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Workshop Report

The basic concepts of scientific research and communication: (A Report on Preconference Workshop Held in Conjunction with the 40th Annual Conference of the Indian Pharmacological Society-2007): Pitchai Balakumar, Sreekant Murthy, Gowraganahalli Jagadeesh 303

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The 40th annual conference of the Indian Pharmacological Society (IPS) was held at the National Institute of Pharmaceutical Education and Research (NIPER), Mohali, Punjab, from November 01 to 03, 2007. The conference focused on ‘Changing Trends in Drug Discovery and Development’ and was preceded by a workshop on ‘The Basic Concepts of Scientific Research and Communication’. The preconference workshop was organized by Dr. G. Jagadeesh from US Food and Drug Administration on October 31, 2007. Below we present the proceedings of the workshop for the readers who could not attend it.

Postgraduate education and pre-/postdoctoral fellowship are important steps for becoming a scientist. Research is the original and intellectual investigation undertaken to discover, interpret, revise the knowledge and improve the understandings of any facet of science or a major subject of its specialization. It includes the generation of many ideas that lead to new or substantially improved insight with the relevance to the needs of the society. In essence, the goal of the research process is to produce new knowledge. Most postgraduate (PG) students are not exposed to the process of developing a research protocol or study design—the very first step in scientific research—before they actually delve into research. Additionally, they are not trained to communicate (oral, poster or full paper) the laboratory findings in an appropriate format. A number of universities around the globe have introduced a mandatory course, e.g., principles of research methods, principles of scientific research, experimental study designs, grant writing, etc., coupled with teaching communication skills and ethics (at the PG level) into the curriculum. There is a growing awareness in the scientific community regarding the benefits in imparting these skills before a student begins his/her first day of research. Broad-based training in the scientific methods of research and communication are essential before an individual can pursue a scientific and/or academic career.

An experiment is a well-conceived plan for data collection, data analysis and data interpretation. Consequently, PG students should learn a step-by-step developmental process to write an effective research protocol that is not overly ambitious or difficult to complete in the given time frame (e.g., 1-2 years for PG students and approximately 3 years for Ph.Ds.). The research should have the potential for success, advancing the knowledge in the field of interest and strengthening their future career prospects. Keeping this in mind, the primary aim of this workshop was to provide the understanding of basic research concepts, how to systematically develop a research protocol/proposal, how to appreciate the importance of conducting a research, researching using good laboratory practices, seek funding for research and communicating research goals, objectives and the research’s potential societal benefits.

The workshop commenced with a welcome address by Dr. P. Ramarao, the organizing secretary of the 40th annual conference of the Society and Director of NIPER, Mohali, Punjab. He stressed the importance of such workshops in building the career of young scientists. Later, the convener of the workshop, Dr. G. Jagadeesh, outlined the learning objectives of the workshop, explaining that the first part of the workshop will comprise 7 lectures discussing ‘building basic steps into research’; the second part will comprise 8 lectures devoted to the basic elements and logistics of ‘writing a scientific article’ for publication. The final aspect of the workshop, after all presentations, was the ‘panel discussion’.

There were six sessions in all with 15 presentations made by distinguished speakers from India and abroad. All the sessions were completed on time, including time for discussions after each presentation. Approximately 100 participants attended the preconference workshop. All delegates received a copy of the PowerPoint slide presentations along with a short biographical description of the speakers. In addition, supporting materials for some of the presentations were also made available to the participants.

The first lecture of the workshop was conducted by Dr. Sreekant Murthy from Drexel University College of Medicine, Philadelphia, USA. He described and correlated the five building blocks of research: ideas, objectives, rationale, hypothesis and significance. In addition, Dr. Murthy elegantly described the potential approaches toward becoming a research scientist. Following this, Dr. G. Jagadeesh from the Center for Drug Evaluation and Research, US Food and Drug Administration, Maryland, USA, spoke on writing a research protocol/proposal—a roadmap for research. His presentation dealt with defining the objectives, methodology and design of a study protocol successfully.

Dr. Murthy and Dr. Jagadeesh emphasized on a responsible conduct of the research, experiments and collection of data, writing and publishing scientific papers. From the lectures of Dr. Murthy and Dr. Jagadeesh, the participants had the opportunity to learn that the first critical step in scientific research is to identify the research problem (research question). In order to formulate a problem for study, a specific research question (a good or novel scientific idea) is essential before a study can be designed. The research question or the idea needs to be carefully evaluated and nurtured because it drives the study, and thus, the research question and the study design are the two
most important components of a study protocol. At the outset, the specific research question or researchable problem should be clearly defined. Following are the base for the formulation of the research question: (a) critical or intelligent observations made on an ongoing study in the investigator's laboratory (b) identification of a gap in research based on a literature review (on a topic or idea of study in which a researcher is interested) and adding additional important variables to define objectives and research outcome. The formulated research question should be developed into hypothesis(es). The hypothesis is tested using different designs and variables. The statistics should test the relationship specified in the hypothesis. The study design follows a set plan with primary and secondary objectives. An important point to remember here is that when the project is evaluated, the results will be compared to the objectives defined at the outset. If the objectives have not been spelled out clearly, the project cannot be evaluated. These should be described in the introduction followed by a literature review. A clearly written purpose of the study should be included with the protocol. A statement regarding the specific goal(s) of the study should be comprehended from the problem. Furthermore, how to write 'background and significance' and 'rationale' for the study were discussed.

One of the major aspects of scientific research is the statistical analysis of the obtained data. On behalf of Dr. R.M. Pandey from the All India Institute of Medical Sciences, New Delhi, Dr. Kalaivani (of the same institute) discussed the types of experimental designs and statistical methods of analysis in both clinical and experimental pharmacology studies. She explained the ways and methods of expressing data, testing the significance of data between the groups and the application of various statistical procedures based on the type of data collected such as parametric or non-parametric with various post hoc statistical analyses. On behalf of Dr. S.K. Kulkarni, Faculty of Pharmaceutical Sciences, Panjab University, Chandigarh, Dr. Asish Dhar (of the same department) presented 'Thesis: From protocol to final submission'. Dr. Dhar presented an interesting topic for PGs and Ph.Ds.: how to write and organize a thesis. He emphasized that completing any research project requires meticulous planning, execution, compilation and interpretation of data either in the form of a research paper or a dissertation/thesis.

Numerous universities/colleges lack adequate laboratory facilities and have a less than ideal atmosphere to carry out experimental studies. A number of researchers and teachers working here face tough challenges in completing their work as they struggle to secure funds for their research projects. The major reasons may be a lack of an awareness of the funding opportunities and techniques needed in preparing research proposals. Dr. C. Adithan from Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, spoke on how and where to find financial support within and outside India. Dr. Adithan presented the details for seeking financial support from various funding agencies such as ICMR, DBT, DST, CSIR, AICTE, UGC, etc. Furthermore, Dr. Adithan carefully outlined the guidelines for international collaboration for research in biomedical sciences in India. He informed that the states of Delhi and Punjab have secured the largest number of funds in the recent years from various grants-in-aid agencies. He recommended that a well-written proposal in the priority area of the concerned research organization or funding agency will have a better chance of being funded even if the investigator is a beginner. In this paper's author's opinion, the IPS should organize workshops periodically training teachers and researchers on how to write and submit grant proposals to various national agencies. This would go a long way in increasing the research productivity and visibility of Indian pharmacologists in the global arena.

How good are we? We cannot simply be good to ourselves; we should universally demonstrate our excellence. This goodness applies to our laboratory practices in preclinical studies. Dr. Y.K. Gupta from the All India Institute of Medical Sciences, New Delhi, spoke on 'Good laboratory practice (GLP)'. He stressed on the need for enforcing GLP not only for the pharmaceutical industry but also for the research laboratory and academic institutions so that the preclinical data is 'reliable and reproducible'. GLP is a quality system focused on organizational process and the conditions, under which preclinical studies are planned, performed, monitored, archived and reported. Dr. Gupta reminded everyone that until GLP is enforced as the official regulation in India, it should be in the best interest of all concerned researchers and research managers to self-impose the GLP guidelines in order to make our data globally acceptable.

The value of research outcome could be assessed by its publication in a journal of repute. However, most of researchers are naive regarding publication ethics. Dr. Raveendran from JIPMER, Puducherry, spoke on the essential topic of publication ethics. Dr. Raveendran indicated that a good researcher should know that it is unethical to submit the same article to multiple journals at the same time, not considering the guest authorship, falsify or fabricate research results, neglect toward undeclared conflicts of interest, publish the same results in multiple journals, plagiarize (stealing others ideas and contents of a paper) and use inappropriate acknowledgements. Additionally, he discussed how editors as well as peer reviewers should ethically conduct themselves when reviewing a manuscript. Dr. Perdeep Kumar of Elsevier Publishers, South Asia Division, New Delhi, enlightened the audience regarding the Journal Impact Factor. Dr. Kumar said that the impact factor is a measure of the citations to science and social science journals. It is frequently used as a proxy for the importance of a journal in its field. The impact factor for a journal is calculated based on a three-year period and can be viewed as an approximation of the average number of times the published papers are cited in the two calendar years following publication.

A successful bench work should be translated into a publishable scientific paper. The paper informs regarding the project handled right from the thought process to the answer found for the key question. Thus, writing a research paper is no easier than the research itself. The main thrust of scientific research is on publication. It is the stepping-stone for future success in the scientific career of a researcher. Writing is an organic process of planning, researching and drafting, revising and editing. Sound research, critical thinking and creative writing when combined, enables a researcher to remain competitive, opening up further opportunities for collaboration, professional growth and success. Learning how to conduct a research
fruitfully and receiving the results by publishing in a reputed journal is an arduous task, not only for a PG or a prePh.D. student but also for junior faculty members. This was stressed by Dr. Y.K. Gupta who spoke on behalf of Dr. K. Satyanarayana from the Indian Council of Medical Research, New Delhi, who was unable to attend the session. While discussing how to write a research paper, he suggested that participants prepare their manuscripts following the IMRaD (Introduction, Methods, Results and Discussion) principle, with every section supporting the main message. He described the details of selecting an appropriate title, helpful abstract, key words, running title, questionnaire for writing an effective introduction, methods to allow replication of the work performed, clear and succinct presentation of data with statistical analysis that answers the research question, and finally, a skillful interpretation of data in the manuscript.

Dr. Rakesh Aggarwal from Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, delivered two sequential research question, and finally, a skillful interpretation of data in the manuscript. He pointed out the drawbacks of the peer review process and post-publication peer review. From his own experiences as an editor for various journals, Dr. Prakash discussed the role of an editor after a peer review is complete and what referees specifically do in reviewing a manuscript.

After all 15 presentations, panel discussion began that included all speakers and a few invited senior professors. It was moderated by Dr. G. Jagadeesh. The discussion was aimed at current procedure followed by us, the process that can be initiated and probably adopt with respect to ‘developing a research question and then writing an effective thesis proposal/protocol’ by PG students and Ph.D. candidates. The moderator illustrated the objectives for discussion as provided below:

1. Discuss communication/interface between the research student and the guide in developing a project.
2. Contribution of a research student in literature search and developing an idea.
3. Writing the protocol, who does what?

Based on this, Dr. Jagadeesh asked the following questions to the panelists, in sequence with time for receiving questions/suggestions from the participants and panelists.

1. How much training does a PG student need to develop and write a research/proposal or protocol?
2. What is the role of a guide in imparting research concepts to a PG student?
3. Should there be courses such as ‘Research methods, Scientific writing, Ethics’, (nonbinding) in each and every University departments/colleges?

All participants were excited about this meaningful workshop and shared their personal experiences on the types of research activities and publications undertaken by them. It was evident that the audience enjoyed themselves and had a good grasp of the issues discussed in each presentation as they actively contributed to the panel discussion. Dr. G. Jagadeesh distributed tokens of appreciation for participants, who made critical suggestions to make further improvements based on the abovementioned questions. This session lasted for 90 min and conclusions were obscure; hence, the details of discussion have not been reported here.

Toward the end of this workshop, the participants had the general understandings on various steps involved in developing a research protocol/proposal, including identifying a research question/topic to writing objectives, developing a hypothesis and understanding the typical format and elements of a study protocol and their importance in driving the study to completion. In addition, they gained insights into data analysis and thesis synthesis. The participants also learned the anatomy of a research paper (IMRaD) that included writing an effective title and abstract. The participants had the opportunity to acquaint themselves with the language and style in writing a research paper and realized that writing references either for a thesis or for a publication is not a casual task. It was stressed by most of the speakers that a casual approach in manuscript writing may also reflect a casual approach in experimental work. Finally, the participants had an opportunity to learn...
various aspects of scientific ethics. Overall, the preconference was extremely beneficial to students, teachers and emerging researchers. The audience used the feedback evaluation form to rate their experiences regarding the scientific content and quality of presentations as 'very satisfactory to satisfactory'; all participants agreed to attend such workshops organized in future frequently, at zone and state levels. The participants noted that the program was very hectic (since 15 presentations were delivered in <8 h) and requested to increase the duration of the program as well as discussion.

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