Scientific Writing for Biomedical Scientists and Role of Information Technology

Dr Surya Nath Singh

Abstract

*The objective of the article is to discuss the basics of scientific writing as a mode of communication and solutions to common basic problems, which most scientific staff face in their day-to-day working: what? why?, whom?, where?. It emphasizes types, basic structure, copyrights, authorship, and discusses about the most commonly used skills/practices at international level for Scientific Communication. The focus is on the **"application"** rather than basic usage of scientific writing to one and all. The target audiences of this workshop are: Scientists, Senior Technical Staff, Information Officers, Librarians and other associated with scientific writings and communication. The article will be very useful to participants across various scientific organizations/institutes, industries and scientific specializations viz ICMR, CSIR, DST, DBT, medical and paramedical colleges and institutes. The article is designed such that there would be "significant value addition". The article gives an overview about steps, style and methods of scientific writings. It summarizes common mistakes, ethical issues, while scientific writing. It also describes the role-challenges and opportunities of librarians and information officers and IT for scientific writings. The article concludes with some useful suggestions for scientific writings including e-writings: articles books, research studies, research proposals/report, articles for public, brochures press release promotional writings and technical/ annual reports.*

Introduction

Communication of knowledge through writings is an essential component in our life. In the science, it is most important to convince the global community, on contrary to the idea comes first - **(Sir Francis Darwin)**. It is often hard to read scientic writings. Knowledge/information is not worth unless it is communicated to the proper user at proper time. Scientific writing is an additional to human knowledge. Key elements are audience: **Who they are? What they know? Why they read? How they will read?** They may be specific group, general public, and/or non-technical. It is also assumed that difficulties of science are born out of necessity, extreme complexity of scientific concepts, data and analysis. The main purpose of scientifc writing is not the only presentation of knowledge/ information/thought, but also the best way of communication to the proper user at proper time. It also matters, only when a large majority of the audience reads and understands about what author(s) wants(s) to communicate, rather than how an author has converted all the correct data into sentences and patagraphs. Consequently, in order to improve the scientific writing, here in this article some of the useful tips have been suggested with the hope that the article will help the major group of audience, especially biomedical scientific community, not only to improve the methodology of quality of their writings but also the quality of thoughts to achieve the reader expectations. Biomedical scientists like other scientists use generally four type of communication viz oral/podium, written, poster and animations (1-9). It is very difficult to incluse here all the components of scientific writings, however effort has been made to cover common featutre of all types of writnigs especially biomedical scientific articles.

1.1. Importance of Scientific Writings

Scientific writing is an addition to human knowledge. It is a reversible statement (addition of knowledge takes place through scientific papers). It is also known as ocean of ignorance, Island of human knowledge and it is your paper going to be added in this universe of knowledge. The oral communication is the oldest form of communication. The basic types of scientific communication are: audio, visual, graphic, poster, written, animations, etc. However, scientific writings are essential, irrespective of above forms of presentation. A well-written paper gives a clear picture of knowledge of an author and information to targeted audience.

1.2. Why to Write: Purpose of scientific writing is to inform; to persuade, mandatory, promotion/assessment, award, etc. The main **Occasions are:** scientific; politics and ethics; formalities; format; process and deadlines. It matters, when only a large audience read a particular book, article, etc. There are many types of scientific writings: editorial, original article, review, short papers, case reports, and letter to editor, personal views, as well as special communication. A scientific career is all about expansion of human knowledge: **Share knowledge:** academic, public sector- oral/podium, written and poster are mandatory in most of the scientific institutions, assessment, interview, promotion (reputation) /fresh job, project assessment, etc. **Satisfaction:** scientists are motivated by: 1. To understand the world, 2. To get credit for it. 3. Award, 4. Obtain research grant, 5. To reach broad audience, etc. Publish or perish should indeed the experts express the rule for the scientists. If he/she does not publish he/she is out. It is unethical to conduct a study and not report findings. Some results are worth publishing/reporting.

1.3. What to Write

Information is interpreted more easily and uniformly, if it has to be placed, where most of readers expected to find it. In the scientific writings the reader have relatively fixed expectations about their substances in form of tables, graphs, illustrations, etc. However, it also matters, if it is properly structured in prose form. The main forms of scientific writings are: Letters, Book Reviews, Commentaries, etc; Book/Chapter of Book; Thesis; Projects Proposal, Project Report, Technical Reports, Conference Proceedings, Lectures, etc

1.4. How/Steps of Scientific Writing

The main points should also to be taken into consideration, while starting to write are: Check your use of supporting evidence: References and Data, check your use of sources, check to see to achieve your purpose, check your attention to audience, check for over all impression, check sentence structure and style, check paragraph structure, check format, check documentation.

1.4.1. Careful Planning: is the first step of scientific writing before actually writing the paper. This includes selection of journal (depends upon the quality/originality of paper), full/part of data to be included, organization, attention to details, key points to be communicated, communication with colleagues, collection of references, reading-full article, drafts, finalizing, sending, reviewing, communication with colleagues, response to revision/referees comments. It is also essential to decide in the planning stage about the type of publication i.e. letter to editor, short communication, case report, full paper, etc.

1.4.2. Getting in the Mood: It is essential to make a mood to write, identify problem to decide targeted journals, page, size, heading, etc depending of newness of idea. Once mood is created, it is essential to put on paper in form of draft for the targeted audience. It has been suggested by several experts to bifurcate an elaborative study into 2-3 articles, on contrary to publish original ideas in one paper. It also needs proper discussion with co-authors, colleagues and

experts in the planning stage itself to answer the following questions: Is it worth to publish in a scientific journal? Is the data is sufficient for full article or short/letter to editor communication? Is it the original/first work to report?

1.4.3. Writing First Draft: First draft is a foundation of any article. Based on findings, put these on paper, analyse the data, construct tables and figures. Put the first draft for 2-4 weeks aside. It has been experienced that it is very difficult to point out his/her own mistake by an author. Hence, it is advisable to ask another subject expert/colleagues, co-author to read the first draft. It will help to correct spelling mistakes/typographical errors, as well as content of the article. It is also essential to have literature search for the new references, collect full articles and read these thoroughly during the first draft.

1.4.4. Revising, Revising, Revising : Revise the content as well language 1st-3rd draft. After the second draft, it is advisable to share with others, other than coauthors. During this period, it is essential to consult guide, experts, and co-authors. This will not only beatify the content but also language of the article and correct citations of the references in the text.

14.5. Finishing: Check list-short/snappy title, correct quote references. In this stage, it is advised to avoid ambiguity, choose the correct words, remove common grammatical mistakes, check consistency of style i.e. uniformity in using small and capital letters, punctuation marks, abbreviations, numbering of headings and sub headings.

1.4.6. Final: Submitting to journal is a major goal for the scientific writings. Since, now

a days the most of the journal ask authors to submit their paper electronically, it is suggested to submit and correspond electronically. This will bring promptness and avoid time log as it happens earlier..

2. Manuscript Structure-Sequence: Organization and Presentation

Although, sequence and style of scientific writings differ from journal to journal. A scientific writing is generally divided into various sections and subsection. The main sequence for the arrangement of an article is: Title, Authors, Abstract, IMRAD, Acknowledgements, References (20-30 ref). In the scientific writings **IMRAD**: (**I**ntroduction- why did you start? (1-Page), **M**ethods- what did you start (2-3), **R**esults- what did you find? (2-3) **A**nalysis; **D**iscussions- what does it all means (2-3)), style is more preferable and recommended; which also includes tables and figures.

2.1. 1st Page: The first page is known as title page, which contains **TITLE** (concise information): choice of title; short title/running, footnote, keywords to be given on the title page. After title, name of author(s), highest academic degree(s), affiliation, department, institution, disclaimers if any, name and address of author for correspondence about the manuscript, source of support in the form of grants, equipment, drugs, short running head or foot line of no more than 40 characters to be indicated. The title of the article to be written as per norms provided by various experts, associations and journals: Developing a title in four steps as given by (Lilleman 1998), it should be concise and precise not declarative (New Eng J Med), concise but informative and descriptive (Lancet), as brief as possible (Ann Int Med), keep them concise (BMJ), not misleading/ unrepresentative, specific: include type of study and numbers, words appropriate for classification, interesting not dull.

2.1.1. Style: It is advisable to use plain/simple English, construct small sentences with subjects; verbs and objects pattern to form the sentences. Avoid jargons/dehumanizing words, ambiguity; choose the correct word, spellings, etc. Some of the important recommended words have given in (Reference: Satyanarayana K. Grammar and Syntax in scientific writing. In: Naik SR and

Agrawal Rakesh, eds. Communication for biomedical scientists. New Delhi, Indian council of Medical Research, 2003. iv; 180p.)

- Thus, as a result of-------Consequently, a considerable amount of---Much, a number of --- Many, End result--Result

2.1.2. Authorship: It is essential second issue to sort out basic authorship politics i.e. scientific and administrative problems in beginning before writing to avoid any conflict in the future. At international level, it has been decided to have maximum number of authorship i.e. maximum number for an article-8-9; letters-4-5; review-3-4. It is also essential to agree on authors: role and responsibility, first authors and co-authors, agree on three journals. Every thing about the authorship must be according to instructions to authors. In is also essential to decide the name of individuals, groups, organizations, etc during the planning stage only. Those, who do not qualify for authorship, may be acknowledged as part of acknowledgements. Authorship is a major part of an article to be considered. The main points to be considered are (5-9): (a) All person designated, as authors should qualify for authorship, (b) Author should have participated sufficiently in the work to take public responsibility for the content, (c) Authorship credit should be based on substantial contribution to: Conception, design, (d) Analysis & interpretation of data approval, (e) pparticipating solely in acquisition of funding, collection of data does not justify authorship, (f) General supervision of research group is not sufficient for authorship, (g) Order of the author should be a joint decision of the authors, (h) Who will be principal author? (**i**) Who will be coauthors? (**j**) Who only be acknowledged?, (**k**) Order of authors: senior/ independence-1st&2nd and (l) Corresponding author (1, 4-9).

The contributors, who assist in drafting, revising it critically, for important intellectual contents and final approval of the contents qualifies the authorship. However, participating solely in acquisition of funding, collection of data, providing statistical assistance, laboratory animals, laboratory and chemical facilities, etc does not justify authorship, general supervision of research group is not sufficient for authorship. Order of the author should be a joint decision of the authors. It is also suggested to show the drafts to all the contributors at all the draft stages.

2.2. 2nd Page : (S) Summary (Structured Abstract): After title page it is followed by page of abstract, which includes: introduction, problem investigated, purpose of research, hypothesis/ hypotheses, methods, discussions/ interpretation of data-results, conclusions. The sequence should be the same as the main part of the article. It is suggested to remove unnecessary: "a, an the, as", etc, add essential key words, take help of information officer/librarian. Although style of writing abstract differs from journal to journals, however it is restricted to 100-200 words. Some of the journals even suggest giving abstract as separate page. Hence, it is suggested to follow instruction to author.

2.3 3rd Page: (I) Introduction (What Question was asked?): After abstract, it is introduction that a reader will like to read. Hence, broad information on topic should be brief and clear (6). Review of previous research, narrower background information, need for study, focus of paper, hypothesis, summary of problem (selling point) are the main points of introduction. It should be restricted to overall 200-300 words unless it is warranted. Para-1: what we know; Para-2 what we don' know); reason for doing research study, (Para-3 why we did this study); avoid history; what you did, why you did it, what you found; indication of conclusions. It is suggested, " Don't make introduction to long." Before begin, answer basic questions: What do I have to say? Is it worth saying? Who are the Audience? What is right format for the message? What is right journal for message? Tell all Readers Need of Study, Clarify what your work adds **e.g.** several studies

have shown…we report two further patients, Follow the best advice/guide lines of the journal, keep it short, make sure that you are aware of earlier studies. The following common mistakes should be avoided, too much or not enough information, unclear purpose, lists confusing structure, first-person anecdotes, avoid review of literature as reference-only essential references (4-10).

2.4. 4th Page: (M) Methods (6): In this part author(s) must consider: **How was study studied/ designed?** Keep the description brief, say how randomization was done, and use names to identify parts of the study sequence, provide sufficient details for others to repeat, use subtitles if required, make sure statistics are appropriate. The basic scientific studies are: experiments, clinical trials, surveys, evaluation of diagnostic tests, observations, meta analysis and cost analysis. It is essential to describe selection of the observational, experimental subjects including controls, experimental method (reference for standard methods), statistical methods, and ethics.The next point is, **"How the study was carried out":** Describe how the participants were recruited/ chosen/ excluded; mention ethical features-authorship, peer review, details of materials used i.e. standard operating procedure (SOP), exact drug doses, unusual form of treatment/apparatus used. **"How the data were analyzed":** Use a p value to disapprove the null hypothesis, give an estimate of the power…false/negative beta error, give exact tests used for the statistical analysis, give complete detail of any new method used, give precision of measurements undertaken, sensibly use statistical analysis. **"Provides instruction on exactly how to repeat experiment":** subjects, sample preparation/ experiment techniques (SOP), sample origins, field site description, data collection protocol, data analysis techniques, any statistical method/computer programs used (e.g. Statistical Package for social Sciences-SPSS), description of equipment and its use. Use a p value to disapprove the null hypothesis, give an estimate of the power…false/negative beta error, and give exact tests used for the statistical analysis. Give complete detail of any new method used, give precision of measurements undertaken, sensibly use statistical analysis (6-8).

2.5. 5th Page: (R) Results (What was found?): **Objective Presentation of Experiment Results** is an important part of any article. The following points need to be considered very carefully. **Summary of Data:** Summary is not a discussion. In the text sequence tables, figures, and illustrations: general considerations must be arranged properly. The various common mistakes/ possible problem in this section are: raw data, redundancy, improper discussion and interpretation of data, summary of major findings, lack of figures or tables as well as methods/materials reported and logical sequence of presentation. It is also essential to answer following questions: Is description of results clear and detailed? Are results credible, valid and well presented? Are statistical methods appropriate? It is also suggested to minimize unpublished results, use subheadings if required, and indicate ethical/patent issues (6, 9-10).

2.6. 6-7th Page: (A) Analysis (How data was analysed?): This section is related to interpretation of results and must answer following questions: Did study confirm/deny the hypothesis? If not, did results provide an alternative hypothesis? What interpretation can be made? Do results agree with other research? Sources of error/anomalous data? Implications of study for field and suggestions for improvement and future research must be briefly included and also relate/compare to previous research work. It is essential to provide summary of result and how result led to conclusions, place results in context of current knowledge, impact of data (present and future), unanswered questions.

2.7 6-7th Page: (D) Discussion (What do findings mean?): The discussion should have: **Templates for Discussion: Para-1:** Address aims stated in introduction; **Para-2:** Strengths and weaknesses of methods; **Para-3:** How results support current literature; **Final:** future directions. It is suggested:

be consistent with targeted journal. There are three ways: Mini-seminar, Journal club, Experts opinions to improve this part. It is also suggested to summarize relevant important previous works, put your result in context, mention doubts, weaknesses, etc. The common possible mistakes are: Combined with results (as discussion is an interpretation not result), new results discussed, broad statements, incorrectly discussing inconclusive results, ambiguous data sources, missing information, combined with results.

2.8. 7th Page: Acknowledgements: Those, who do not justify being authors, should be acknowledged. Those, who have provided technical financial help, chemical, laboratory, statistical, references, photographic and laboratory animal, method and material support should be acknowledged. Sometimes the works of previous authors, whose work has been used, needs to be acknowledged. This also helps to avoid plagiarism and copyrights.

2.9. 7-8th Page: Reference is an important part of any scientific writing and also mandatory. There are standard rules for referencing, however the style of referencing i.e. bibliographical details, differs from journal to journal and majority of biomedical journals follow, mainly **Medline** and/or with slight modification.

2.9.1. Referencing Guidelines

Referencing is telling authors, where you learned or found the information that you are writing, same as hyper linking on web page. It is a standard method of acknowledging sources of information and ideas that have been used in assignments in a way that uniquely identifies their source. Direct quotations, facts and figures, as well as ideas and theories, from both published and unpublished works must be referenced. There are two ways to write the references- as footnotes and at the end of text. The referencing guides prepared by the library are guides only. Individual journals, societies, associations, Schools and Departments have recommended variations on these styles - or referencing styles not worth to list here. It is very important that authour (s) check with librarians, instruction to authors, and guides/cpauthors to make sure they are using the correct style.The various guidelines are: 1. Chicago; 2. APA; Vancouver; 3. Harvard Style from The Melbourne University Australian Journal of Physiotherapy Referencing from Curtin Department of Public Health; MLA from Purdue University USA; Anglo American catalogoing Rules-II, etc (5-9). There are separate ways to cite references for books, chapter of the books, articles of the journals, reports and internet based references.

Reference Manager and EndNote: are bibliographic management softwares that help manage references and produce bibliographies in a variety of **referencing styles.** Main points to consider are: check specific referencing style of journal: instructions to authors, numerous variations, full name vs. initials, number of names before et al, page inclusively, punctuations; **Should Reference:** Peer-reviewed journal articles, abstracts, books; **Should not Reference:** Non-peer-reviewed works, textbooks, personal communications, unpublished data, etc; Be serious about literature search and reading full papers-each day, Are all references relevant? Never cite a paper, which you have not read, Do references fairly represent the latest? Is major literature omitted? Are there any misquotations/incorrect? Common Databases-Medline, EMbase, SCI, digital Dissertations, etc. Take help of your information centre and library (ICLs). **Reference Manager:** is an impotent tool for referencing and full text references storage and retrieval. It is also suggested it to use regularly. It will help in many ways.

Following common mistakes of reference part are: format, style, not following the instruction to author properly, sequence of bibliographical details for citations of books, journals, reports, references of web page, Figures and Tables, Equations, and References, Redundant Information,

Text, Figures, Tables, and Captions, Type of Reference: Journal's article, Books, Proceedings, Reports, Composite Books, etc. There is standard sequence to give bibliographical details, use of various punctuation marks but majority of authors do not follow the consistency and use different patterns in same article, while writing references. Consequently, it is suggested to follow a uniform patter as given in instruction to authors. For example:

Standard journal article Vega K., Pina I., Krevisky B. Heart transplantation is associated with an increased risk for pancreatic obiliary disease. ***Ann Intern Med*** 1996 Jun 1: 124(11): 980-3

Books and other monographs: Phillips SJ, Whisnant JP. Hypertension and stroke. ***In***: Laragh JH, Bremier BM, editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. P.465-78.

Dissertation: Kaplan SJ. Post-hospital home health care: the elderly access and utilization (dissertation]. St. Louis (MO): Washington University: 1995.

Unpublished material: Leshner AL. Molecular mechanisms of cocaine. N Engl J Med. In press 1996.

Electronic material: Morse SS. Factors in the emergence of infectious disease. Emerg Inftect Dis [serial online] 1995 Jan-Mar (cited 1996 Jun 5]; 1(1): [24 screens]. Available from URL: http:/ www.cdc.gov/ncdod/EID/eid.htm

2.10 Figures, Captions and Tables: must be self-contained. **Tables:** Presents lists of numbers/ text in columns, uniformity. Figures: Visual representation of results or illustration of concepts/ methods (graphs, images, diagrams, etc.) must be self explanatory and self-contained. Captions: Must be stand-alone. Guidelines for Figures and Tables:

It is also suggested figures and tables should be high resolution, neat, legible labels, simple, clearly formatted, indicate error, detailed captions. It is also recommended to focus on key points, don't clutter illustrations, define symbols/abbreviations in legend, label axes (X, Y), use same units as in text, photo authenticity to avoid recent scandals, obtain permission for use of previously published material.

3. Where to Write: Following points needs to be considered: Choose the journal before start writing; Choose important related journals and restrict of three journals at planning stage and come to one consensus at submission stage. To decide the targeted journal it is suggested: Carefully review several recent issues; study instruction to the authors; identify the publication costs; standard abbreviations (MeSH-Medline). Impact factor is another criteria to decide the journal due to various reasons.

4. How to Write a letter (Submission): It is suggested to consider following points, while writing letter to editors: address letter to editor, describe paper in 3-4 sentences, Why it is appropriate to this journal, If allowable suggest reviewer, undertaking/signature of coauthors on the statement of authenticity/responsibility. **Response Letter with Revision:** Segregate responses to editor and each reviewer, respond to each comment (consider number), start polite introduction to each reviewer…we are grateful to reviewer a for useful comment…, Don't try to muscle the reviewer (6-8).

5. Role of Library & Information Officer

A library and information officer is custodian/manager of knowledge. He/she helps the authors in following manners: **Referencing:** Different journals, research reports have their own ways of writing references. It is library and information officer, who helps the authors about their

reference as per journals style, use of different tools e.g. **Reference Manager** as well as provides **full text** of references as and when required. He/she also guides about: **Instruction to Authors, IPR and Copyrights, Impact Factor** of the journals. Some of the library and information science (LISc) professional helps in correction and proof reading as well as editing of the draft prepared by the authors. Based on quality and subject matter of the article LISc professions also suggest about the more relevant journals, where an author can publish his/her paper.

6. Twenty Most Common Errors

Some of the most common mistakes are: Failure to follow instruction to authors, too many foots on the title pages, inconsistent formation to the body of manuscript, error of **punctuations** of references, failure reproducibility of results. It has been observed that majority of authors do not use proper punctuations, leading vague meanings. **Introduction:** Some of the authors write unnecessary very long introductory part of their article. In science introductory part should be very brief and communicative. Don't Make introduction to long, too much or not enough information. Unclear purpose lists, confusing structure. **Firstly**-Person anecdotes are not essential for scientific writing. **Secondly**, it is suggested to avoid long review of literature. **Thirdly**, only essential and important references are to be incorporate as review. **Method**: The possible common mistakes in this part are: too little information, information from introduction, verbosity, and results/ sources of error reported. **Result:** The possible following common mistakes to be avoided: raw data, redundancy, discussion and interpretation of data explained in discussion part, possible problem, summary of major findings, no figures or tables and/or improper sequences. Methods/ materials reported in the earlier studied must be indicated, not to be explained in details. **Discussions:** Repetitions of interpretation/analysis in the discussion part should be avoided. **Punctuations** (chose correct, avoid incorrect): comma, full stop, colon, semicolon, apostrophes, parentheses, and square brackets, slashes, etc are the important component of scientific writings. By using a semicolon, we may create a second stress position to accommodate a second piece of information that seemed to require emphasis. There are three rhetorical principles based on reader expectations: **First**, grammatical subjects should be followed as soon as possible by their verbs; **second**, every unit of discourse, no matter the size, should serve a single function or make a single point; and, **third**, information intended to be emphasized should appear at points of syntactic closure. Using these principles, we can begin to unravel the problems of our example prose (4). These are (1-10):

6.1. Missing comma after an introductory element: It is essential to use comma after an introductory element e.g. Rakesh, we were baffled by the findings. In fact, scientific education needs proper use of various punctuations for their scientific communication.

6.2. Vague Pronoun Reference: It has been observed that most of the time we miss to use proper pronoun e.g. Transmitting radio signals by satellite is a way of overcoming the problem of scare airwaves and limited how, they **(the airwaves)** are used.

6.3. Missing comma in a compound sentence: Generally authors missed comma, while framing compound sentences. E.g. We wish dreamily upon a star, and then we look down to find ourselves standing in mud.

6.4. Wrong word: Sometimes author also uses wrong spellings, leading wrong communication. E.g. The Pacers played there (**their**) best, but that was not good enough.

6.5. Missing comma(s) with a nonrestrictive element: It has been observed that sometimes authors forget to use comma, while using non-restrictive elements. **E.g.** Sudarsan, who was the president of the club, was first to speak.

6.6. Wrong or missing verb ending: It has also been experienced that authors use wrong form of verves. **E.g.** Suresh use **(uses)** feline imagery throughout the poem. The United States drop (dropped) two atomic bombs on Japan in 1945.

George D. Gopen and Judith A. Swan (4) have given three rhetorical principles based on reader expectations: "**First**, grammatical subjects should be followed as soon as possible by their verbs; **second**, every unit of discourse, no matter the size, should serve a single function or make a single point; and, **third**, information intended to be emphasized should appear at points of syntactic closure. Using these principles, we can begin to unravel the problems of our example prose. Note the subject-verb separation in the 62-word third sentence of the original passage: Recently, however, immunoprecipitation experiments with antibodies to purified, rotenone-sensitive NADH-ubiquinone oxido-reductase [hereafter referred to as respiratory chain NADH dehydrogenase or complex I] from bovine heart, as well as enzyme fractionation studies, have indicated that six human URF's (that is, URF1, URF2, URF3, URF4, URF4L, and URF5, hereafter referred to as ND1, ND2, ND3, ND4, ND4L and ND5) encode subunits of complex I. After encountering the subject ("experiments"), the reader must wade through 27 words (including three hyphenated compound words, a parenthetical interruption and an "as well as" phrase) before alighting on the highly uninformative and disappointingly anticlimactic verb ("have indicated"). Without a moment to recover, the reader is handed a "that" clause in which the new subject ("six human URF's") is separated from its verb ("encode") by yet another 20 words.

If we applied the three principles we have developed to the rest of the sentences of the example, we could generate a great many revised versions of each. These revisions might differ significantly from one another in the way their structures indicate to the reader the various weights and balances to be given to the information. Had the author placed all stress-worthy material in stress positions, we as a reading community would have been far more likely to interpret these sentences uniformly. We couch this discussion in terms of "likelihood" because we believe that meaning is not inherent in discourse by itself; "meaning" requires the combined participation of text and reader. All sentences are infinitely interpretable, given an infinite number of interpreters. As communities of readers, however, we tend to work out tacit agreements as to what kinds of meaning are most likely to be extracted from certain articulations. We cannot succeed in making even a single sentence mean one and only one thing; we can only increase the odds that a large majority of readers will tend to interpret our discourse according to our intentions. Such success will follow from authors becoming more consciously aware of

the various reader expectations presented here (4)."

6.7. Wrong or missing preposition: Sometimes authors also miss to use proper prepositions. E.g. We met in (on) Main Street at (in) Pune.

6.8. Common Splices

6.9. Missing or misplaced possessive apostrophe

6.10. Unnecessary shift in tense: have also been reported. Poornima laughs until she cried (cries) during the class.

6.11. Unnecessary shift in pronoun: It has been experience that author also have unnecessary shift in using various pronouns, it should be avoided.

6.12. Sentence fragment is common mistakes reported in the scientific writings. It is suggested to avoid such mistakes.

6.13. Wrong tense or verb form: Sachin has broke (broken) many cricket records.

6.14. Lack of subject-verb agreement has also been reported in the scientific writings. **E.g.** A major part of my life goals have **(has)** been to go to university.

6.15. Missing comma in a series: Comma plays and important role in any writing. However, in scientific writing missing comma in series have been observed. Hence it is essential to use, wherever it is essential to communicate correctly.

6.16. Lack of agreement between pronoun and antecedent: Neither Rani nor Kavita felt that they (she) had been treated fairly.

6.17. Unnecessary comma (s) with a restrictive element is also a common practice in scientific writings, needs to be avoided, as it leads wrong meaning

6.18. Fused sentence: It has been observed that some of the authors forget to use capital letters, while starting the new sentences. **E. g.** The current was shift. he **(He)** could not swim to shore.

6.19. Misplaced or dangling modifier

6.20. Its/It's confusion: It is a common mistake in all the writings about the proper use of Its and It's due to lack of knowledge. E.g. The bus is lying on it's (its) side in the ditch. Its (It's) a white Maruti.

7. Select a Writing Mentor (Guru): A mentor is a kind of career therapist, who charges up/ downs and gives proper direction, etc. H/She also motivates, advices, supports, and reviews journals for writing style. Consequently, it is essential to identify a writing mentor to assist with thinking through and reviewing paper. It is also advisable to have discussion with the experts/ colleagues/coauthors.

8. Role of IT and Scientific Writings

Like other discipline information technology (IT) helps researchers as well as authors in several ways and means. Time has gone, when scientist has to spend his/her maximum time in literature search, collecting the relevant references from various resources. It is very difficult to elaborate all the applications of IT used for scientific writings here, however some of them are listed as below:

Research and preparation draft-calibration, measurement in various scientific equipments, etc are attached with various IT applications, which also help to get direct tables, graphs, illustrations directly. This helps in scientific writings. Internet has become a boon for expeditious and pinpointed literature search from different sources within no time, which earlier authors have to hunt different libraries and spend days to months for the same. The IT bases communication for scientific writings are: Via E-mails, choice and links: access website of journal, enter author submission area--submit new manuscript-Metadata, speed of publication, submission and peer review process, new publication formats-long, short html, pdf. Word processing job has made correction and re-correction of mistakes, spellings, shifting of paras from one place to other more easier.

9. Ethics of Publications (1, 6, 8-9)

It is essential to sort out various ethical issues (copy rights, intellectual property rights, animals used, material used for research including published and unpublished information, materials, methods, tools used from other, etc.) during the first draft only and/or simultaneously, even

before start writing, if possible. Scientific misconducts and fraud are as old as science itself. Scientific misconduct prevails in all the specialties of science and biomedicine is no exception to it. There are various types of fraud/misconducts in science reported: experimentation, statistical analysis, publications-gift authorship, inadequate research design, bias, self delusion, inappropriate statistical analysis, misdemeanours ("trimming cooking"), data Manipulation/exclusion, suppression of inconvenient facts, fraud, fabrication, falsification, plagiarism, etc.

It is suggested to quote proper references, give due credit to contributors to avoid plagiarism, research misconduct-fabrication, falsification. It is also suggested to avoid-cut and paste, from the various sources available free and freely on Internet, etc. The various ways and means to avoid above scientific misconducts one has to follow ethics of the publications and guideline suggest by various experts, associations from time to time e.g. the Committee on Publication Ethics (COPE), countries their own codes and procedure as well as guidelines for authors and editors. The various types of misconducts in publication reported are: gift authorship, duplicate/ repetitive articles, failure to publish, plagiarism, and falsification. Scientific misconduct can never be ignored. The various types and steps to avoid scientific misconduct are:

Plagiarism: It is a commonest form of misconduct in scientific writings. These are: **authorship** i.e. putting own name for the work carried out by others, **ideas:** avoiding to give proper citation/ acknowledgement for the original works written by other, **secondary sources:** cite the paper from secondary sources without reading the primary source/original article and/or quoting the same reference from one of the article read by him/her, **paraphrasing, word for word** (6. Gitanjali B p. 121-128). Hence, it is suggested to cite the original references and also take necessary permissions from all the concerns to avoid above misconducts of scientific writings. It is also suggested to include ethics of scientific writings at postgraduate level as a compulsory paper in the syllabus and conduct various workshops/training programmes on scientific writings including ethical issues. In most of the cases, (researchers as well as some guides) it is due to lack of knowledge, while in some of the cases willful.

11. Prevention and Research Misconduct:

Practically, it is very difficult, if not impossible to prevent scientific misconducts, completely. However, the same can be avoided. It has been observed that there is lack of knowledge about above matters, among the scientific community, especially researcher and students. It is guide, as mentor and senior authors have to bring to the notice of their students, colleagues about the above problems, their consequences and solutions. All the scientific, technical, medical/paramedical staff and other concerns need to be educated about the ethics of research and scientific writings. It can be done at institutional, local, national and international level, depending upon the levels of needs by organizing regular training programmes, workshops from time to time. Some of the scientific organizations have their own in house ethical and publication committees to sort out above problems. Some of the journals have started to take undertakings as mandatory about copyrights, ethical committee clearances from the authors along with the manuscript itself. The ways are: define methodology for data analysis, statistical advice, ethical approval, supervision-Standard equipments, research standard operating protocol (SOP), provision for fixing responsibility, publication disclosure- conflict of interest, previous publications, submit only one journal at a time, assume research data audit. Some of organizations have their own journal clubs/forums, where all the papers have to be presented and discussed before sending for publication.

11. Suggestions

- **Ethical:** It is suggested to follow Committee on Publication Ethics (COPE) guide lines to avoid ethical conflicts. In India Indian council of Medical research has also published important guidelines in the regard. It is recommended to solve key issues viz. Authorship, Ethical approval-use of animals, human being, Conflicts of Competing Interest: Authors-reviewers---editors---publishers, Peer Review-Open Peer Review trend to enhance quality, Redundant Publication (duplicate/triplicate)-different journals without cross reference, however, publication of an ABSTRACT, as part of proceedings is not redundant.
- **Accuracy:** Scientific writings must be accurate. Be simple and concise. It is general practice to avoid repetition of words in the same sentences. Make sure that you have communicated properly, what you mean. Be very careful with commonly confused words (effect, affect).
- **Clarity:** Write your level, which suits your audience. Use active voice, which is more clear and concise than passive voice. Use first person. Avoid dangling participles.
- **Succinctly:** Use verbs in place of abstract noun. Use strong verbs in place of "to be". Use small sentences and short words.
- **Grammar:** It is essential to the sentences, which are grammatical correct with correct spellings and punctuation marks. In case of any doubt, use standard grammar book. Although all the computers have the provision of spellchecker, but it has been experienced that they don't catch all the mistakes especially scientific words. For the correct spellings in the scientific writing, it is suggested to use medical and technical dictionaries, encyclopedias, subject headings viz biological/medical dictionaries, medical subject headings (MeSH), Biotech's Life Science dictionary, thesaurus, etc.
- Avoid unnecessary commas and other punctuation marks however wherever necessary must be use to clarify the meaning.
- Galley proof is an essential and final part of publication from author point of view, hence it is suggested to be very careful about the proof reading to see it any words out.

Conclusions

The substance of science comprises more than discovery and recording of data; it extends crucially to include the act of interpretation. It may seem obvious that scientific information is incomplete without the interpretation of the author(s). Effort has been made to make conscious to author(s) about some clues needs to be taken into consideration, while writing scientific papers. It matters, when a large number of audience read your paper. The key aspects of scientific articles can be summarized as: Introduction, Method results, Conclusions. Review with senor authors and key collaborators; write first draft and Review with senior authors, review subsequent drafts, penultimate draft sent to all coauthors, submission, reply Reviewers' Comment.

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