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Getting Started with Research "Carrying out your research project"

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Abstract

This paper gives an overview of the considerations and practical aspects of carrying out a research project which may be of use to those beginning their research career or simply carrying out a research project for the first time as part of an academic qualification. It outlines practical steps for consideration in the day to day management of a research project and highlights areas which require particular consideration for a project to be completed successfully.

Introduction

This paper is the second in a series outlining the practical considerations which need to be made when carrying out a research project and it follows on from the first in the series which outlined the steps which should be taken when developing a research question.[1]

At this stage you will have defined your research question, aim and objectives and based on these you will have developed a research plan with approximate timelines as discussed in the first of this series of papers on carrying out research.[1] Also, while preparing your literature review you will have identified suitable instrumentation or equipment and methodology for the different parts of your project work.[2] All that is left now is to get started, however, prior to jumping in and starting to carry out your project work, the following are a few things you should think about first and organise:

- Ethical Approval
- Methodology Used, Data Collection and Recording
- Data Storage and Security

Ethical Approval

It is advisable that you identify if you need ethical approval for your project work at as early a stage as possible, so as to avoid time delays at pertinent times in the research study, as you will need to apply to a particular meeting of the ethics committee, which may meet as frequency as every two weeks or as infrequently as once every two months.[3,4] Furthermore, the ethics application requires you to answer key questions regarding your methodology and the study design, answering these questions will help you to further refine your experimental and data collection approach. Ethics applications are often seen as a source of bureaucracy however, it is worth considering what the purpose of an ethics committee is. For example, their main remit is to ensure that all subjects get treated with dignity and respect, that the research is conducted in a responsible and safe manner and that all the requirements of legislation and codes of best practice are adhered to and finally that the research conducted will contribute to scientific knowledge. So how do these committees ensure this, well this is achieved through the use of their standardised and inclusive application forms which are used to collect information about the research methodology, the reasoning behind the number of subjects included in the study, the manner in which the data will be securely stored (anonymised and encrypted) and backed up, the manner in which the subjects identity will be protected, the manner in which informed consent will be obtained from the subjects and finally how the data obtained from the study will be disseminated to the scientific community. Furthermore, different types of research projects may not strictly require ethics approval for example it is very important to identify are your carrying out original research, or an audit (clinical audit) or research which involves the use of diagnostic information that was obtained already as part of a routine investigation. For example if research is limited to secondary use of diagnostic information that was previously collected in the course of normal are it is generally excluded from the REC review, provided that the patients or service users are not identifiable.[4] What constitutes original research has already been discussed in the first paper of this series.[1] It has been succinctly defined by Leehy and Ormrod[2] “research is a systematic process of collecting, analyzing, and interpreting information (data) in order to increase our understanding of the phenomenon about which we are interested or concerned.” Whereas a Clinical Audit is as defined by NICE in 2002 '

…a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change. Aspects of the structure, processes and outcomes of care are selected and systematically evaluated against explicit criteria."[5]

Research versus Clinical Audit

- Research is about creating new knowledge, about whether new treatments work or whether some treatments are better than others. It determines what best practice is.
- A Clinical audit is a way of finding out if we are doing what we should be doing. Are we following guidelines, and are we implementing best practice?
- Both a Clinical audit and Research involve answering a specific question relating to quality of patient care for example.
- Both can be carried out either prospectively or retrospectively.
- Both involve careful sampling, questionnaire design and analysis of findings
- Both activities should be professionally led.
- Research is based on a hypothesis; a Clinical audit measures against standards.
- Research can involve patients trying an untested treatment method; a Clinical audit **never** involves patients trying new treatment methods.
- Research may involve a degree of experimentation on patients; a Clinical audit **never** involves anything happening to the patient which is different to their normal treatment.

Methodology Used, Data Collection and Recording

It can sometimes be useful to carry out a small pilot study to help determine if the chosen equipment / instrumentation and methodology is suitable for your study and if

it is feasible to obtain the required resolution in your data.[2, 3] If not you can change the equipment or refine the methodology to obtain the correct level of resolution required in your data. For example this small pilot study can help you to identify the following valuable pieces of information for your study design:

- What equipment should be used and is it suitable or fit for the task?
- What protocol should be used?
- What is the repeatability of the test with this equipment and protocol?
- It also helps you to get a more realistic handle on the time required for the different parts of the project work and thereby help you to identify more accurate timelines for the various project milestones.

Another of the more important parts of carrying out scientific research is to record all the details of the equipment or instrument settings, details of the methods used and the results or data obtained as without this, the credibility of the research is in question as the details of the research cannot be presented for your peers to examine it. There are many ways in which these details can be recorded, for example all these details can be recorded in a physical notebook, or in a ring-binder folder, or directly logged in an excel sheet on the PC or even using electronic tablet devices to both record the details and also take photos of the experimental set-up. Basically, there are numerous approaches to recording these details, the approach taken is not important all that is important is that the details are recorded in a systematic manner allowing your peers to review your work or other researchers to reproduce your work.[3] Furthermore, a lot can be gleaned by observing more experienced researchers carry out their experimental work and the way in which they record the details of their work which can help you develop your own approach to data collection and recording. Being meticulous in recording all the details of the experimental set-up and methods will help you also in analyzing your data and interpreting the data. Also, keeping all of your data and notes from data collection organized is very important so that important experimental details or vital pieces of data do not go missing, thereby reducing the impact of the rest of your other data. When it comes to analyzing and interpreting your data it is very important and advisable to do this at regular intervals as you progress through your experimental

work. Most experienced researchers will recommend this as something important, since what usually happens is all the data is collected and then towards the end of the project the data is analysed. It is at this state that the researcher realizes they should have collected some other piece of data or should have tested the impact of a different instrument parameter but now either their time or funding has run out and it is too late to collect this data. However, a practical way of ensuring that this does not happen is to commit to presenting your work at conferences or meetings at defined intervals throughout the project, thereby forcing yourself to analyse and interpret the data and draw conclusions from the research at regular intervals.

Data Storage and Security

A very important aspect of data storage and security is the requirement to keep confidential patient information safe, therefore it is advisable to use a two-pronged data security approach, firstly the data should be anonymised and the computer or hard drive used to store the data should be encrypted, advice about how to do this can be obtained from the National Research Ethics Service and Data Archive Website (data-archive.ac.uk). [4, 6]

Another important aspect of data storage and security is not losing the data as a result of your computer crashing or the hard drive where you store the data failing. It is therefore very important that you backup your data regularly, both raw data and processed data and implement a backup system which is easy to use and which you are likely to use. This is your insurance as computers and hard drives fail and can be stolen and this should not mean that you have lost all your data, lost all that time that went into the data collection but also wasted all the resources (other peoples time and the use of specialist equipment and funding) that went into your project up to that point.

Thinking about Time Management

It may seem to be more suited to the business environment than the academic environment but it is very important to consider how you use the time you have available to you. By organising your time and planning ahead you can identify

important deadlines like applying for Ethics Approval for your project. Also, if you identify the main tasks in your project this will mean that if a piece of equipment is delayed in arriving after ordering or breaks you can easily identify another task which requires attention. But the message is that time management is important as it is an irreversible resource as succinctly described by Alan Lakein in the following statement on time. "Time is Life. It is irreversible and it is irreplaceable. To waste your time is to waste your life, but to master your time is to master your life and make the most of it".[7] There are simple approaches that can be implemented to get more out of your time for example an excellent utube video on Time Management for Academics by the late Professor Randy Paush[7] is certainly worth 1 hour of your time but the following is a summary of his and other time management gurus advice:

- **Plan ahead** - Make a schedule of things that need to get done ahead of time.
- **Use planning aids** - Wall chart and diary

  - Daily planners or organizers can be really useful.

  - Calendars or Wall Charts

  - Jotters

- **To Do Lists**

- Allow a 10 minutes each morning to examine the list of tasks you have to complete. Research has shown that one minute spent planning saves ten minutes of your time!

- Are your tasks manageable in the day, or do you need to break them down into smaller tasks over a longer period?

- Make use of committed time
- Use blocks of time
- Do not fill all available time, leave time for the unexpected or unplanned jobs
- Know how much time things are worth

- Put up a clock where you can see it
- Finally, know when you are most alert and productive and fill this time with mentally difficult tasks, conversely, during periods when you are not mentally at your peak fill this time with necessary but non mentally challenging tasks, like inputting data to an excel sheet, inputting references into a reference manager, backing-up data or filling / organising your data.

Conclusion

In conclusion, it is important to consider firstly the nature of your project work, is it original research or a clinical audit and obtain ethical approval where necessary. Then it is important to carefully select the equipment and methodology that you will use, ensuring that you keep on top of your data analysis and interpretation throughout the project. Most importantly, make sure to protect the identity of your patients through anonymisation and encryption methods and back-up your data regularly.

Also, it is worth mentioning that you enjoy your research area and have fun doing your research project as it can be an exciting and an exhilarating time. Also, at the end of your project you should even become an expert in that particular research problem and thus have the potential to add to the scientific knowledge in that research area!

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