

Innovations in Orthopaedics: Hypothesis to publication

Medicine is a science of diagnosing, treating, or preventing disease and damage to the body or mind. Medical invention would be any instrument, machine, and implant or treatment method, which is useful in diagnosis, treatment, or prevention of disease. Any innovation in medicine requires an out-of-the-box thinking which is evidence-based to provide pain relief economically to one and all.

Medicine has evolved based on scientifically evolved innovations. The practice of medicine is an art transformed from an art based on belief in supernatural force to an art based on science. This art is learnt by observations of talented physicians and by practice. Medicine is an artistic application of knowledge based on scientific research. More and more knowledge based on scientific research for diagnosis, treatment, and prevention of disease will reduce guess work to achieve cure of pain.¹

Medicine evolved in different parts of the world as Modern Medicine in Europe, Chinese medicine, and Ayurveda in India. Ayurveda evolved from ongoing body of practical medical experience passed down orally through numerous generations until eventually it was written down as Sushrut Samhita (1st century BC) and Charak Samhita (1st century AD). It was based on a combination of empirical treatment and erroneous religious and philosophical assumptions. It was far ahead of western medicine particularly in surgery. Modern Medicine also evolved from a long prescientific stage of development, but clinicians continued to apply scientific principles. The concepts based on superstitions with no genuine medical foundation were discarded. This is something Ayurveda never did, hence it remained in original prescientific stage while western medicine advanced. That is the reason today medicine means western medicine and Ayurveda and Chinese medicines are alternative medicine.

Medicine is a biological science. The biology is never stationary. Human beings have evolved from one cell.

The medicine has also to evolve. The perfect example is antibiotics. Whenever a new antibiotic is introduced, in no time bacteria evolve and develop resistance.

We need innovations to find out solutions of our clinical problems and of others. Two-thirds of the world population are from low- or middle-income countries where there exists an imbalance in patient load and available infrastructure. Consequently, a huge number of patients do not get elementary health facilities. As a result, some get no treatment initially, while others get substandard treatment, producing neglected clinical problems. We get a huge number of patients of fresh fractures, neglected fractures, and also all spectra of complicated clinical cases.

The practice of medicine in India was guided by the West and it worked well till the middle of the 20th century. But now there is a huge disparity in disease profile. The West do not have to conduct research for our clinical problems. We have to find out solutions to our clinical problems as well as devise cost-effective treatment to one and all.^{2,3} This is made possible only by methodologically conducted scientific studies.

Scientific communication may be oral/poster presentations or publications.⁴ They are needed for growth of science and improve the quality of clinical practice. We ask a question every day to ourselves after coming out of operation theater, “Could I have done better?” Then we start analyzing our performance in a particular case. This is outcome evaluation. When the evaluation is done on scientifically well defined criteria in a series of cases, it makes our clinical performance predictable and with fewer complications. In the process, we may suggest new protocols, steps, change of procedure, document complications, and that is “research.” Research is something that is searched again.

There are four level of research. The first level is “Thesis” done to train the postgraduate students to conduct research. As it is a small-scale investigation, results are seldom conclusive. The second level is “Doctoral dissertation” which is a detailed disclosure on a particular topic done with limited institutional resources, hence rarely makes headline. The third level is research done “at the level of institution,” which is a topic of discussion among the researchers and commands respect and sometimes changes the way medicine is practiced. The fourth level is “multicenter study” done on a common protocol. The pooled observations

Access this article online	
Quick Response Code:	Website: www.ijoonline.com
	DOI: 10.4103/0019-5413.104182

likely give reliable conclusion at a national or international level and produce path-breaking results.⁵ The basics of all types of research are the same. Once a research is done, it can only be retrieved beyond human life if it is published, which in turn becomes a basis for future research, and that is how medicine evolves.

The objective of evidence-based practice is to give the best available evidence for our clinical problems. The studies are placed at five levels, with randomized control trial (RCT) and meta-analysis as level I (best evidence), prospective cohort study as level II, case control studies as level III, retrospective case series as level IV, and opinion as level V.⁶ In RCT, we take a group of similar clinical problems and give two types of treatment by randomly choosing the patients in each group. Thus, it gives evidence for the best treatment protocol, provided patients in both groups are identical, randomly allocated, and the researchers have equal competence to provide two types of treatment. This is done forward in time. Not every clinical situation can be randomized as sometimes it is unethical to randomize the patients and we not have adequate number of patients with similar clinical picture. There may be a differential expertise to execute two types of treatment and this type of study requires big research group. Poorly done RCT is more harmful, hence we need to be very methodical while conducting RCT.

Prospective cohort studies are also done forward in time. Here also, a series of patients are exposed to two types of treatment and outcomes are compared. Case control studies are done backward in time, where a group of patients with a particular complication or outcome are retrospectively analyzed for some prognostic factors and are compared with a group of similar patients without those complications (control) to define prognostic factor.

Retrospective case series are most commonly performed and sent for publication. Once a research question is defined, all cases of similar kind treated or operated are retrospectively reviewed. The limitation of this type of study is that a large number of similar patients are treated or operated, but a small number are reviewed. This may create a situation where a good outcome may be reported while bad results have not been evaluated, hence the results are skewed. Similarly, it being a retrospective evaluation from the record, all information may not have been recorded when patients were initially treated. Even then, 80–90% studies are retrospective case series. The advantage of this hierarchy of evidence is to differentiate studies with the least bias (level I) from those with the highest bias (level V) to provide the best evidence.

Any study which has a clear research question, what is evaluated, how it is evaluated (basis to say good or bad), what is observed, whether the observation difference is

significant or not (statistical method), and conclusion (which is the answer to the research question) is publishable. The paper which is presented in a manner that it is understood by reviewers and editor has the best chance of being accepted for publication. The premise in the paper should be accepted by the reviewers. The articles are not rejected by the editors. The editor's job is to choose a suitable peer for a particular article and oversee any conflict of interest on the part of peer or if the peer missed a vital point; if all is well, then editors remove the redundancy in the article and make it more presentable.

The manuscript written in a crisp and concise manner, concentrating all segments of manuscript (introduction, methods, results, and discussion sections) to the specified research question is the one which has the best chance of being accepted by the peers.

Before writing a manuscript, the prospective author should be well aware about the instructions to author available on website of a journal in which the author intends to publish. The submitted article should be written as per the content and style of the journal. Introduction should not be more than 25% of the length (500–700 words) of the paper. It should cover the current state of knowledge on the subject and lacunae in the current knowledge. The introduction should end with the statement as to what is the study about and its methodology (research question).

Materials and Methods is the most common cause of rejection. It should be written so well that any reader can perform the study after reading the methods section. For an experimental study, all the details about selection of animals, number of animals, selection of variable, tests conducted, and observations made should be given. For a clinical study, we must include period of study, place of study, design of study, number of patients chosen, details of power study if undertaken, and inclusion and exclusion criteria. If randomization is done, how it is done, selection of outcome scores with appropriate reference for the scores, details of measurement taken and who took the measurement should be included. If it is a case control study, it should contain information on how the controls were chosen. It must include Ethical Committee approval for a clinical study and institutional animal welfare committee approval for an experimental study. The results section should be of 500–750 words and should be written in a clear and concise manner with appropriate tables and figures. The facts and figures should match with those in materials and methods section. The patients who have lost to followup or have died should be identified.

Discussion should include the meaning of your results in terms of original research question and point out a biological difference. Relate them to other studies and suggest further

work and limitations of the study. In the end, one should give a succinct conclusion. The repetition of data of results section in discussion and preferential citing of previous work should be avoided.

The abstract should be written in the last. It is the most commonly read part of the manuscript. It stimulates authors to read the full paper. It should be divided into four parts with a statement of the purpose of the study, what was done, what was found, and what was concluded. The title should be crisp and should raise curiosity among the readers. The references should be collected from standard textbooks or monographs and standard indexed journals. The references are listed in (a) Harvard method or (b) Vancouver method. In Harvard method, the references are arranged alphabetically and given as author name and year of publication in brackets. The Vancouver method is the most commonly used. The *Indian Journal of Orthopaedics* uses Vancouver method where references are cited consecutively in the text by numerals in brackets. When tables are used, they should be numbered with a clear title of the table. The graphs and histograms are required to highlight some observations which are difficult to write and easier to understand. The photographs selected should show specific findings. They should be numbered with proper legends. Each and every photograph must highlight an observation. The journals are not photo albums. Neither they test the integrity of authors.

The polishing of an article makes it crisp and removes redundancy. The article can be polished by any other surgeon who was not part of the study. The reading of manuscript by its author 3 weeks after the initial writing will make the author himself to shorten it significantly. One should avoid slang or words never heard of. The authors should be watchful while using the references. They should avoid the use of other's work, ideas, images without citation or representing the work of others as being their own work (plagiarism).

Every experience into patient care should be translated into research. We should start documenting each and every patient and every event of the patient on electronic database. Once such data is collected, lots of thoughts will start fleshing the thinking mind for retrospective and prospective research question. Such record maintenance will help in generating evidence for any clinical research question.

The objective of such write up is to bring about a change in the mindset that research is nothing but a summation of critically well thought conclusions about the outcome of treatment we offer to the patients everyday and well thought innovations we undertake, which we have been doing since time immemorial. The only change now is we wish to do it at a faster pace and ensure that it is retrievable beyond human life, because I personally believe that in orthopaedics India can lead the world.⁴

Indian Journal of Orthopaedics is published in 6 issues with a capacity to print 1500 pages per year. Currently we publish 600–700 pages per year. Rests are available to be used as author. The best reviewers are those who face particular clinical situations. The clinical problems that are faced are peculiar to us, and hence the solutions required will be innovative. So, we are the best reviewers for our clinical problems. By reviewing the manuscript, the writing skills also improve. In nutshell we have to translate all our experience of clinical practice into published research to solve our clinical problems and explore new horizon in orthopaedics as living biology is our strength.

Anil K Jain

Department of Orthopaedics, University College of Medical Sciences and GTB Hospital, Delhi, India

Address for correspondence: Dr. Anil K Jain,
Department of Orthopaedics, University College of Medical Sciences and
GTB Hospital, Delhi, India.
E-mail: dranilkjain@gmail.com

REFERENCES

1. Jain AK. Orthopedics: Can India lead? *JIMSA* 2011;24:7-10.
2. Jain AK. Orthopaedic services and training at a crossroads in developing countries. *Indian J Orthop* 2007;41:177-9.
3. Jain AK. Research in orthopaedics: A necessity. *Indian J Orthop* 2009;43:315-7.
4. Jain AK. Scientific communication. *Indian J Orthop* 2007;41:1-2.
5. Indrayan A. Elements of medical research. *Indian J Med Res*.2004;119:93-100
6. Petrisor B, Bhandari M. The hierarchy of evidence: Levels and grades of recommendation. *Indian J Orthop* 2007;41:16-22.

How to cite this article: Jain AK. Innovations in Orthopaedics: Hypothesis to publication. *Indian J Orthop* 2012;46:605-7.

Source of Support: Nil, **Conflict of Interest:** None.