Research Methodology and Biostatistics Series

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Abstract: This series on Research Methodology and Biostatistics is designed to equip medical researchers to produce impactful and innovative research independently. The introductory article emphasises the importance of selecting the right research problem, providing guidelines for selecting suitable topics based on factors such as feasibility, originality and relevance. It offers practical tips for selecting a research topic, explores current trends in medical research and stresses the need to refine the focus of the research problem. Essentially, the article serves as a comprehensive guide for researchers in the medical field.

Key words: Medical research, research methodology, biostatistics

Introduction

Research, the relentless pursuit of truth, stands as the cornerstone of progress in every field, including the vital domain of healthcare. In India, a country rich in talent and diversity, the pursuit of impactful research holds immense potential to address pressing healthcare challenges and improve patient outcomes. However, selecting the right topic for research remains a pivotal yet daunting task for many aspiring researchers. It involves navigating through a myriad of possibilities to pinpoint a problem that not only resonates with the researcher but also holds significance in the local context. Let me begin this series by affirming the current narrative that the time has arrived to assert ourselves in the global context and stop looking at the West for guidance. We have the capability to create research that we can be proud of, research that will not only garner citations but also be quoted in books and implemented in clinical practice for the utmost benefit of patients. We have enormous talent that we need to harvest to lead from the front. I hope that the tips in this Series will help in producing world-class research.

Selecting a topic for research

Research is fascinating to some and awful to others. What is 'research', after all? In one sentence, this is a relentless search for truth. It may be the discovery of new facts that were either never thought of, were in the domain of conjecture, or were being looked at with suspicion. Research may enunciate new principles, provide new implications of the existing principles, or may even be a fresh interpretation of the existing ideas. It explains the why and how of a phenomenon and tries to get answers to what, when, and how much of an effect. All researches open up new questions and the search never ends.

With such diverse connotations, research could be an intriguing process, particularly for a beginner. However, a large number of researches are successfully carried out around the world that change the way we think, live and behave. Medical science has a special appetite, first because medicine pertains to the vitalities of life that we value most, second because enormous human variations generate huge uncertainties and third because the unknown domain in medical science is much larger than the known domain. For example, we do not yet know the cure for advanced malignancies that restores full health, nor even the measurable biomarkers of positive health that can help us prevent ailments before their onset.

Because of such a wide spectrum of medical research endeavours, it seems it is not difficult to identify an appropriate topic. However, that assumption is not entirely accurate. Whereas seniors can identify a problem from their practice, many postgraduate (PG) students and their guides seem to struggle in selecting the right topic. A large number of students within each department aggravates the problem because each student is to be assigned a new topic year after year. Broadly speaking, the first step in selecting a topic is identifying a broad area of research, dictated by your specialty and the second step is fine-tuning it by a critical study of the existing literature and other evidence to find exactly what is known and what is not known. The focus of the problem is determined in the final step. In this article, we briefly discuss the parameters on which the selection of the topic of research can be made and describe steps that can help in sharpening the focus.

What is a problem for research?

Successful research begins by selecting the right problem. A problem is a perceived difficulty, a feeling of discomfort about the way things are, the presence of a discrepancy between the existing situation and what it should be, a question about why a

discrepancy is present, the existence of two or more plausible answers to the same question and such other aspects on which convincing answers are required[1].

It is colloquially said that research is half done when the problem is clearly visualised. Thus, do not shy away from devoting time in the beginning to identify the right problem, understand its various dimensions and choose the specifics that you would like to investigate.

Among countless problems, identifying one suitable for research requires consideration of several factors. The prime consideration is research ability. This includes elements such as feasibility and availability of resources in terms of time, expertise, equipment and cases. For example, research on geriatric problems in a predominantly young population could be a challenge as a sufficient number of eligible old people may not be available in this setup. Time is always a limitation as the development of new technology is fast these days and can quickly displace the question. Brock[2] has discussed out-of-date research before it is published in the context of the Zika virus. The time restriction is particularly severe with a PG thesis since this has a deadline for submission. The other consideration is your interest. A topic that does not excite cannot produce good research. A good problem is also original and novel. An investigation on the biomarkers of positive health is an example of such a topic. For appropriate research, examine whether the chosen topic has adequate theoretical backup. For example, if the role of a particular form of diet in heart disease is to be investigated, consider why that diet can alter the risk of that heart disease. Biological plausibility gives a definite edge.

Choose an area that needs development, verification, or refutation. You may have sufficient reasons to question even an established practice, but the topic should be ethically sound. Once these features are established and the problem is filtered, the next step is to refine its focus. I discuss this in a short while.

A PG thesis can be on an extension of existing ideas, or a replication with an altered focus in a new environment. For example, you could strive to find if a strategy worked out in another country applies to your local setup where the underlying conditions can affect the outcome. Though not desirable, replication can be considered also if convincing reasons to doubt the existing result are present or if the earlier believable findings, now questioned, have to be confirmed. But do not try to reinvent the wheel. Such replication does not apply to the frank research beyond a PG thesis.

How to select a good research topic?

Besides the ubiquitous features such as feasibility, rationale, originality, novelty, relevance, timely and applicability, the following may help in selecting a research topic.

i. Do you feel concerned about the way a particular aspect of health or the patients with a particular condition are being managed? If yes, this could be a good problem for research. Medical therapy as an alternative to surgery for advanced-stage breast cancer is an example.

ii. Locate a study published recently of your interest. Examine if you are convinced with its methodology and the results. In case of any doubt or suspicion, pick it up as a problem for your research.

iii. Look at the last paragraph of papers on the topic of your interest in some good journals of your specialty. Most articles indicate what further research is required.

iv. Study the results of some articles and examine whether they will be directly applicable to your patients. Many may not, because of variations in the profiles of our patients arising from genetic and environmental factors. Nutrition status and lifestyle can substantially affect the outcome. In case of reasonable doubt about their applicability to the local conditions, choose that as your problem for research.

v. Can you think of a new method of management of specific cases? If yes, search and study the relevant literature and discuss it with your seniors and peers. If that convinces you about the better efficacy of this method than the existing management, go ahead and do a trial.

vi. Study the recent literature and examine whether the results can be extended to a new group of patients. Repurposing anti-viral drugs for CoViD-19 is an example[3].

Some hot topics for medical research

- Robotics is catching up fast as a mode of surgery. It would be timely to assess the implications of the use of this tool in resource-poor settings on recovery and long-term quality of life.
- Regeneration of body tissues and parts[4] may look fanciful but is being investigated with an element of success.
- Personalised medicine or precision medicine is being hotly discussed. This considers each person as an individual and the management in this case is not guided by the averages or percentages as is mostly done now but is guided by the specifics of the characteristics of the patient.
- Much of the recent medical research is on predictive models and artificial intelligence. The tools such as ChatGPT are set to take over as all-weather assistants for nearly all medical activities. This would require some knowledge of computers and statistics, but this is an extremely promising area of medical research.
- Living healthy till the end of life could be an exciting topic. This would require catching up on the signs of impending ailments, particularly degenerative diseases. Can we discover an anti-aging regimen? Prevention and treatment of cognitive impairment could help live healthy in old age.
- What begins must end. We can prolong life but cannot deny death. What mode of death is most desirable? Can medical science guide us on what we need to do during our young age to increase the chance of death by, what we consider, the most desirable cause in old age[5]?

Sharpen the focus

Once the features mentioned earlier are established and the problem area filtered, the next important step is to determine the focus. For this, review the existing information to identify the parameters of the problem and use biological knowledge to refine its focus. Specify exactly what new the world is likely to know through this research that is not known yet. This requires that the problem must be well-defined and focused. Identify the age group, severity of disease, nutrition status of the patients and such other details that you would like to concentrate on. You should have a full grip on the problem. Enormous efforts involving large sums of money and unaccountable hours of work are sometimes wasted in chasing ill-defined concepts that fail to make any impact.

Browsing journals in medical libraries used to be an important contributor to increased understanding of the broad area of research and sharpening the focus. Internet and now open access, has completely changed the scenario since much of the literature across the world can be accessed from the comfort of your home. Exploit these resources to provide cutting edge to your research.

For a PG thesis, it is advisable to consider several topics and choose the one that suits your interest, calibre and resources. Take guidance from your supervisor. Do not feel shy about selecting another topic if the one you chose earlier does not work out. Finally, believe in yourself and remind yourself that the human mind has unlimited potential.

State the research topic

Statement of the topic of research is not just wording the title. It is a comprehensive statement regarding the basis for selecting the problem, details of gaps in knowledge, a reflection on its importance and comments on its applicability and relevance. The focus should be sharp. For example, if the problem area is the dietary role in cancers, the focus may be on how consumption of meat affects the occurrence of pancreatic cancer in males residing in a particular area. For further focus, the study may be restricted to only non-smoking males to eliminate the effects of smoking. For depth, meat can be specified as red or white. Further depth could be about how much red and how much white meat is consumed and for how many years. The role of other correlates that promote or inhibit the effect of meat can also be studied. The actual depth would depend on the availability of relevant subjects on one hand and the availability of time, resources and expertise on the other. Such sharp focus is very helpful in specifying the objectives and hypotheses, in developing an appropriate research design and in conducting the right investigations.

Justification of the problem is crucial to get support from faculty, institutions and other agencies. Explain the rationale of the problem with convincing arguments. Juxtapose it in the context of the local healthcare framework and convince others that the problem is important for health improvement. Include considerations such as timeliness, the segment of the population affected, the relationship with the ongoing healthcare activities or ongoing research, the kind of concern it generates among medical professionals, etc. All this would require an extensive review of the available information on the chosen topic. The available information would be mostly in the literature and sometimes useful information is also available in the records of the hospital or at various websites such as of the universities, health organisations, and crowd-sourced databases. Exploit these to the full extent for a complete understanding of the problem you wish to investigate.

References

1. Quizlet. Business Research. https://quizlet.com/558153844/business-research-flash-cards/ - Last accessed 24 Jan 2024
2. Brock J. Out of date before it is published. Nature Index. 30 July 2019. https://www.nature.com/nature-index/news/living-systematic-reviews-emerging-solution-problem-superseded-research-zika-virus
3. Kato Y, Nishiyama K, Nishimura A, Noda T, Okabe K, Kusakabe T, et al. Drug repurposing for the treatment of COVID-19. J Pharmacol Sci. 2022 Jul;149(3):108-114. doi: 10.1016/j.jphs.2022.04.007. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9040495/
4. Regeneration. National Institute of General Medical Sciences. https://www.nigms.nih.gov/education/fact-sheets/Pages/regeneration.aspx - Last accessed 22January 2024
5. Indrayan A. Can I choose the cause of my death? BMJ. 2001 Apr 21;322(7292):1003. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1120113/