

● Medical research

# Expert tips on conducting successful medical research

In order for doctors to progress in their careers, it is usually necessary for them to be involved in, and contribute to, research within their field. We offer some guidelines for medical doctors entering the world of research

**R**esearch directors Dr John Nolan and Mr Stephen Beatty, based in the Waterford Institute of Technology and Institute of Vision Research, Waterford, have been working closely for several years with medical doctors and have supervised many research papers and projects to successful completion.

"We identified that an understanding of the elements required to conduct high-quality and meaningful research aren't always recognised by medical doctors in training," said Dr Nolan. "The ten steps to becoming a successful researcher (see below) are the guidelines for executing, conducting and completing research to the highest level."

## Stepping stone

Research milestones include a Masters, PhD or MD degree. Others include publishing papers, presenting data at conferences and developing a portfolio containing a summary of all of the above. By doing this, the doctor positions him or herself to progress within his or her own research field and to gain entry onto the SpR scheme, the stepping stone towards becoming a consultant.

In recognition of this, Dr Nolan and Mr Beatty designed a research skills course for doctors in training. This one-day course, now in its third year, has been developed using the expertise of other medical and academic research experts who bring to the course over 50 years' research experience.

## Getting started

### 1. Identify your research topic and select a mentor

It is important that you identify a research mentor to provide direction and guidance throughout the research project. The research mentor should be a key opinion leader within his or her field and therefore guide you towards achieving similar goals.

An ideal mentor should have a track record in publishing, be active in research, be approachable, and available. The mentor will need to be able to meet with you for at least one dedicated hour a week.

### 2. Ethics, legal and political issues in research

The Nuremberg Code states that the voluntary consent of the subject (individual volunteering for the research study)



Medical doctors are not always fully aware of the elements required to conduct successful research

is essential, and they should have the legal capacity to give consent. The subject should be fully informed on the methodology and should understand the purpose of the research, its benefits and any risks involved. The research should yield results for the good of society, unachievable by other means.

The Declaration of Helsinki (1964) is a set of ethical principles for the medical community regarding human experimentation. It states that all subjects must volunteer for the study and that an ethical review committee is required.

It also states that the importance of the objective must outweigh the inherent risks, and that there is a reasonable likelihood that the populations in which the research is carried out stand to benefit from the research.

### 3. Identifying grants and funding sources

You must identify sources of funding: liaise with your Research Support Unit and your mentor. Allow at least three months for completing and submitting a grant application, and at least nine months to secure the funding. The most important criteria for a successful grant application are: a) applicants' track record; b) feasibility of the project; and c) design and originality of the project, including its ability to answer

the research question. Two ways to ensure your funding is *denied* are to disregard the application guidelines and to use a title that has little relation to your stated objective.

## Conducting a project

Prepare appropriate documents and identify and obtain the appropriate equipment. Investing time and energy at the beginning will ensure that your project is conducted in an ethical and efficient manner.

### 1) Patient consent form – this must include:

- a statement that the volunteer understands all aspects of the study;
- a statement that their participation is voluntary;
- a statement that the data collected from the volunteer will be analysed for research purposes;
- (if necessary) a statement that a blood sample will be taken for DNA or similar analysis.

### 2) Study information leaflet – this must contain:

- The background of your study, in simple and understandable language;
- An invitation to participate;
- Study design and methods. Describe a typical visit in terms of what the subject might be required to do, e.g. provide a blood sample, have their height and weight measured etc;

- Payment: state whether the patient will receive payment for participating: e.g. "This study is entirely voluntary. You will not be paid for your participation. If you decide to take part, you are still free to withdraw at any time and without giving a reason. This will not affect the standard of care you receive."

## Interpreting data

Once you have started collecting research data, your next objective is to find out statistically what is important about it. Even if you do not have a statistical background, it is important that you understand your research data and learn how to perform your own basic statistical analysis.

**1) Population and sample:** statisticians define a population as the entire collection of items that is the focus of concern. A population can be very general (all human beings) or very narrow (all male ginger cats called Bob). However, scientists rarely have access to every member of a population. Therefore, we collect data from a small subset of the population ('a sample') and use these data to infer things about the population as a whole.

**2) Testing hypothesis:** this explains exactly what hypothesis was tested. A simple hypothesis might be that an intervention should result in a

particular effect: "Does weight loss reduce blood pressure levels?"

**3) Qualitative data:** this refers to separate classes which may have no numerical relationship with one another, e.g. Sex: male/female. Eye colour: brown/grey/blue/green. These types of data variables are referred to as 'string variables'.

**4) Quantitative data:** this refers to numerical data, arising from counts or measurements, such as the height or weight of a person. These types of data variables are referred to as 'continuous variables'.

## How to write a paper

For a beginner, writing a paper is difficult. However, follow the rules of writing:

**1) Introduction:** state the question that you tried to answer in the research, and why you have undertaken the study.

**2) Methods:** describe methods and methodology, including how you will analyse your data. If you can, you should include your method of patient recruitment.

**3) Results:** the first paragraph should include descriptive and demographic statistics. Use figures and tables where possible. Your reader must be able to interpret them without having to refer to the text. Be as brief as possible: this section is to present the results, not discuss them.

**4) Discussion:** state the main findings of the study. The first paragraph should describe what you did and why. The second should describe your most important finding. Any discrepancies between your findings and those of previous investigators should be discussed, as well as strengths and weakness of your study. The concluding paragraph should succinctly summarise your study and suggest future directions of research in the field.

**5) Check it:** do not assume that you have finished a paper when you think you have. There will be at least one spelling or grammatical error: proofread your work, and then check it again!

**6) Reference managing:** familiarise yourself with reference managing software programs and the different aspects of referencing, from inputting references into the software directly from the internet, to inputting them manually. Using a reference managing software program such as EndNote or Reference Manager will save you time, effort and energy. The key is that the reference manager pro-

gram, and not the researcher, does all the work.

## Presentation skills

In order to gain entrance onto the SpR scheme, it is important to study the techniques of interview preparation and performance. Familiarise yourself with the selection process and scoring system which determines how candidates are assessed.

Before the interview, however, it is important that you design an effective Curriculum Vitae (CV). A good CV should emphasise a candidate's track record in research (a contribution to your field is a critical demonstration of advanced professional practice); publications (weight these according to impact factor and first author); presentations; research prizes; and research grants.

An effective interview consists of two elements: preparation and performance. A comprehensive, well-strategised preparation will anticipate, almost to the detail, the contours and questions of the actual interview. Preparation can be mapped onto the pattern of the interview, especially in the case of the structured interview. Allow yourself a realistic preparation timeframe.

## Ten steps to becoming a successful researcher

- Identify your research field
- Identify your mentor
- Identify and understand your research question
- Identify a funding source
- Identify a time frame to collect data on your research question
- Identify the methodology required
- Become proficient with appropriate reference software
- Become proficient with appropriate statistical software
- Identify the forum in which to present and publish your research data
- Identify new research questions that merit study

## Research Skills Course

The Research Skills Course, to be held this year on Saturday, March 6 in the RCSI, Dublin 2, is designed to furnish doctors in training with appropriate research skills to start, conduct, publish and present results of a research study. During this one-day intensive research course, speakers include:

- **Mr Stephen Beatty**, Consultant Ophthalmic Surgeon and Research Director, Institute of Vision Research, Whitfield Clinic, Waterford.
- **Dr John Nolan**, Senior Scientist and Director, Macular Pigment Research Group, Waterford Institute of Technology, Waterford.
- **Dr June Frisby**, Research Project Manager and Generic Research Skills Co-ordinator, Waterford Institute of Technology.
- **Evelyn Byrne**, Communications Expert and Teacher of English, Persona: Effective Communication Skills.

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