Writing the Title, Abstract and Introduction: Looks Matter!

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"I always avoided eating the pineapple due to its tough and spiky exterior, until a friend of mine offered me a slice of it." That friend may not be there at all times for all of us; therefore, you need to ensure that what catches the eye first, needs to be inviting. The Title, Abstract and the Introduction are the face of any research paper, and hence need to be dressed in such a way as to enthrall the readers [1].

GETTING THE TITLE RIGHT

The title is the first part of any manuscript that is seen by the editors, reviewers, as well as readers. It is also what appears on the contents page of the journal issue, and serves as a window to the research paper [2]. A strong title pulls readers into it, making it memorable and encouraging for people to read. A weak title dulls the readers' expectations and could negatively affect the views on your research work, no matter how good it is.

Most electronic databases and search engines, and journal websites, use the words in the title or the keywords provided by the authors to retrieve the scientific paper during online searches. Therefore, title plays a crucial role in ensuring the access of your paper to its readers. Busy editors often decide the eligibility of a manuscript for publication and peer-review based on their initial impression after a scrutiny of the manuscript's title and abstract [3]. Therefore, having a good and inviting title should be a priority.

HOW TO WRITE A GOOD TITLE ?

Keep it Concise

If the title is too long or complicated, it may put off the readers right at the onset. Use of about 10-12 words in the title will enable you to bring out the essence of the research work (patient/species, intervention done, any comparisons, and outcome). Consider the following title:

"A novel study on the usefulness of NS1 antigen detection test in the diagnosis of dengue fever in children: analysis of clinical features and comparison with ELISA test and viral culture with clinical follow-up in 100 patients of dengue fever at XYZ Hospital, Delhi." This would take ages to read. Not many people will have the patience to go through this with a clear head! Now consider: *"NS1 antigen test for the diagnosis of Dengue fever"*. Obviously, this title is better because it is clear and concise. It permits the reader to proceed onto the next section within his/her attention span. To make the title concise, we need to avoid unnecessary phrases. Consider the following titles:

- Role of steroids in aplastic anemia
- Effects of antenatal exercises on birthweight of baby
- A study on efficacy of beta-blockers in heart failure

The underlined words in these titles do not add to the information provided, and by simply omitting these superfluous words, the title is as informative and definitely sharper.

Keep it Specific

Let us consider another title: "*Vitamin D and Pneumonia*."

Despite being extremely concise, this title is still lacking the power to engage the reader as it is too general and vague. It does not lead the reader in any particular direction. Instead, it leaves the informative work to the abstract and the paper itself, which, as we know, not many people go over. Consider replacing it with "*Vitamin D deficiency and risk for severe pneumonia in under-five children*." This is longer but definitely more specific.

Whether to include Place of Study

Sometimes, a given study, if conducted with the same methodology, by the same researcher but in a new setting, may yield completely different results. Consider a study on prevalence of hypertension in young adults in Mumbai. Here the location of the study is vital to the study itself. The prevalence of hypertension at a certain geographical location is dependent on its prevalent

lifestyle habits, which in turn are affected by the economic status and cultural and social practices. So, inclusion of the place of study in the title for this study would be desirable for sake of completing of information.

Now consider the following titles:

- *"Daily vs. weekly iron supplementation in adolescent girls in Delhi"*
- *"Methylprednisolone vs. Cyclosporine for treating Childhood Aplastic Anemia in Manchester"*

The study of iron supplementation in adolescent girls in Delhi will not be very different from the study of iron supplementation in adolescent girls elsewhere. The affecting factor here is not the socio-economic or political environment, but evolutionary build-up of a species, which will not differ even if we change the geographical location of the study. Same applies to the second study. The results obtained in the Manchester study are also applicable to other geographical locations. In such studies, the name of place becomes redundant in the title.

Placing the Keywords towards the beginning

The important words and terms related to your study should be placed towards the beginning of the title. For example, *"Rituximab for Treatment of Autoimmune Hemolytic Anemia"* is a better title than *"Treatment of Autoimmune Hemolytic Anemia with Rituximab"*.

Let us take the example of a study being conducted to ascertain the differences in the prevalent trends of obesity between men and women. The title for this study can be composed in two ways: *"Prevalence of Obesity in Adults by Gender"* or *"Gender Differences in Prevalence of Obesity in Adults"*. Both titles are concise, specific, and bereft of unnecessary phrases, yet these are inherently different in their approach. In this example, the focus of the study is not prevalence of obesity *per se*, but the male-female comparison of prevalence of obesity. Therefore, the second title, which emphasizes the focus of the study by placing it in the beginning, is more appropriate.

Use of Colon in the Title

It is important to note that the study design is usually preceded by a colon in the title. For example, *"Azithromycin for treatment of enteric fever: a randomized controlled trial"*.

Use a Descriptive/Neutral Title

A descriptive title has all the elements of the research work (Patient, intervention, outcome, comparison), yet it does not reveal the main findings of the study or its conclusion. Using too amusing or loud titles should be avoided and as far as possible use a neutral title [4]. For example, "*Seven Days versus Ten Days Antibiotic Therapy for Culture-Proven Neonatal Sepsis: A Randomized Controlled Trial*".

Avoid Declarative Titles

A study title which states the main findings of the study is said to be a declarative one. It reflects the intrinsic bias on the part of the researcher regarding the interpretation of the data.

"*Seven Days Antibiotic Therapy is better than Ten Days Antibiotic Therapy for Culture-Proven Neonatal Sepsis: A Randomized Controlled Trial" is a declarative way of writing the title for the previously mentioned study*.

"*Cryptosporidium is the Most Common Enteric Pathogen in HIV-infected Children with Diarrhea*" is another example. "*Prevalence of Cryptosporidium in HIV-infected Children with Diarrhea*" is a more appropriate title as it lets the reader approach the subject with an open mind and retains the curiosity of the reader.

Avoid Query/Interrogative Titles

Introducing the subject of research in the form of a query can be distracting, and is best avoided. Consider the query version of the previous example: "*Is Seven Days Antibiotic Therapy Better Than Ten Days Antibiotic Therapy for Treating Culture-proven Neonatal Sepsis*?"

Query titles tend to sensationalize the subject and can sometimes be used for review articles. A research by Jamali and Nikzad [5] revealed that articles with query titles tend to get downloaded more frequently, yet they are cited less frequently.

Avoid Abbreviations/Acronyms in the Title

As far as possible, refrain from using abbreviations/ acronyms in titles. Consider the title: "*Diagnosis of ARF in Children*". Here, the abbreviation ARF could imply acute renal failure or acute rheumatic fever, and hence abbreviations are best avoided in titles. Now consider another title: "IVIG for treatment of PANDAS". Here, IVIG is used for intravenous immunoglobulin and PANDAS denotes Pediatric Autoimmune Neuro-psychiatric Disorders associated with Streptococcal Infections. A reader unaware of their meaning may skip this article altogether.

However, abbreviations are sometimes useful for long, technical terms in scientific writing. The use of abbreviations that appear as word entries in Webster's Collegiate Dictionary is acceptable. For example: Use of abbreviations like HIV, AIDS, NADPH, and ATP, may be acceptable.

Ingredients of a Good Title

A balanced title needs to be "SPICED" [6]. The acronym here refers to the six key elements of a title, i.e., Setting, Population, Intervention, Condition, End-point, and Design.

Setting. This refers to the situation in which the research takes place in. It could be community-based, home-based, school-based, hospital-based, or laboratory-based. Within the hospital itself, it could be amongst out-patients or inpatients, or in the emergency room. Likewise, it could be a rural or urban setting. It is important to mention the setting in the Title if results are not generalizable to other settings, or if the setting reflects the magnitude of your research. For example: "*Mortality in Severe Acute Malnutrition in Under-five Children: A Hospital-based Study*." Here it is important to mention the setting because mortality in severe acute malnutrition will be different in under-five children admitted to the hospital and those in the community.

Population. The population is the target of the research work and needs to be explicitly stated (age and/or sex, where necessary). For example: "*Prevalence of Depression in the Elderly*" and "*Prevalence of Osteoporosis in Post-menopausal Women*." In the first title only age is specified because sex may not be important. The latter title includes both age and sex, because of their relevance.

Intervention. Intervention (therapeutic or preventive) is a key element of any clinical trial. For example "*Vitamin D Supplementation in Children with Severe Asthma: A Randomized Controlled Trial*". The study here could evaluate the effect of supplementation of Vitamin D on the severity of the asthma episode (therapeutic effect) or the occurrence of recurrent episodes of asthma (Preventive). The title should be able to clarify the type of study (see Design below) and the type of intervention, if it was planned. A still better title would be *"Therapeutic Effect of Vitamin D Supplementation in Children with Severe Asthma: A Randomized Controlled Trial"*.

Sometimes, research may only be observational with no intervention whatsoever. For example – "*Serum Vitamin B_{12} Levels in Adolescent Indian Girls: An Observational Study*".

Condition. It refers to the clinical condition of the subjects. "Serum Folate Levels in Pregnant Indian Women: An Observational Study", here the condition is pregnancy.

Box 1. SEVEN SECRETS TO WRITING THE TITLE OF A RESEARCH PAPER

- Keep it Concise.
- Keep it Specific.
- Decide regarding Place of Study.
- Use a Descriptive/Neutral title.
- Appropriately 'SPICED' content.
- Avoid Interrogative or declarative titles.
- Avoid acronyms/abbreviations in the title.

Endpoint. Outcome is sparingly used in the title, unless we wish to use a declarative title. It refers to the change or type of change the condition undergoes after being subjected to intervention.

Design. Including the study design in the title itself makes the title complete and it is usually placed after a colon or an em dash.

***Box* 1** summarises the tips for writing a good title.

When to Write the Title?

A rough title should be written when planning a study, keeping in mind at least five of the SPICED elements (except endpoint). This can be tailored after the completion of the study depending upon what we wish to highlight from the study.

CRAFTING A RUNNING TITLE

Many journals ask for a "running title" or "running head" or "short title" to be included in the submitted manuscript. This an abridged form of the main title, which is usually placed at the top left in the header of the published page of an article. The running title enables the reader to keep track of the article as he goes through loose printed pages of the article. Most journals would ask for a running title of no more than 50 characters including the spaces. To make the title still shorter, standard abbreviations could be used, and articles and study design be omitted. For example, the running title for a research paper titled "Pulse Oximetry Screening to Detect Cyanotic Congenital Heart Disease in Sick Neonates in a Neonatal Intensive Care Unit" can be written as "*Pulse Oximetry Screening for Cyanotic CHD*".

CHOOSING THE KEY WORDS

The keywords you choose are important as these are used for indexing purposes [7]. Keywords are listed below the abstract text. It is important to not duplicate the "keywords" and "words used in the main title" as both

enable accession and hence citation of your research work. Using the right keywords will speed up the internet retrieval of your work [8]. In order to determine the keywords, read through your paper and list the terms, phrases and abbreviations used frequently. Try to include variants of a term/phrase already used in your title as keywords; *e.g.* sepsis and septicemia, renal and kidney, tumor and cancer. Now refer to an indexing standard like the Medical Subject Headings (MeSH) database of the US National Library of Medicine [9]. Check if these terms are listed therein. The MeSH uses two tools to determine keywords:

- MeSH on demand
- MeSH browser.

'MeSH on demand' is a simple tool available from *https://www.nlm.nih.gov/mesh/MeSHonDemand.html*, which automatically deciphers the keywords from text such as an abstract or summary. MeSH Browser is a tool available from *https://www.nlm.nih.gov/mesh/MBrowser.html*, which allows for searches of MeSH terms, text-word searches of the Annotation and Scope Note, and searches of various fields for chemicals. Another way to identify keywords is to search similar research work from PubMed and then ascertain the MESH headings assigned to them. The keywords are not necessarily single words but may be two words. For example, "breast cancer" is listed as keywords in MeSH.

Before you finally submit your article, check if the keywords are appropriate. Type the keywords into the search engine and see if the search results resemble your research work.

WRITING THE ABSTRACT

The abstract is a concise statement of the major elements of your paper. It is usually the last section written by the authors, but is the first section of your paper that is read by the editors and reviewers. It should therefore provide a snapshot of the research undertaken by you. In addition, it should be comprehensive yet crisp [10]. The abstract should highlight the selling point of your research work and should lure the readers to read the whole paper. Besides determining selection of the paper, abstracts are also important for indexing. When searching online for research work, most databases would display the title as well as the abstract. This would enable the readers to determine if they really need to go through the full text of your research paper. However, it is important to remember that for your article to be picked up during an online search, it must contain the key words that a potential researcher would use to search.

What Should the Abstract Contain?

The abstract should be a window to your research and should effectively convey all the elements of the research work. The abstract essentially has four elements (**Box 2**).

Box 2. ELEMENTS OF THE ABSTRACT

Purpose	Why this work? What was aimed?
Methods	How was it achieved?
Results	What are the findings?
Conclusion	What is the inference?

Abstracts cover all the aspects of the research including the background, objectives, methods, results, conclusions, and recommendations. They, however, do not provide a critique of the research. These are usually around 300 words or about 10% of the length of the manuscript.

Format of an Abstract

Abstract can be written in running text without the use of subheadings (Unstructured abstract) or it may be in a structured format with use of subheadings. A structured abstract may be a 4-point abstract or a detailed traditional 8-point abstract. A 4-point abstract has four subheadings, usually, (1) Background and/or Objectives,(2) Methods, (3) Results, and (4) Conclusions. An 8-point abstract has eight subheadings, *viz*, (1) Objectives, (2) Study-design, (3) Study-setting, (4) Participants, (5) Methods/ Intervention, (6) Outcome measures, (7) Results, and (8) Conclusions. You will have to choose the format of the abstract after checking the "Instructions to Authors" of the journal you wish to submit your research to.

The 4-point abstract is easy to write as the elements are distinct entities. They are:

Background - It should be brief and limited to two or three sentences, where you need to specify what is already known and why you conducted the study. The objectives of study should also be mentioned.

Methods - This is usually the longest section of the abstract and should give enough information to the reader to understand what and how was your study done. The important aspects that need to be covered here include the study design, study setting, clinical diagnosis of participants, sample size calculation, sampling methods, intervention done, duration of the study, research instruments used, and define the primary and secondary outcome measures and how these were assessed.

Results - This is the most important and difficult section to write in an abstract. The results should mention the

exact number of participants including the drop outs, and adverse effects, if any. The results of the analysis of the primary objectives and the salient secondary objectives should be presented in words as well as numbers including *P* values. An abstract should present the results of your research as data (mean, standard deviation, 95% confidence interval, mean difference, *P* value, median, and interquartile range, where applicable). Merely stating the interpretation of results in sentences without numerical results is inappropriate. Consider the following examples:

"Response rates differed significantly between hypertensive and non-hypertensive children." A better way to state your results is *"The response rate was higher in non-hypertensive than in hypertensive children (50% vs 20%, respectively; P<0.01)."*

Another example where results of a study evaluating the role of probiotics in diarrhea are presented:

"The time for resolution of diarrhea, and the recovery in terms of resolution of diarrhea and need for hospitalization was similar in the probiotic and placebo groups."

Or

"The median time for resolution of diarrhea was 54 hours in both the probiotic and the placebo group. Recovery in the probiotic group was marginally better but not statistically significant for resolution (hazard ratio = 0.91, 95% CI 0.60-1.31), rehydration (hazard ratio = 0.91, 95% CI 0.64-1.39) and hospitalization (hazard ratio = 0.94, 95% CI 0.67-1.34)."

The latter way of presenting the results in the abstract is better and more informative.

Conclusions - The conclusions need to state the 'take home message' and any other salient findings which need to be considered. The conclusions must always take into account your hypothesis and research question and must be written so as to answer the same in the light of your results. Additionally, you may present your perspective in this section of the abstract. **Box 3** depicts some examples of writing the conclusions section of the abstract.

The 8-point abstract ensures completion of all aspects of the research; however, there is a significant overlap between the methods and results section. Therefore, it needs to be drafted very carefully. For example, under the subheading "participants", you will not only need to specify the inclusion/exclusion criteria (part of methods section), but also need to mention the exact number recruited in your study (part of results).

Attributes of a Good Abstract

A well-written abstract is characterized by the four Cs, *viz*. it should be complete, concise, clear and cohesive.

A good abstract should be *complete*. It should be a stand-alone document and cover all the major parts of the research in addition to bringing out its novelty.

A good abstract should be crisp and free from excessive wordiness or unnecessary information. For example, "X stimulates Y" will be a better choice of words than "X produces a stimulatory effect on Y". A good abstract should avoid too much background information. You should refrain from using empty phrases like "It was interesting to note that ….". Cliché statements like "More research is needed" should be avoided. If there are implications, then you must state them clearly.

The abstract should be *clear*, i.e., readable, well-organized, and not too jargon-laden. The abstract should be written in the past tense. Abstract written in active voice provides greater clarity. So, we may write "We conclude that…" instead of "It was concluded that….". The findings of your research should not be discussed in the abstract, and any discussion should only be done in the main text of your research paper. The abstract should be free of figures, diagrams, tables, or images. The abstract should not contain any references/citations. Avoid use of abbreviations or acronyms.

A well written abstract should be *cohesive* and the text should flow smoothly between the parts. The abstract must follow the chronological order of sections in your main research paper ensuring a smooth transition. It must read like a story. A direct cohesiveness needs to be maintained between objectives, main outcome measures, results and conclusion (example in **Box 4**).

Before you finally submit your abstract check it for *consistency*; a mismatch between the abstract and main

Box 3. EXAMPLES OF THE CONCLUSIONS SECTION OF ABSTRACT

- Daily zinc supplementation (40mg for 14 days) in children aged five to 12-year with acute dehydrating diarrhea did not shorten the duration of diarrhea or reduce subsequent episodes. Further community-based trials with adequate sample sizes are needed.
- Pyomyositis is a specific and potentially fatal infection, which is common in India and must be differentiated from intermuscular abscess. A high index of suspicion and early institution of specific antibiotics followed by surgery can be lifesaving.

text may raise doubts on authenticity of your results. Check if the abstract meets the guidelines to authors in terms of format, word count, etc.

WRITING THE INTRODUCTION

Need for an Introduction

The introduction should aim to set the mood for your research, acquaint the readers with your research hypothesis, and motivate the readers to read your paper [12]. It should steer the readers from why you are doing the research into how you are going to fill the knowledge gap i.e., into the methods section.

An introduction essentially has three main elements:

1. *What is known?*

The background of the research topic needs to be stated right at the onset to enable the readers to understand what is already known on the subject. This sets the stage for the basis of your research.

2. *What is lacking*?

You need to justify "why you are carrying out that research work", i.e., whether you are building upon previous research, looking at a novel aspect not evaluated by previous research, or if you are trying to improve upon a previous research that yielded ambiguous results.

3. *What you aim to do*?

You need to briefly state the objectives of your research. It is also advisable to present a detailed hypothesis at this juncture only.

How long is too long?

There are no strict word limits for writing the introduction; generally it is one of the shorter sections of the paper. Having the readers meander through too much of introduction can be counterproductive as it may cause them to lose focus and interest. You should assume that your work is going to be read by someone who has at least a reasonable knowledge about your research topic, so it is preferable that you do not beat about the bush. For example, for a study evaluating the role of probiotics in acute diarrhea in children, there is no need to discuss definitions and etiology of diarrhea in the introduction; you could start by commenting upon the well-established treatment options for acute diarrhea and how your study will add to the existing knowledge and practice.

How to write the Introduction?

It would be useful to structure your introduction like an "*inverted pyramid*" or what could be simply said as

Box 4. EXAMPLE OF A COHESIVE ABSTRACT [11]

Vitamin D Supplementation for Severe Pneumonia - A Randomized Controlled Trial.

Objective: To determine the role of oral vitamin D supplementation for resolution of severe pneumonia in under-five children.

Design: Randomized, double blind, placebo-controlled trial.

Setting: Inpatients from a tertiary care hospital.

Participants: Two hundred children [mean (SD) age: 13.9 (11.7) months; boys: 120] between 2 months to 5 years with severe pneumonia. Pneumonia was diagnosed in the presence of fever, cough, tachypnea (as per WHO cut-offs) and crepitations. Children with pneumonia and chest indrawing or at least one of the danger sign (inability to feed, lethargy, cyanosis) were diagnosed as having severe pneumonia. The two groups were comparable for baseline characteristics including age, anthropometry, socio-demographic profile, and clinical and laboratory parameters.

Intervention: Oral vitamin D (1000 IU for <1 year and 2000 IU for >1 year) (*n*=100) or placebo (lactose) (n=100) once a day for 5 days, from enrolment. Both the groups received antibiotics as per the Indian Academy of Pediatrics guidelines, and supportive care (oxygen, intravenous fluids and monitoring).

Outcome variables: *Primary:* time to resolution of severe pneumonia. *Secondary:* duration of hospitalization and time to resolution of tachypnea, chest retractions and inability to feed.

Results: Median duration (SE, 95% CI) of resolution of severe pneumonia was similar in the two groups [vitamin D: 72 (3.7, 64.7-79.3) hours; placebo: 64 (4.5, 55.2-72.8) hours]. Duration of hospitalization and time to resolution of tachypnea, chest retractions, and inability to feed were also comparable between the two groups.

Conclusion: Short-term supplementation with oral vitamin D (1000-2000 IU per day for 5 days) has no beneficial effect on resolution of severe pneumonia in under-five children. Further studies need to be conducted with higher dose of Vitamin D or longer duration of supplementation to corroborate these findings.

"*funnel approach*". This implies introducing the topic of the paper and discussing it in a broad context and then finally narrowing down to the research problem and hypothesis.

The introduction can be written in about two-to-three paragraphs. The opening paragraph should be dedicated to introducing the topic of research; it may also provide an overview of the topic of research. You must remember that the introduction is not a review of literature but it should convince the readers that you have thoroughly researched the topic and built their confidence in your hypothesis. A thorough literature search is an essential pre-requisite for identifying and framing the research question. However, a very lengthy literature review can put-off the readers so it is important to summarize what research has already been done on that topic, and highlight the lacunae or controversies regarding the same.

In the second paragraph, you need to identify a research niche. This can be done by highlighting the lacunae in existing research or opposing an existing practice or assumption. This will help you to arrive at your research question. You need to emphasize what additional knowledge will be gained through your research and how you aim to bridge the gap in knowledge. An ideal study should focus on a central question and may be another two or three questions that can be additionally addressed through your study. It is preferred to use "open-ended research question". A good research question should yield a testable hypothesis. It may be necessary for you to clarify any key terms or concepts in the introduction itself, particularly if you are dealing with an unfamiliar or new concept. It is also pertinent to declare any assumptions you are going to make in the research work.

In the third paragraph, you need to articulate your objectives and hypothesis. The hypothesis should be a tentative prediction of relationship between two or more variables. It should be neither too general nor too specific, and is often declarative. While stating the hypothesis it would be better to state it implicitly rather than saying that "Our research is based on the hypothesis….". For example, a research hypothesis can be stated as "10-days duration of intravenous antibiotics is not inferior to 14-days therapy for treating neonatal septicemia". The hypothesis should be used to convince the readers about what results are expected from your research. Also, remember that a hypothesis is valuable even if proved to be wrong.

And as the phrase goes "Well begun is half done", so is the story with a research paper. A well drafted abstract and introduction section with a strong title will help the researcher to win half the battle.

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