Anaesthesiology encompasses knowledge of probably all sub disciplines of modern medicine especially with the inclusion of critical care and pain. Despite the available avenues for research in our country, sadly, the output has not been so encouraging. It is not that the will is lacking, but probably there is a lack in the direction to research. The need of the hour is to delve into these challenges and to provide an outline to improve the research in anaesthesiology as medical science is ever-evolving.

If, it were the ‘six honest serving men’ that taught Kipling ‘all he knew’ (What, Why, When, How, Where and Who), there can be ten essential ‘T’s’ that impart impetus to research in anaesthesiology.[1] These include: Team, Timeliness, Therapeutic necessity, Technology, Techniques, Tenor, Tabulation of data, Tests, Transparency and Teaching and Training. These ten ‘T’s’ form the very basic foundation of a good research activity.

Team
A lone soldier cannot win a war! The expanded meaning of ‘TEAM’ (together everyone achieves more) itself conveys everything and is one of the most important facets of any research activity. Right from the conception and design of the study, defining the intellectual content, literature search, forming the protocol to conducting clinical/experimental studies, acquisition and analysis of data requires time and aptitude. It is nearly impossible to do it alone; neither does one have all the expertise. This is followed by preparation of the manuscript, revision and final draft before it can be submitted to a journal. Apart from the core group of people actively involved in the research, help is invariably obtained from colleagues and ancillary workers who may not be direct contributors but provide an invaluable input without which the research would have been incomplete. It is therefore imperative to acknowledge all these contributors either as authors, order of which may be decided by the team itself or as indirect contributors in the acknowledgement section.

This cannot be better exemplified than the formulation of the ‘ISA Fasting and Feeding Guidelines’ which are being published in this issue of the Indian Journal of Anaesthesia (IJA).[2] All the authors have collectively worked hard in formulating plans and policies, collecting the evidence, analysing the data and details as well as discussing numerous times about each and every minute detail of these guidelines so as to arrive at an appropriate evidence-based document. These guidelines have comprehensively covered everything based on the strength of evidence for each and every frequent query related to fasting and feeding instructions before surgery in various subsets of population.[2]

Timeliness
This is perhaps the second most important aspect of research. Nothing else can underlie the importance of being first. The classical example is that of Marconi and Jagdish Chandra Bose who discovered the radio almost simultaneously with the former taking credit because of an earlier patent. This also underlies another fact- the duration allotted for a particular research. Too long a duration may cause it to be redundant due to a change in technology or worse, nature of the disease, whereas, too short a duration may not result in a meaningful result.

Though lesser in importance to timely prospective studies, occasionally retrospective studies can be very useful in delivering the message and help in formulating strategies and policies to counter the challenges enhancing morbidity and mortality. These studies can be completed in a very short time but they
lack the evidence-based advantages of prospective and interventional studies. A retrospective study being published in the current issue of the IJA aims to predict the various factors responsible for maternal mortality by utilising the World Health Organisation (WHO) near-miss approach and maternal severity scores. The message delivered by the study is very clear as they found out that haemorrhage is the leading factor leading to higher maternal mortality and the maternal severity score is very much reliable in risk stratification of maternal morbidity and predicting maternal mortality.[3]

The coronavirus disease (COVID)-19 pandemic has tremendously increased the pace of research projects on COVID. There is a change over from the time-consuming face-to-face data collection to shorter voice calls, SMS messages, electronic mails and web meetings. Research has thus, all of a sudden, changed its form.

Timeliness also refers to an intervention being stopped if it is causing more harm than benefit during the trial itself. Thus, reviewing and re-reviewing of an intervention is an important aspect of any research activity.

It is worth mentioning here, that just when the anaesthesiologists of our country were in a state of dark uncertainty and tremendous anxiety with the advent of the COVID-19 pandemic, our very own organisation, the Indian Society of Anaesthesiologists (ISA) and many others came up in time with their awareness articles, position statements and consensus guidelines.[4-6] Many innovative and timely interventions have been advised in these documents. Several other organisations are currently publishing guidelines for use during COVID times; in fact the IJA had to launch the May 2020 COVID supplement to accommodate the COVID-related research material. However, one must remember that haste makes waste. No guidelines should be framed in a hurry and without following proper protocols. Taking into consideration the global impact of recently retracted articles from internationally reputed journals, the researchers should be refraining from proposing and carrying out fictitious and meaningless research so as just to be pseudo- pioneers of a ‘timely’ study.

Therapeutic necessity

Research in any subject should be guided towards a clinical goal. Broadly speaking, there can be three results: benefit, harm or no effect. While most of the research is focussed on the former, or in terms of statistics, a positive result, negative or no result is equally important. However, it is not the statistics that make a research meaningful, but the clinical applicability of the results. The first step in planning of a research is why. Why is this research required? What are the gaps in knowledge? How is it to be planned? Who is the intended/target population? Which equipment/techniques would be required or need to be investigated? And lastly, when?

Therefore, it is necessary to identify the gaps in knowledge, challenges for a particular event or procedure, limitations with respect to technology and resources available, collaboration required and the spectrum involved. Although, timeliness in terms of initial evaluation after development of an equipment or technique matters, certain evidence needs to be revisited with changes in technology and environment.

Neuraxial blocks have always been challenging and the disparity in clinical efficacy and varying patterns of blockade is well documented in scoliotic patients. Such gaps in our knowledge base do create the need for a therapeutic intervention so as to have a better understanding of the pathophysiological process during the intervention. A good example of a study designed to do this is being published in this issue. The authors of this study tried to find out the disparity in spread of drug in the cerebrospinal fluid based on Cobb’s angle and the thoraco-lumbar spine curvature.[7] The results were remarkable as they concluded that most failed spinal blocks were due to right-sided curvature of thoraco-lumbar curve and a higher Cobb’s angle. These small responses to therapeutic needs can pave the way for better future research projects.

Technology

Advancements in surgery have led to a corresponding change and increased use of technology in the field of anaesthesiology. A corresponding development in the field of biotechnology has changed the face of anaesthesia. Right from the era of direct laryngoscopy to video-laryngoscopy and even robotic intubations, nerve blocks initially blind, later stimulator-guided and now under direct vision of ultrasound, from fibreoptic to video endoscopes, changes have been especially rapid in the last decade.

The robotic surgery is bringing a new revolution in the surgical sphere and the anaesthesia specialty is
also keeping a good pace with it. A comparison of restrictive fluid therapy versus liberal fluid policy with estimation of intraoperative lactate levels in patients undergoing robotic colorectal surgeries has been meticulously done in another interesting study by Kumar et al. being published in this issue. The authors are in favour of restrictive fluid therapy as it does not increase levels of lactate or creatinine apart from improving the surgical field and shortening the stay in the intensive care unit (ICU).[9]

Research should, therefore, incorporate the technological advances especially if they have been found to be superior to the conventional techniques. Although these technological advances may not have penetrated to every corner of the world, research in terms of conventional techniques is rendered redundant in the global scenario. The advent of ultrasound has made many anaesthesia and critical care procedures safe, especially the regional blocks. A study which aptly exemplifies this adorns this current issue of the IJA. The authors of this study have meticulously utilised the technological aid provided by ultrasonography in administering the quadratus lumborum block for alleviating the post-operative pain in patients undergoing renal transplant. A reduction in opioid consumption and a higher patient satisfaction resulted from the help of technology in this research process.[9]

Techniques
Thanks to the direct visualisation of the anatomy with ultrasound, newer and safer blocks are being introduced and replacing the need for general anaesthesia and making great strides in the management of chronic pain. Also, along with the changing technology, the techniques of providing anaesthesia are being improved upon with an increasing armamentarium of drugs and devices. As our understanding of the mechanism of drugs producing anaesthetic effects is increasing, newer techniques are emerging. Total intravenous anaesthesia (TIVA) has given way to inhalation-based anaesthesia and with increasing evidence of side effects of opioids, use of opioid-free anaesthesia and even opioid-free TIVA is emerging. A relatively new combination technique has been used by the authors of a study which is being published in this issue of the IJA. This combination technique of TIVA with Tumescent Infiltration Anaesthesia (TIA) was used in burn patients who underwent excision and skin grafting and had a very remarkable homeostasis and early recovery.[10]

A study by Bhardwaj M et al. in this issue aims to highlight the three techniques of insertion of i-gel placement namely, standard, reverse and rotation in relation to the primary outcome of mean time of insertion and to compare other secondary variables such as ease of insertion, success rate in first attempt, any particular manoeuvre required, oropharyngeal leak pressure, etc., and to see if any complications occurring with any of the techniques. The results indicated that reverse technique may have few advantages over the other techniques, but it is the comfort level and experience of the investigator which is decisive in the choice of technique.[11]

With the help of technology, even techniques can be refined thus taking them to safer altitudes. This issue of the IJA has a study on USG guided infraclavicular brachial plexus block technique through four approaches in cadavers; all four approaches had a mix of advantages and demerits. The authors have emphasised that it is not only the needle tip that is important alone but the vicinity of structures throughout the entire length of the needle must be taken care of during the block procedure thus enhancing the safety of the procedure.[12]

The focus of research should therefore be in the development and refinement of newer techniques of anaesthesia and analgesia.

Tenor/Temperament
Words can be like X-rays if you use them properly — they’ll go through anything. You read and you’re pierced! The importance of this ‘T’ cannot be overemphasised. It is often said that the pen is mightier than the sword, and it is true how you present your ideas to the world through the written word. The tone of the article has to be scientific, evidence based and provides an impartial analysis of what the results show. Opinionated, biased, authoritative and self-encompassing language is not only undesirable but detrimental. It is but human to err. Limitations should be accepted and a future direction be forwarded to carry on the legacy. An idea is not the end of research. It is but like a door of opportunities which leads to many other doors. Keeping this door locked or the key to yourself is the worst hindrance to further research!

Tabulation of data
Gone are the days of ‘All that glitters is not gold’! The more attractive the product, more it sells. Similarly, presentation of data in tables, graphs and illustrations
enhance the visual of the manuscript and prompts a better understanding of the research. Nowadays, it is just not the data which is to be graphically represented, but the entire study is summarised as a graphic so that the essence may be grasped at a glance.

At the same time, data and statistics are better understood when compared next to each other rather than in text. Thus, it is always better to represent the essential elements of a study in a graphical format.

All the original articles being published in this issue have meticulously expressed the data in a concise and compact manner which makes it easier for the reader to understand the statistical details of the study.\[3,7-13]\n
Tests

Facts are stubborn things, but statistics are pliable! It is often joked that anything can be proven by statistics. Just like words, figures can be twisted to say what the researcher wants rather than what the experiment proves. The most common error in this regard is the beta error. Without an adequate sample size, studies are carried out, and the results generalised. Often, apples are compared to oranges, and means provided instead of medians, because they prove the hypothesis. It is essential to be pragmatic rather than work on a fixed idea or belief. This attitude certainly defies the very need for evidence. Appropriate statistical tests should be applied and importance should be laid not only on the statistical but also the clinical significance of the results.

Most of us often find this the most burdensome, troublesome and difficult aspect of conducting research. This has been beautifully explained by Ernest Rutherford- “If your experiment needs a statistician, you need a better experiment.”

Transparency

‘There is not a crime, there is not a dodge, there is not a trick, there is not a swindle, there is not a vice which does not live by secrecy.’ Since times immemorial, research has been synonymous with secrecy. Not anymore! Research nowadays encompasses a full disclosure to the participant, the institute and the lay person even before the first participant can be recruited.

The process starts with the formulation of a research protocol. An important step in this regard to enhance the study design and maintain transparency is to follow the guidelines for reporting as laid down by the EQUATOR network.\[14]\ This is followed by presentation of the research protocol to the institutional ethical committee. The committee scrutinises the research methodology and ethical issues involved including the risk-benefit ratio and usefulness of the research. The responsibility is increased if grants for research have been received especially from the pharmaceutical companies.

The next step involves the registration of the study protocol in a public registry such as clinicaltrials.gov (USA) or the clinical trial registry of India (www.ctri.nic.in). The registration is mandatory at present for all randomised controlled trials or experimental studies prospectively, that is, before the recruitment of the first participant. This entails a stepwise elucidation of the research methodology and protocol to be followed, the characteristics of the participants, intended benefits and expected harms, with a liability to full participant disclosure and compensation in case of harm to the participant.

This is followed by a full written informed disclosure and consent of the participant. The results/sub analysis and unexpected events, adverse effects should be communicated to the concerned committee at regular intervals. The same should then be followed while submission of the manuscript for publication.

With increasing incidence of data fraud, duplication and fabrication, many journals now ask for the raw data to be provided as a linked file so that the data can be analysed in the future. With the number of retractions increasing by the day, data sleuthing, which started as a hobby for some may indeed blossom into a full-blown career unless we maintain transparency in research.

Since the last few years, the IJA is publishing original articles which are registered in clinical trial registers (CTRI in India) irrespective of the type of the study. This ensures transparency to a larger extent. In the long run it will definitely minimise retractions after publishing. This criterion certainly needs to be applied by every journal to improve transparency in research.

Teaching and training

Conducting research is an acquired skill. Submission of thesis as a part of speciality examination is the first introduction of a medical graduate to research methodology. These skills are acquired by the concerned supervisor and the departmental environment. It was
therefore deemed necessary to impart basic knowledge in research methodology by the Board of Governors in supersession of the Medical Council of India. This was materialised by a basic course in biomedical research which was made mandatory for the new post-graduate students and supervisors. While this may provide the first step of the ladder, regular workshops in research methodology and biostatistics are required for training of students and trainers. Apart from this, there should be regular workshops conducted for ethics and requirements and publishing of research, so that the ideas and knowledge may be disseminated to as many as possible.

We are sure that these ten ‘T’s would be helpful in guiding the formulation of upcoming research projects or in reinforcing the existing projects into meaningful publications. The ten ‘T’s of research can be likened to the ten reincarnations of Lord Vishnu. Just like how these ‘dashavatars’, meaning ten forms, protected and preserved the human race, these ten ‘T’s of research can certainly protect and preserve quality and quantity in research which is an urgent need of the hour.

Sukhminder Jit Singh Bajwa, Nishant Kumar*, Lalit Mehdiratta*

Department of Anaesthesiology and Intensive Care, Gian Sagar Medical College and Hospital, Banur, Patiala, Punjab, *Department of Anaesthesiology and Intensive Care, Lady Hardinge Medical College and Associated Hospitals, New Delhi, †Anaesthesiology, Critical Care and Emergency Medicine, Narmada Trauma Center, Bhopal, Madhya Pradesh, India.
E-mail: sukhminder_bajwa2001@yahoo.com

Submitted: 22-Jun-2020
Revised: 22-Jun-2020
Accepted: 22-Jun-2020
Published: 01-Jul-2020

REFERENCES

1. Six honest serving men’, by Rudyard Kipling. [Last available from: kiplingsociety.co.uk/poems_serving.htm]. [Last accessed on 2020 Jun 21].
2. Dongare PA, Bala Bhaskar S, Harsoor SS, Garg R, Kannan S, Goneppanavar U, et al. Perioperative fasting and feeding in adults, obstetric, paediatric and bariatric population: Practice guidelines from the Indian Society of Anaesthesiologists. Indian J Anaesth 2020;64:556-64.
3. Magar JS, Rustagi PS, Malde AD. Retrospective analysis of patients with severe maternal morbidity receiving anaesthesia services using ‘WHO near miss approach’ and the applicability of maternal severity score as a predictor of maternal outcome. Indian J Anaesth 2020;64:585-93.
4. Bajwa SJ, Sarna R, Bawa C, Mehdiratta L. Peri-operative and critical care concerns in coronavirus pandemic. Indian J Anaesth 2020;64:267-74.
5. Malhotra N, Joshi M, Datta R, Bajwa SJ, Mehdiratta L. Indian society of anaesthesiologists (ISA National) advisory and position statement regarding COVID-19. Indian J Anaesth 2020;64:239-64.
6. Malhotra N, Bajwa SJ, Joshi M, Mehdiratta L, Trikha A. COVID operation theatre- advisory and position statement of indian society of anaesthesiologists (ISA National). Indian J Anaesth 2020;64:355-62.
7. Ballarapu GK, Nallam SR, Samantaray A, Kumar VA, Reddy AP. Thoracolumbar curve and Cobb angle in determining spread of spinal anaesthesia in Scoliosis. An observational prospective pilot study. Indian J Anaesth 2020;64:594-8.
8. Kumar L, Kumar K, Sandhya S, Koshy DM, Ramamurthi KP, Rajan S. Effect of liberal versus restrictive fluid therapy on intraoperative lactate levels in robot assisted colorectal surgery. Indian J Anaesth 2020;64:599-604.
9. Sindwani G, Sahu S, Suri A, Sureka S, Thomas M. Efficacy of ultrasound guided quadratus lumborum block as postoperative analgesia in renal transplantation recipients: A randomized double blind clinical study. Indian J Anaesth 2020;64:605-10.
10. Salgaonkar SV, Jain NM, Pwar SP. Total intravenous anaesthesia with tumescent infiltration anaesthesia without definitive airway for early excision and skin grafting in a major burn -A prospective observational study. Indian J Anaesth 2020;64:611-7.
11. Bhardwaj M, Singhal SK, Rashmi, Dahiya A. A prospective randomized trial to compare three insertion techniques for i gel™ placement: Standard, reverse, and rotation. Indian J Anaesth 2020;64:618-23.
12. Sivapurupu V, Bhat RR, Vani NI, RajeshJl, Aruna S, Paulose DT. A cadaver study of four approaches of ultrasound guided infraclavicular brachial plexus block. Indian J Anaesth 2020;64:624-30.
13. Thomas AS, Moorthy RK, Raju K, Lakshmanan J, Joy M, Mariappan R. Measurement of noninvasive blood pressure in lateral decubitus position under general anaesthesia — Which arm gives more accurate BP in relation to invasive - BP dependent or nondependent arm? Indian J Anaesth 2020;64:631-6.
14. Available from: www.equator-network.org. [Last accessed on 2020 Jun 22].