton, Southampton, United Kingdom

ARTICLE INFO

Keywords:
Grants
writing
funding
respiratory research
review

SUMMARY

Obtaining research funding is central to the research process. However many (clinician-) scientists receive little, or no, training in the process of writing a successful grant application. In an era of reductions in research budgets and application success rates, the ability to construct a well presented, clear, articulate proposal is becoming more important than ever.

Obtaining grants is a method to achieve your long term research goals. If you are able to formulate these long term goals, it is relevant to explore the market and investigate all potential grant opportunities. Finally, we will provide an outline of key elements of successful research grants.

INTRODUCTION

Writing research grants is a central part of the work for a (clinician-) scientist. Being successful in obtaining research grants is perhaps one of the most important factors in becoming an independent researcher and pursuing an academic career. Whereas researchers spend a lot of time to improve their knowledge and skills in their research field, it is remarkable that there is limited training on how to write research grants. This is important at a time when research funding is becoming more and more restricted, and thus obtaining grants is getting more and more competitive. For example, the United States National Institute of Health budget for funding research almost doubled between 1998 and 2004, but flattened between 2004 and 2008. Success rates of independent research project grants (R01) for renewal of previously funded grants dropped between 2000 and 2008 from 53% to below 24%.[1] In the United Kingdom, researchers are currently facing an expected cut of at least 10% of the total research budget.[2] In respiratory research, the challenge may even be bigger compared to other fields. The field of respiratory research is underfunded when compared to the burden of respiratory disease to the society, in terms of morbidity and mortality.[3,4] Thus, it is important to consider the funding process in more detail as well as the art and science of writing research grants ("grantsmanship"). This review is based on a literature review of others' experiences,[5–14] as well as a reflection of our own experience in grant writing. We will consider the preparation of grant proposals as a way to accomplish long term research goals, and the quality of the grant proposal as key components of successful grantsmanship.

HOW IS GRANT MONEY DISTRIBUTED?

Empirical data in the biomedical literature on how grant money is distributed is scanty. There is debate whether scientific merit (the best science gets funded) is the key predictor for obtaining grants. Other mechanisms may be important as well, such as accumulative advantage (to those who have grant money, more will be given) or a political, hegemonial system (elite scientists distribute grant money between themselves). In 2004, Viner *et al.* investigated these three models (merit, accumulative advantage, political) by analyzing the United Kingdom Engineering and Physical Science Research Council (EPSRC) peer reviewed funding process between 1995 and 2001, and provided evidence for all three models. The EPSRC considers about 5000 research proposal per year. Viner and co-workers defined a most active group of grant submitters, either submitting 5 or more grants, and/or receiving 3 or more grants between 1995 and 2001. This group represented 26% of the submitting population, and was responsible for submission of 61% of all research proposals. 44% of this most active group was appointed in the ESPRC peer review college. There was a significant association between securing grants and being member of the peer review college in the group of applicants that had a relatively low acceptance rate. In the group with higher acceptance rates, longevity of membership of the peer review college was an important predictor for obtaining grants, suggesting that those more experienced have an advantage.[15] These findings suggest that funding resources are preferentially distributed to those

* Corresponding author. Department of Paediatric Pulmonology and Paediatric Allergology, Beatrix Children's Hospital, University Medical Center Groningen, PO Box 30.001, 9700 RB Groningen, The Netherlands. Tel.: +31 50 3614125; fax: +31 50 361 4235.
E-mail address: g.h.koppelman@bkk.umcg.nl (G.H. Koppelman).

1526-0542/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.prrv.2011.02.001

with power in the distribution process, but it is important to realize that the causality for this association is unknown. Are those who formulate excellent research grants, and get them funded, invited to become part of the peer review process? Or does involvement in decision making bring success? Or is there an unmeasured confounder, such as talent of the individual?[15] Moreover, if proven track record in the field is one of the criteria used to assess the quality of the grant, this will introduce an advantage to those that who have been previously successful in obtaining grants. In this study, also several other predictors for grant success were found, such as home institution and ethnicity, but not gender.[15]

From the perspective of the researcher, it is important to consider researcher's behaviour that is associated with success in obtaining grant money. This was investigated among 286 US academic researchers (mean age 55 years, 49% full professors) from the fields of biological sciences, mathematics, physical and computer science. A detailed assessment of each researcher was made, including individual aspects (type of research, networking, proven record of accomplishment), individual efforts (number of agencies applied to, number of grants applied for), support (either by university of by own research team), and system characteristics (grant type, teaching, research facilities). Significant predictors of funding success were personal factors (having had education in grant writing, and a reduced teaching workload), networking (attending association meetings, meeting association officers and participating in consortia), increased research team size and submitting a higher number of research proposals.[16] Interestingly, factors such as the number of publications and academic rank were not significantly related to funding success.

In this review, we will propose that obtaining research grants is a method to achieve your long term goal. If you are able to formulate these long term goals, it is relevant to explore the market and investigate all potential grant opportunities, being a project grant or a personal career grant. Finally, we will provide an outline of key elements of successful research grants. The process of preparing your research grant is depicted in the figure.

FORMULATING YOUR LONG TERM RESEARCH GOALS

What is the goal of your line of research in five or ten year's time? And how will your research in the long term serve patients, science and society? Formulating an answer to this question may not be as straightforward as you might think. Taking a few days off, to reflect upon your long term future goals may seem impossible in your busy daily life, but is usually rewarding in the end. Once these long-term research goals have been formulated, obtaining research grants no longer is a goal in itself, but serves the long term vision you created. This will also help you to refrain from ad-hoc grant opportunities. Attractive as they may seem, they tend to be time consuming and they distract you from your long-term research focus. Moreover, being able to articulate the benefit of your long term goals to patients and the society aids in completing the "benefits of your research" and "relevance to society" paragraphs of your grant application.

Having decided on direction of your research for the next years, it is helpful to consider the questions in Box 1. Some authors point toward the importance of seeking a mentor in this phase of your career,[9,12,14] who can supervise you with your first grants.

THE MARKETING OF RESEARCH

Let us consider the grant as a product, and potential funders as the market. Before bringing a novel product to the market, an in depth knowledge of the market; i.e. potential funders, their interests and priorities, is of utmost importance. Most universities have officers who will assist you in identifying potential grant opportunities, who have knowledge and experience in the types of grants that get funded, and who may liaise you with people who wrote successful grants.

Box 1. Questions to be answered to before starting to write a grant

- Do I or does my team have all relevant skills, techniques, and knowledge?
- Should I consider additional training or recruiting new personnel?
- Do I have local, national and international collaborations to achieve my goals?
- How good are my grant writing skills, should I attend a workshop?
- Am I ready to be a full investigator or should I be a co-investigator first?
- Should I seek a mentor?

Funding sources of grants can be distinguished into (1) government; either national, or international; (2) patients advocacy groups; (3) charity, and (4) pharmaceutical industry. It is also important to consider the type of grants, either directed at the person of the researcher (i.e. career grants), or at achieving specific research aims (i.e. project grants). These research aims have to fit the priorities formulated by the funding agency. Finally, it is important to obtain insight into the decision process of grants, either by scientific committees, internal and external reviewers, or by interviews. If you are not familiar with grants decision making, it may be very wise to interview colleagues who have been successful, or members of the scientific board that make decisions or recommendations. Many institutions will keep a record of academic staff that serve on grant review bodies and it is wise to contact these people to ask for advice on the decision making process. For those considering submitting a grant to the NIH, there are several papers describing the process of the NIH review for preclinical[13] and clinical[11] studies, career development[9] and conference grants.[10]

For career grants, it is important to familiarise yourself with criteria for funding agencies, with respect to quality or quantity of your publications, scientific esteem (i.e. awards) and international experience. Do you meet these criteria and is it visible that you belong to the top 10% of your age group? Take some time to look at the profiles of those who get funded, and compare your CV with theirs. For a project grant, it is important to ask yourself: Is the market ready for my grant idea? If the answer is no, you may consider strategies to interest the research community and grantors in your ideas, for example by publishing a 'novel ideas' paper or pilot data first, by proposing to organise a session on a scientific conference delineating your ideas, or by presenting your ideas to opinion leaders in the field (who also may serving as scientific advisors for grantors), governmental and patient organisations.

THE QUALITY OF THE GRANT

You, as the principal investigator of this grant, are primarily committed to the quality of your research and your grant. We will not discuss the quality of the research *per se*, but focus on how to describe your research idea in a grant proposal. Key elements of writing project grants are presented in Box 2.[3,6]

Innovation

How novel is your idea? Are 10 groups all over the world able to perform the research you propose, and perhaps already doing it, or are you in the unique position to innovate the field? Some grantors

Box 2. Key elements of projects grants

- the innovativeness of the idea
- a clear focus on a well written hypothesis
- testable specific aims
- appropriate preliminary data
- quality of the environment where the proposed research will be performed
- scientific stature of the applicants
- correct budget justification
- fulfilment of all regulatory paperwork, including institutional review board approval

specifically ask for cutting edge, potential risky, science and the application of novel techniques. Can you clearly explain why this research is novel, why you are the right person to undertake this and what the potential impact of the research you propose to conduct is likely to be?

A clear focus on a well written hypothesis

Is it possible to state the core idea of your grant in one or two sentences? This core hypothesis should be based on a state of the art review of the literature, and preferably pilot data. It should be concise, and lead to testable specific aims. Some authors suggest supporting your core idea with a clear figure[14] that illustrates the proposed mechanisms of your core hypothesis. A poorly focused or overly ambitious hypothesis reduces the likelihood of the grant being funded.

Testable specific aims

This is the experimental part of the grant. The specific aims should be tested in an experimental design that has a clear rationale, and that answers the questions raised. Convince yourself and the reviewers that you are able to perform and deliver this experimental part and able to interpret the data. Make sure your specific aims clearly relate to the overall hypothesis, how will undertaking the experiment test the hypothesis you have proposed? It is advisable to make this clear to the reader, rather than burying it in a dense paragraph of text, or omitting it altogether in an attempt to squeeze a few more words into the grant's page or word limit. Furthermore, show that you are aware of the strengths and limitations of your experiments or clinical studies. If necessary, provide back up strategies. A timeline may be helpful showing the long range planning of the grant.[14] (See the paper by Inouye and Fiellin for an example[11]). It is important that your grant is well organized and correct (use a readable font, no spelling errors, correct page, table and figure numbers, references checked, budget adds up to the total requested grant). More and more grantors use online submission systems which can do strange things to layout, references and special symbols that you use. It is wise to test this system ahead.

One of the most important tasks for you to complete before you even consider submission is to ask colleagues, collaborators or a mentor, to read your grant and provide feedback. Listen to their comments and rewrite the grant accordingly. An excellent check list for grants for clinical studies is provided by Inouye and Fiellin.[11] For personal grants, it is important to show your personal track record emphasizing your contribution to scientific output (i.e. previous grants, presentations, papers), and your international experience and collaborations. To emphasize your contribution, speak about 'I' instead of 'we'.

Finally, try to adopt a clear, short, simple and concrete style making your grant easy to read. You are probably reading this article while being tired, sitting at home, lying in bed or travelling, and so are reviewers reading your grants. If you experience difficulties in writing scientific papers or grants, there are excellent courses or books that could be helpful.[17] Last but not least, take enough time to draft both the scientific abstract, as well as the abstract for the lay public. These should be carefully written, stating clearly the long term goal of your research, the hypothesis and specific testable aims as well as the potential impact of your work.

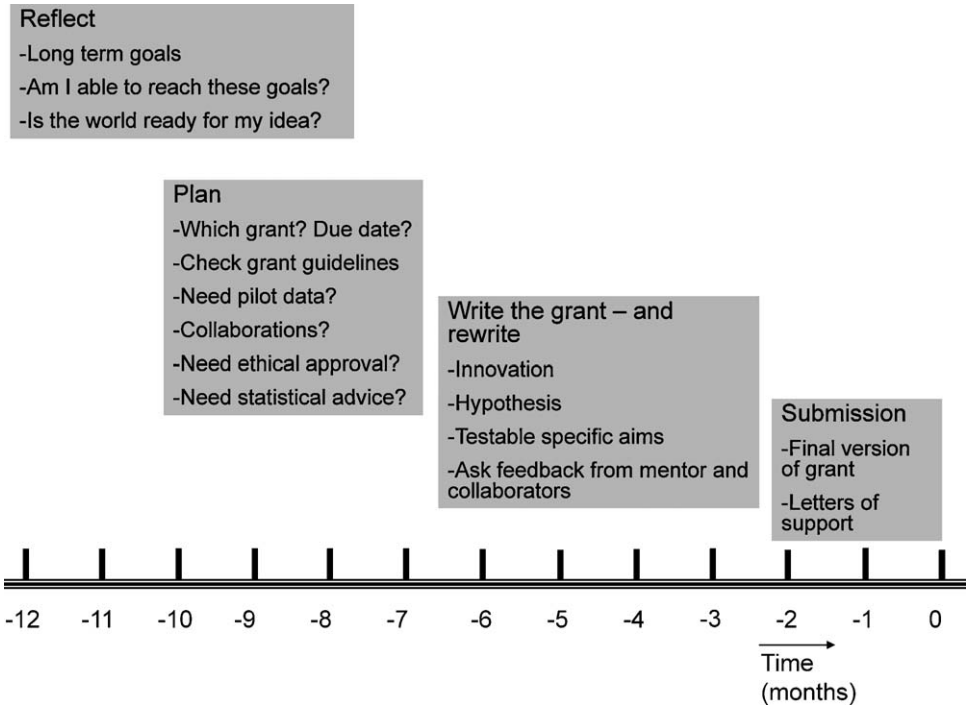


Figure 1. Timeline for preparing a grant application (after Inouye and Fiellin[11]).

PLANNING AND ORGANISATION

The last, but by no means the least, key factor in successful grant writing is your ability to plan and organise your time (Figure 1). Research your potential funders well in advance and take note of usual application deadlines. Take the time to draft your proposal well in advance so you have time to seek advice from colleagues and mentors. If they suggest more pilot data is needed or the application would benefit from initiating a collaboration, there needs to be time available to do so. While most of us (the authors not excepted) lead busy professional lives and see deadlines as a challenge to be met, you will not be able to present your research proposal to best effect without the time to personally reflect and seek the opinions of others before revising the application.

CONCLUSION

In summary, writing research grants is an art that can be learned.Once you are able to formulate your long term research goals, and have investigated grant opportunities and preferences of grantors, you can start preparing your grant proposal. Involve mentors, colleagues and collaborators to improve your grant proposal. Plan your grant preparation carefully. And even if you do so, remember; everyone has had grants rejected. Showing persistence in pursuing your research aims will ultimately be rewarding.

CONFLICT OF INTEREST

GHK and JHW report no perceived conflict of interest relating to the subject of this review.

References

1. Wadman M. Research funding: Closing arguments. *Nature* 2009 Feb 5;**457**(7230):650–5.
2. Dillner L. Cutting the research budget. *BMJ* 2010;**341**:c5128.
3. Laurent GJ. Getting grant applications funded: lessons from the past and advice for the future. *Thorax* 2004 Dec;**59**(12):1010–1.
4. Holgate ST. The future of lung research in the UK. *Thorax* 2007 Dec;**62**(12):1028–32.
5. Ried K, Farmer EA, Weston KM. Bursaries, writing grants and fellowships: a strategy to develop research capacity in primary health care. *Bmc Family Practice* 2007 Apr 5;**8**.
6. Urrutia R. Academic skills: A concise guide to grant writing. *Pancreatology* 2007;**7**(4):307–10.
7. Devine EB. The art of obtaining grants. *American Journal of Health-System Pharmacy* 2009 Mar 15;**66**(6):580–7.
8. Todd III RF, Miller DM, Silverstein RL. Hematology grants workshop-2001. *Hematology Am Soc Hematol Educ Program* 2001;507–21.
9. Brock MV, Bouvet M. Writing a successful NIH Mentored Career Development Grant (K award): hints for the junior faculty surgeon. *Ann Surg* 2010 Jun;**251**(6):1013–7.
10. Sonis JH, Triffleman E, King L, King D. How to write an NIH R13 conference grant application. *Acad Psychiatry* 2009 May;**33**(3):256–60.
11. Inouye SK, Fiellin DA. An evidence-based guide to writing grant proposals for clinical research. *Ann Intern Med* 2005 Feb 15;**142**(4):274–82.
12. Longo DR. Learning by doing: mentoring, hands-on experience keys to writing successful research grants. *Annals of Family Medicine* 2005;**3**(3):281–2.
13. Kessel D. Writing successful grant applications for preclinical studies. *Chest* 2006 Jul;**130**(1):296–8.
14. Davidson NO. Grant writing and academic survival: what the fellow needs to know. *Gastrointest Endosc* 2005 May;**61**(6):726–7.
15. Viner N, Powell P, Green R. Institutionalized biases in the award of research grants: a preliminary analysis revisiting the principle of accumulative advantage. *Research Policy* 2004 Apr;**33**(3):443–54.
16. Stewart Cole S. Researcher behavior that leads to success in obtaining grant funding: a model for success. *Research Management Review* 2006;**15**(2): 1–16.
17. Zeiger M. Essentials of writing biomedical research papers. 2 ed. USA: 2000.

How to apply for a research grant

Matt J Bown

Rob D Sayers

Abstract

Surgeons often find grant writing difficult and there is a perception amongst them that their projects are looked upon unfavourably. However, there is no reason or evidence to suggest that this is true and often surgeons are in ideal positions to conduct research, particularly in the areas of technical innovation and clinical trials. Major funding bodies do not discriminate against surgeons compared to other researchers, and there are even specific funding streams available only to surgeons.

The opportunities for surgical research and funding are currently greater than at any previous time. To make the best use of these opportunities it is important to prepare a comprehensive, detailed and error-free application. However, many surgical applications are poorly prepared which therefore makes the award of funding impossible. The chances of success can be improved through the consideration of several key areas in the application that are directly addressed in this article.

Keywords Funding bodies; grant; research

Obtaining funding for research is often viewed as difficult. Less than 25% of all grant applications are successful, but many of those that fail are due to poorly prepared submissions. There are several factors to consider when applying for funding that will increase your likelihood of being successful.

Recently the emphasis has been on translational studies which are defined as studies which can translate into an obvious patient benefit in the very near future. Translational studies are seen as an important link between basic science studies and research which is of clinical benefit to patients. The National Institute for Health Research[1] (NIHR) has been established to fund and support this approach and represents the research arm of the NHS. Many other funding opportunities exist. These include major charities such as the Medical Research Council,[2] The British Heart Foundation,[3] Cancer Research UK,[4] The Wellcome Trust[5] and other smaller ones. These organizations all have websites and adverts appear regularly in journals such as the *British Medical Journal* and *The Lancet*. It is often useful to gain advice on funding opportunities from your local academic department of surgery or research departments at the Royal Colleges of Surgeons.[6] Searchable websites exist that collate all funding opportunities.

Whilst multiple opportunities currently exist for translational research (Figure 1), sometimes your project may not fit into an obvious funding stream or your project may seem high risk, but nevertheless important (high impact). A telephone call to the research office of the funding organization is often helpful in clarifying whether your project fits into their particular remit and/or funding streams. Often you will be invited to submit a brief abstract of your project to aid the decision. This strategy is often useful for obtaining information about future funding calls and/or special funding opportunities.

Writing a research grant can appear to be a complex and formidable task. The key to successful applications is prior planning and preparation. Allow adequate time to complete the application including obtaining the necessary approvals. The time taken to complete this is often under estimated. A major application often takes 6 months to prepare. Collecting the curriculum vitaes (CVs) of the applicants can take time as can getting it signed off by the NHS or university head of department or finance officer etc. Accurate costs for both staff and consumables also take time to collect and you will probably need expert help. Do not forget to adjust your costs for a realistic project start date. Often funding bodies will specify an earliest start date, but if not allow 6 months for the grant to be reviewed, a decision made and the administrative process of grant acceptance to take place. In particular, if your project involves the employment of staff you will need to allow time for recruitment.

It is very important to read the guidelines and follow the instructions. For example, don't exceed the word count or number of pages allowed. If it says one A4 page of references only, do not submit more. It is also important to make sure you are eligible for the grant for which you are applying; there is no point applying to Cancer Research UK for a study on cardiovascular disease. Similarly, if you are applying for a fellowship that requires you to be an SpR, don't apply when you are at CT2 level. The following is a checklist that an experienced grant reviewer might use to assess a grant application.

What is the research question being asked?

It is important to ask a question, that is, there should be a null hypothesis which is being tested. You should say why the question is relevant and how you propose to investigate it. The project should be sensible and achievable. It may be a clinical project involving patients, basic science or a combination of both. Sometimes purely observational studies rather than hypothesis-testing studies are appropriate.

Literature review

It is usual to perform a literature review to demonstrate the scope and importance of the clinical problem, to identify similar work in the field and to critically appraise previous approaches to the problem. This can be used as the introduction or background to the grant. Another function of the literature review is to check that your proposed study has not been done before.

Matt J Bown *MD FRCS is a Senior Lecturer in Vascular Surgery at the University of Leicester and an Honorary Consultant Vascular Surgeon at The University Hospitals of Leicester, UK. Conflicts of interest: none declared.*

Rob D Sayers *MD FRCS is Professor of Vascular Surgery at the University of Leicester and an Honorary Consultant Vascular Surgeon at The University Hospitals of Leicester, UK. Conflicts of interest: none declared.*

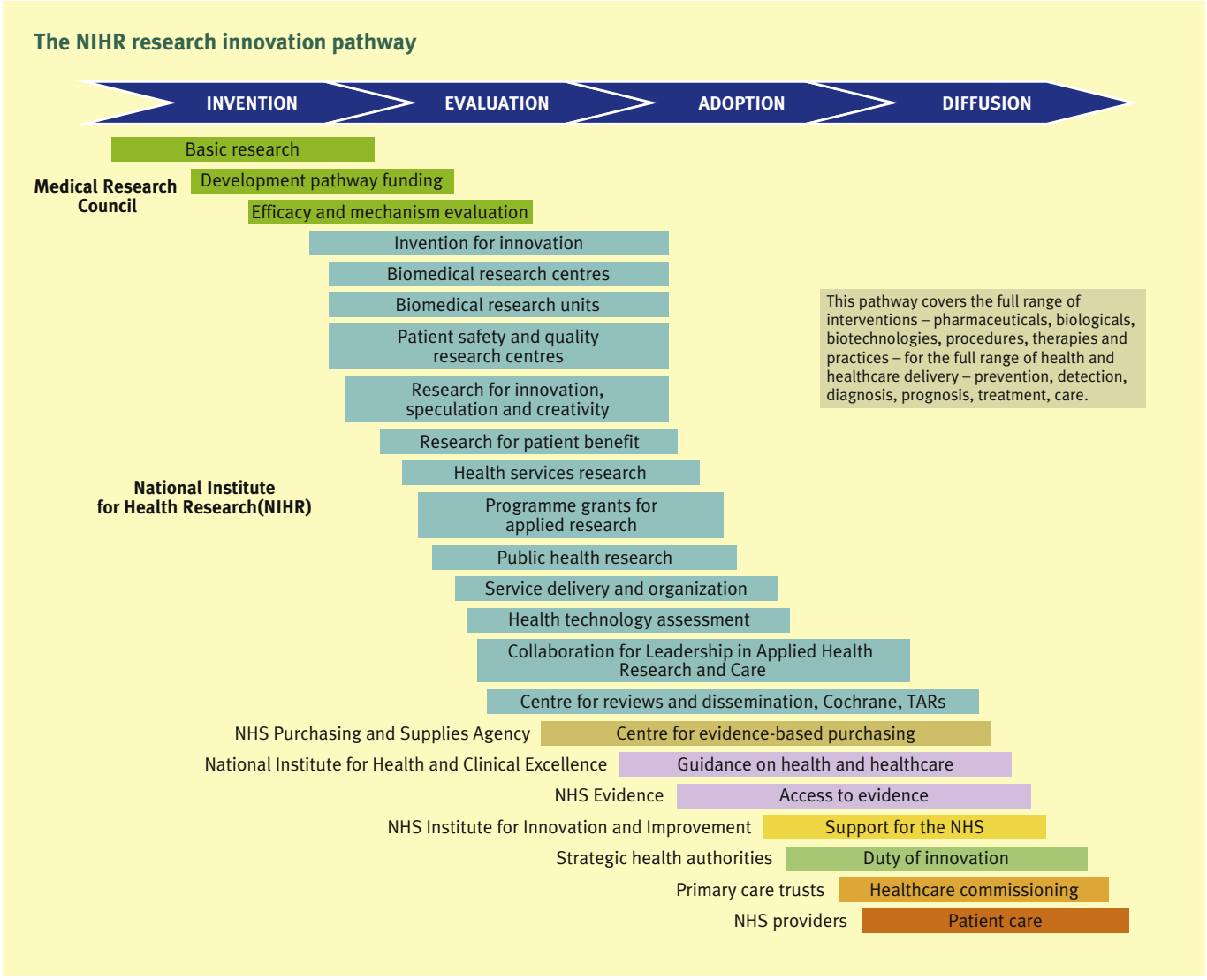


Figure 1 The funding bodies relevant to each research programme are shown in bold on the left. Those funded by the NIHR are highlighted in light blue.

Pilot data

Pilot data can be obtained from the literature or personally generated. The advantage of the latter is that it demonstrates that the study is feasible and the applicant has all the resources and expertise to produce results. Pilot data are essential to perform power calculations.

Power calculations

Most applications require a power and sample size calculation. If you have not done this, you are unlikely to be successful. To do this, you can get help from an experience statistician or there are several web-based resources available to use online or download.[7–9] Often it is better to demonstrate to the reviewer that your proposed sample size is adequate to detect a range of differences and powers and/or the power achievable for a range of sample sizes. Tabular and graphical examples of these methods, together with the resources for their production are shown in Table 1 and Figure 2. The advantage of this approach is that you can demonstrate that even if your recruitment rates are less than you have predicted you can still detect a difference, or, if your recruitment is better than predicted, that you have the power to detect an even smaller difference than specified. The commonest error when performing power calculations is to overestimate the difference you expect to see. You must be realistic in the difference you expect your intervention to make. Again, this is greatly aided by the provision of personal pilot data in your application.

In exceptional circumstances a power calculation may not be possible, feasible or appropriate. For example, we have recently submitted an application investigating aortic aneurysm proteomics with neural networks where traditional power-based sample size calculations are not applicable.

Feasibility

Over-ambitious projects will not get supported; for example, do not say you are going to use a positron emission tomography-

Power profile showing the samples sizes required to demonstrate a variety of minimum detectable differences between two means across a range of powers ($\alpha = 0.05$) for a control population mean of 3 units and standard deviation of 1 unit.[9] The numbers shown are the number required in each experimental group

Minimum detectable difference (units)	Power		
	70%	80%	90%
0.5	50	63	85
1.0	13	16	22
1.5	6	7	10

Table 1

computed tomography scanner if you do not have access to one. Common errors are over-ambitious recruitment estimates or the lack of local expertise to deliver the project. If you are studying hernias and your centre repairs 50 per year, do not say you will recruit 200 over 2 years. Other common errors include assuming 100% recruitment rates (not all patients will consent to participate), underestimating the effects of the exclusion criteria, not accounting for losses to follow up, etc. All of these issues can be avoided by presenting robust personal pilot data. This will reassure the reviewer that your recruitment targets for the study are achievable and the timeline is feasible.

The research protocol

It is essential to have a clearly stated and unambiguous research protocol. It is important to state exactly what will happen to each subject in the study and at what time points these interventions or measurements will occur. If you have multiple groups, be specific about each group. If you are collecting samples, give details about how they will be collected, transported, stored and assayed. Be specific about randomization or assignment to groups and give full details of differing interventions for different groups. Clear milestones and timelines should be given to chart the progress of the study. A flow chart may help.

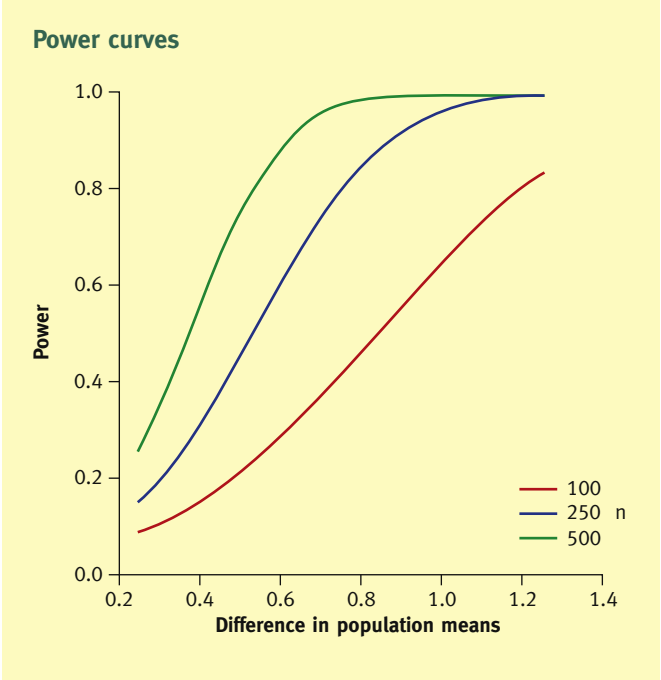


Figure 2 Power curves demonstrating the power for various sample sizes to be able to detect a range of differences between two groups (for control population mean of 2.6, a standard deviation of 3 and α (type 1 error probability) = 0.05). Plotted using the free software package 'Power and Sample Size Calculation' by WD Dupont and WD Plummer.[8]

Control groups

Do not underestimate the difficulties in recruiting control groups in observational clinical studies — they are usually harder to recruit than the study group. The perfect clinical control group does not exist and it is often difficult to recruit sufficient numbers of control patients where all variable have been allowed for.

Ethical approval

It is always best to have ethical approval at the time of grant submission. This will often be necessary for the generation of pilot data. Again do not underestimate the length of time a successful ethics application takes. It is often useful to discuss your project with the local research ethics committee beforehand. Further information is available at the National Research Ethics Service[10] (NRES) and Integrated Research Application System[11] (IRAS) websites. The majority of clinical applications will also need a research sponsor (which is often the trust hospital) and NHS Research and Development (R&D) approval. The precise system for approvals will depend upon which country in which the research is to take place. In the case of multinational studies, advice should be obtained from your local office.

Research environment

This encompasses both staff and support facilities available. The reviewer will assess the adequacy of the host institution, the supervisor and any technical staff together with other necessary resources such as access to adequately equipped laboratories and/or a clinical trials unit. The academic track record of the research environment will be assessed and it is important to demonstrate previous successes in the same or similar fields. If you cannot demonstrate a good track record then perhaps collaboration with a unit that can might be the best approach. Some applications also ask for evidence of mentorship (i.e. that

you have discussed your application with an independent researcher who can offer ongoing support and advice with all aspects of the project).

Patient and public involvement

Many applications now expect involvement of the lay public and/or patient groups in the design and review of research protocols. As you write your proposal, it is essential to check at each stage that what you are proposing is acceptable to patients. Patients will often identify flaws in your project that you may not have thought of such as information sheets written in technical/medical language, logistical problems with hospital visits (parking), unacceptable interventions etc.

Obtaining patient and public involvement can be difficult, but one way of doing this is via your local NIHR research design service. Alternatively you may be able to recruit patient help directly or approach an appropriate disease support group.

Value for money

Reviewers are always asked to make a judgement on whether they believe a grant application represents good value for money and whether the costs are appropriate. It is important to demonstrate that the application is properly costed, including a breakdown of consumable costs and other expenses. Many funding bodies will set an upper limit which you should not exceed. Applying for unnecessary expenses such as computers (when these should be provided by the host institution) or excessive staff/transport costs is often viewed poorly.

Expected value and dissemination of results

You may be asked to justify the benefit of answering the research question that you are posing for the benefit of the wider research community and patients. You may also be asked how you plan to disseminate the results of your study, including communicating these to stakeholder groups (patients, funders, other research bodies) outside of the normal channels of publications and conference presentations.

Other factors to consider

There may be particular and specific issues that you need to address depending on your study design. For example, with randomized controlled clinical trials, funding bodies will expect you to register the trial and obtain an International Standard Randomised Controlled Trial Number[12] (ISRCTN). If you are involved in animal research you will have to obtain the relevant Home Office licences. Your local R&D Department will expect you to pass a Good Clinical Practice Research Course. Some of the above may not be essential at the time you submit your grant but are viewed positively by many funding bodies.

Re-applications

Unfortunately, many grant applications are not successful. All successful researchers will have had grant applications rejected and this does not mean that your project will never obtain funding. It is important that you amend your application in view of the reviewers' comments and do not simply 'cut and paste' your previous application.

Important factors for successful grant applications

- Demonstrate the clinical problem and test a specific hypothesis.
- Allow adequate time to prepare a comprehensive application — it always takes longer than you think.
- Identify your funding body early and tailor your application to meet their criteria.
- Read and follow the guidelines precisely.
- Pilot data add strong support to an application and is often essential.
- Power and sample size estimates — you are unlikely to be successful without them.
- Demonstrate the project is feasible and that you have all the necessary resources to complete it.
- Cost your application properly and demonstrate value for money.

Box 1

Summary

The important aspects of successful grant application are shown in Box 1. If you are early in your research career, the two most important aspects are to allow enough time for your application and seek expert help and advice with your application. ◆

REFERENCES

1 The National Institute for Health Research. The research innovation pathway. URL: http://www.nihr.ac.uk/research/Pages/default.aspx; 2012 [January 2012].
2 The Medical Research Council. Funding opportunities. URL: http://www.mrc.ac.uk/Fundingopportunities/index.htm; 2012 [January 2012].
3 The British Heart Foundation. Research grants. URL: http://www.bhf.org.uk/research/research-grants.aspx; 2012 [January 2012].
4 Cancer Research UK. Funding and research. URL: http://science.cancerresearchuk.org/; 2012 [January 2012].
5 The Wellcome Trust. Biomedical science funding. URL: http://www.wellcome.ac.uk/Funding/Biomedical-science/index.htm; 2012 [January 2012].
6 The Royal College of Surgeons of England. Homepage. URL: http://www.rcseng.ac.uk; 2012 [January 2012].
7 Lenth RV. Java applets for power and sample size. URL: http://www.stat.uiowa.edu/~rlenth/Power; 2006–9 [January 2012].
8 Dupont WD, Plummer PW. Power and sample size calculations for studies involving linear regression. *Control Clin Trials* 1998; **19:** 589–601.
9 Uitenbroek DG. SISA binomial. URL: http://www.quantitativeskills.com/sisa/distributions/binomial.htm; 1997 [January 2012].
10 The National Research Ethics Service. Homepage. URL: http://www.nres.nhs.uk/; 2012 [January 2012].
11 Integrated Research Application System. Homepage. URL: https://www.myresearchproject.org.uk/; 2012 [January 2012].
12 Controlled Trials. International standard randomised controlled trial number register. URL: http://www.isrctn.org/; 2012 [January 2012].