

# Anaesthesia Residency Manual

Strive for excellence

Prof. (Dr) Raveendra Ubaradka S  
Prof. (Dr) Nalini Kotekar



BlueRoseONE.com  
Stories Matter

© Prof Dr Raveendra Ubaradka S, Prof Dr Nalini Kotekar 2022

**All rights reserved**

All rights reserved by author. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the author.

Although every precaution has been taken to verify the accuracy of the information contained herein, the author and publisher assume no responsibility for any errors or omissions. No liability is assumed for damages that may result from the use of information contained within.

First Published in March 2022

**ISBN: 978-93-5611-371-8**

**Price:** INR 600

**BLUEROSE PUBLISHERS**

[www.bluerosepublishers.com](http://www.bluerosepublishers.com)

[info@bluerosepublishers.com](mailto:info@bluerosepublishers.com)

+91 8882 898 898

**Cover Design:**

Geetika

**Distributed by:** BlueRose, Amazon, Flipkart

**Prof. (Dr) Raveendra Ubaradka S, MD, DNB**

Consultant Anaesthesiologist

Jerudong Park Medical Centre, Brunei

Former Prof & Head, Department of Anaesthesiology

K S Hegde Medical Academy, Nitte University, Mangalore

Founder Secretary, All India Difficult Airway Association

Email: [profusr@gmail.com](mailto:profusr@gmail.com)

**Prof. (Dr) Nalini Kotekar, MD, DA**

Senior Consultant, Dept of Anaesthesiology,

Kamakshi Hospitals, Mysore

Former Professor and Head, Department of Anaesthesiology

JSS Medical College, Mysore

Email: [nalinikotekar@gmail.com](mailto:nalinikotekar@gmail.com)

## Anaesthesia Resident's Oath

I will become an anaesthesiologist of excellence. I will make use of every day and every moment of training to the best of my abilities. My training is not only for my personal growth, but also for the benefit of the society of which I am part of.

Sincerity and commitment to my work and care of my patients will be given top priority. I will treat my patients with care, compassion, and empathy.

The department in which I am studying is my temple and my teachers are my Gurus in the true sense. I will never betray their trust in me.

## This book is dedicated to

1. all our most respected teachers who taught us the art and science of anaesthesia
2. the great anaesthesia teachers of the past and present
3. anaesthesiologists, who, by their clinical excellence have made us proud
4. dear professional colleagues and friends, seniors, contemporaries and juniors
5. our former residents, interactions with whom helped us to realize the need for this book
6. present and future anaesthesia residents who are the future torch bearers of this specialty
7. our families for their unstinted support
8. anaesthesia assistants/ technicians who are invaluable part of anaesthesia teams
9. our surgical and nonsurgical colleagues for their constant and constructive support
10. our patients, without whom we have no existence

I seek the blessings of my parents, late Sri U Shankaranarayana Bhat and late Smt Venkateshwari.

I am overwhelmed by the memories of my association with, guidance and affection I received from Late Prof Mrs. V VGangal, my HOD during residency and a universal mother to all of us, late Prof S P N Thota, a legend in anaesthesia from Manipal University, Late Prof P N Viswanathan, Prof Radha, Prof T A Koshy and Brig S P Mehtha. None of them are with us today, but their blessings are.

**Prof. (Dr.) Raveendra Ubaradka S.**

## Gratitude

I bow with gratitude to Almighty for blessing me with the ability to transform a set of unique concepts and ideas into an organized book. It is more than a coincidence that I got the unconditional support and involvement of Prof Nalini Kotekar, senior professor and a renowned teacher, in the entire “journey” of this book writing. I remain grateful to madam for being the co-author of this book.

This book has been written while working in Jerudong Park Medical Centre (JPMC), Brunei Darussalam, a country which I consider as my second home. The excellent working environment and association with highly respected and dedicated colleagues was conducive to writing of the book. It is my privilege and honour to acknowledge the support and guidance from Dato Dr Hj Md Isham Bin Hj Jaafar, Executive Director, JPMC, Honourable Minister of Health and a reputed cardiothoracic surgeon, Dr Meera Sahib Kabeer, Medical Director and Anaesthesia Head, Dato Dr N Ravindranathan, a visionary leader, Maxillofacial and Facial Reconstructive surgeon of international repute and one of my mentors, my colleagues in the department of anaesthesia and the management of JPMC. Timely suggestions from my colleagues, Prof Manjunath Prabhu, Dr Ramesh prabhu, Dr Basavaraj, Dr Gautam Mehta, Dr Suganya and Dr Bala were very useful. I thank them all.

While writing a book on an abstract theme such as this, ideas are often initially vague and need refining and fine tuning based on the inputs from various sources. Many of my colleagues and friends have immensely contributed to the chapters and given constant feedbacks. My heartfelt thanks to Prof Sriganesh Kamath (NIMHANS), Prof Bidkar Prasanna (JIPMER), Dr Nishkarsh Gupta and Dr Anju Gupta (AIIMS, New Delhi), Prof Debendra Tripathi, (AIIMS, Hrishikesh), Dr Vinayak Pujary, Bangalore, Dr Sarika M Shetty, Dr Praveen Kulkarni, Dr Darshini, all from JSS University, Mysore and Dr Shivakumar Kambar, a renowned medicolegal specialist and interestingly my batchmate during residency. Each of them has made significant contributions to this book. My special thanks to Dr Vyshnavi S (JSS University) for helping to edit the chapters and herself contributing few chapters. She has provided invaluable inputs on several occasions during writing this book.

I remain grateful to Prof Naveen Malhotra, senior professor and Head of Anaesthesia, PGIMS, Rohtak and Secretary, ISA, for kindly writing a forward to this book. Similarly, my gratitude to Prof Ramkumar V, Editor of Airway journal and Trustee Operation Smile, Prof J V Divatia, Tata Memorial Hospital, Pune, Dr J Balavenkatasubramanian, Ganga Hospital, Coimbatore, Dr Yatin Mehta, Adjunct Professor, Medanta Institute of Critical Care and Anesthesiology, Gurgaon, Dr Saikat Sengupta, Sr Consultant at Apollo Hospitals, Kolkata, Dr Venkatagiri K M, President, ISA National and Prof Srinivas M,

Dean, ESIC Medical College, Hyderabad for sharing their perspectives on residency training. Being excellent academicians, clinicians and professionals par excellence, their inputs have enormously enriched the value of this book. My thanks are due to Dr Amit Shah and Dr Apeksh Patwa, eminent anaesthesiologists from Vadodara for their valuable contributions. Sincere thanks to Dr Ganesh Chaudhary, anaesthesiologist from Sholapur who is well known for his cartoons which are both educating and entertaining. He has kindly permitted to use some of his cartoons. I wish to gratefully remember the enthusiasm and support showed to the book when it was still in a nascent stage by my dear young colleagues, Dr Deepak Kadlimatti, Ambedkar Medical College, Dr Namitha, my former student, Dr Aejaz Ahmed, Yenepoya Medical College, Dr. Anshul Shankar, Mysore and Dr Bhavna Gupta, AIIMS, Hrishikesh.

It is time for me to recall the unstinted support and guidance from the management of Nitte University (NU) and K S Hegde Medical Academy (KSHEMA) where my prime years of professional career were spent. I owe a lot to Sri N V Hegde, honourable Chancellor of NU and Prof Dr M Shantharam Shetty, honourable Pro-chancellor of NU and the management. Contribution of my former colleagues, going by the power of association for nearly two decades, is by no means small. This rich experience has certainly contributed enormously to my thought process and hence to writing of this book. Grateful to Professors Anand Bangera, Sripada G Mehandale, Sumalatha R Shetty, Anil Shetty, Avanish Bhandary and Manjunath Kamath, Dr Nikhil M P and all the other faculty. My sincere thanks are due to Drs Muralishankara Bhat, Dr Govindaraj and Siri Kandavara for their support.

I am highly indebted to Sri Suhas M of Vega Graphics, Mangalore for his immense patience and professionalism for typing, editing and formatting the book and also to my dear young friend Mr Raghuvveer Singh Shivilal, a dynamic and disciplined personality from Brunei who provided me constant logistics support. I recall with gratefulness the help provided by Ms Pratheeksha, Mysore in the formatting of the book in the initial stages. Lastly, I appreciate the professional service provided by the Bluerose Publishers Pvt Ltd, Noida, New Delhi. Their team has done a wonderful job of designing the cover page, printing and marketing of this book.

I sincerely thank my family, Kavitha my beloved wife and Avinash and Anantharam, my two adorable sons, for their support and encouragement. Finally, The list of persons whom I have been helped from remains incomplete. My apologies if I have forgot to mention the names of any of my friends, colleagues or well-wishers. I seek the support of my friends, teachers and all fellow professionals in making this project a success and their valuable inputs and constructive criticisms regarding the contents of this book.

**Prof. (Dr) Raveendra Ubarakda S.**

## Forward

A well-trained anaesthesiologist is an asset to the society and can significantly contribute to patient care in different ways. This was amply demonstrated during the COVID 19 pandemic. Better training during residency contributes significantly to improvement of overall healthcare in the community. As it has been pointed out by the authors, variations in the curriculum between the institutions, methods of training, availability of facilities and clinical materials in the form of patients are some of the factors which can adversely impact the residency training. This book appears to be an effort in right direction to help the residents to transform into a competent and professional anaesthesiologist from a qualified medical practitioner.

Anaesthesia Residency Manual is an apt title for the book as it has extensively covered a wide range of issues relevant to anaesthesia residents in as many as 25 chapters. Topics range from an interesting introduction to the speciality, its transformation from being a primitive medical specialty to most advanced one to virtually every aspect of residency. Some of the interesting topics include patient safety, ethics, research methodology, a timeline for study, facing the examination, etc ending with a glossary of terminologies. Another unique aspect of this is a self-assessment tool and the concept of self-audit. If sincerely followed by the residents, I am sure, this measures can be transformative in improving the quality of training itself. Chapters on professionalism and excellence certainly enrich the value of the book by exposing the residents to these crucial aspects of the profession. Lastly, a section on "Experts' advice" has further enriched the value of the book by incorporating the advices by eminent anaesthesiologists across the country.

I have known both the authors, Prof Raveendra Ubaradka and Prof Nalini Kotekar for a long time as dedicated professionals and committed teachers. The timing of this book cannot be better considering the increasing demand for the professionals across the country and across the globe and also increased number of seats for MD/DNB training. I am sure this book will be liked by both the residents and faculty. I concur with the authors' suggestion that this book is meant to be "friend, guide and philosopher" for the residents and should be used all throughout the residency. I wish success to the authors in this unique venture.

### **Dr. NAVEEN MALHOTRA**

MD, DNB, FIPM, FICA, FIAPM

Senior Professor & Head,  
Dept. of Cardiac Anaesthesia  
& Pain Management Centre  
PGIMS, Rohtak, Haryana, India

## Contributors

**Dr. Anju Gupta**, MBBS, MD, DNB, MNAMS, PGCCHM, CEPC, IDRA

Assistant Professor, Anaesthesiology, Pain Medicine and Critical Care, AIIMS, Delhi  
E-Mail : dranjugupta09@gmail.com

**Dr. J. Balavenkatasubramanian**, MD, DA

Senior Consultant & Academic director, Department of Anaesthesia,  
Ganga Medical Centre and Hospital, Coimbatore. E-Mail : drbalavenkat@gmail.com

**Prof. (Dr) J.V. Divatia**, MD, FCCM, FICCM

Professor and Head, Department of Anaesthesiology, Critical Care and Pain  
Tata Memorial Hospital, Homi Bhabha National Institute, Mumbai, E-Mail : jdivatia@yahoo.com

**Dr. Nishkarsh Gupta**, MBBS, MD, DNB, MNAMS, PGCCHM, NFPM

Additional Professor, Onco-Anaesthesiology and Palliative Medicine, DRBRAICH, AIIMS, Delhi  
E-Mail : drnishkarsh@rediffmail.com

**Prof. (Dr) Ramkumar V.**, MD

Trustee : Mission Smile, Editor-in-Chief : Airway, Former Professor and Head of Anaesthesiology,  
Kasturba Medical College, Manipal. E-Mail : rvenkateswaran@gmail.com

**Dr. Saikat Sengupta**, MD, DNB, PGDMLS, FICA

Senior Consultant & Academic Coordinator - Apollo Multispeciality Hospitals, Kolkata,  
E-Mail : saikatsg@gmail.com

**Dr. Shivakumar F. Kambar**, MBBS, DA, LLB (Spl), LLM, MBA (H.M.), FIAMS, PGMLE, PGMLS, CCEPC

Anaesthesiologist, Medico Legal Consultant & Pain, Palliative Care Therapist  
Dharwad. E-Mail : docshivak@gmail.com

**Prof. (Dr) Srinivas M.**, MCh (Paed Surg)

Dean and Professor of Paediatric Surgery, ESIC Medical College, Hyderabad.  
E-Mail : srinivasem@hotmail.com

**Dr. Venkatagiri K.M.**, MD, MBA, FICA.

President, ISA National and Member: professional Wellbeing Committee- WFSA  
Sr Consultant in Anaesthesia, Govt General Hospital, Kasaragod, Kerala - 671 121  
E-Mail : drvenkatagiri@gmail.com

**Dr. Vyshnavi S.**, MD, DA

Associate Professor, Department of Anaesthesiology  
JSS Academy of Higher Education, Mysuru. E-Mail : vyshgiri@gmail.com

**Dr. Yatin Mehta**, MD, MNAMS, FRCA, FAMS, FIACTA, FICCM, FTEE

Adjunct Professor, NBE. Chairman, Medanta Institute of Critical Care and Anaesthesiology,  
Medanta The Medicity, Sector-38, Gurgaon -122 001, Haryana.  
E-Mail : yatinmehta@hotmail.com

## Table of contents

Chapter number	Chapter Title	Page number
	Highlights of the book	X
	Introduction	XI
	How to make the best of this book	XII
01	Anaesthesia : Unique specialty	1
02	Growth and Evolution	9
03	Scope of Anaesthesia Specialty	22
04	Curriculum	27
05	Technical Skills	37
06	Nontechnical Skills	45
07	Knowledge of Allied Subjects	51
08	Timeline for Study	58
09	Survive and Succeed	65
10	Stress Management	77
11	Conflict Management	85
12	Patient Safety and Quality of Care	92
13	Ethics in Anaesthesiology	99
14	Research	103
15	Facing Examination	109
16	Towards Excellence	114
17	Beyond Residency	118
18	Learning Resources	122
19	Training Methodologies	130
20	Dissertation, Conferences, Audits, Never Events	136
21	Medicolegal Issues	146
22	Occupational Hazards & Residency During Pandemic	151
23	Golden Rules of Anaesthesia	158
24	Experts Advice	163
25	Self - assessment tool	175
	Anaesthesia Terminologies	186
	References and further reading	197

## Highlights

- **First of its kind in medical literature. Written from experience, observation, and passion about post graduate education and training.**
- **Focus on fundamental issues which have not been given due importance in curriculum, nor included in training and grey areas faced by the residents.**
- **360° perspective: All aspects of training are covered.**
- **Relevant to entire duration of the residency: how to make the best of everyday including facing examination.**
- **Importance given to soft skills and professionalism as much as for academics.**
- **Tips not just to survive but to succeed and excel in the profession.**
- **Knowledge about current teaching and learning tools and methodologies.**
- **Patient safety and ethical aspects of profession.**
- **Advices from renowned teachers in the specialty.**
- **Self-assessment tool.**

# Anaesthesia Residency Manual

## Introduction

Purpose of anaesthesia residency training is to transform a basic medical practitioner into a competent anaesthesiologist. While securing an MD or DNB is an achievement in itself, the newly joined resident is often clueless or has only vague idea regarding the content as well as the methodologies of the training. ahead. Initial few months of training may be lost in just getting oriented to the new working environment and understanding roles and responsibilities. Residents from diverse backgrounds and varying intellectual, emotional and cognitive abilities could find it difficult to adapt and adjust to the rigorous demands of residency training. Failure of smooth transition into residency could lead to a vicious cycle of frustration, disappointment, poor performance, difficulty in learning and poor outcome.

Anaesthesiologists are assets to the society. Better training during residency contributes significantly to improved overall healthcare in the community. Variations in the curriculum between the institutions, methods of training, availability of facilities, clinical materials in the form of patients, are some of the factors which can adversely impact the residency training. Further, the informal yet important aspects of training such as scope of specialty, patient safety, ethics, discipline, management of stress, facing examination, etc. are usually not part of any organized teaching programs. However, their importance for successful training cannot be overemphasized.

This is a small effort to fill-in these gaps and help the residents to derive maximum benefits from their training. It is the result of few decades of our experience in academic and clinical anaesthesia, interaction with the residents their feedbacks, influence of our own teachers and colleagues and a genuine desire to contribute our bit to the residency training in India. Hope this effort will be welcome by the beneficiaries, the residents as well by the teachers across the spectrum of teaching departments and institutions.

## How to make the best of this book

Dear residents, this book is meant for you. It is aimed to help you to get the best from your residency and transform yourself into a professional of excellence. This book is not a replacement for your subject learning, but it complements the available learning resources. Effort has been made to cover all the aspects of your training in such a way that you can adapt to the new environment easily and effectively. A close look at the list of chapters and highlights will help you to appreciate the uniqueness and usefulness of this manual. The book covers a whole range of topics related to MD, DNB or DA courses, keeping in mind the objectives and diversity of training.

This book is written in an informal manner focusing on simplicity of language and clarity of presentation across diverse topics. This provides you with all the required information for a successful residency. In the 25 chapters we have attempted to cover a whole range of issues from the introduction to the specialty, history and its scope to the various academic and clinical aspects of training. All these are presented as a hardbound A5 size manual. We suggest that this book should be constantly with you so that it can be referred to at any time wherever you are. The contents are relevant and appropriate to the different workplaces, be it hospital or department. In addition to the subject learning related topics, emphasis has been laid on soft skills, value systems, medicolegal aspects of training, structuring of studies, facing the exams and future opportunities. You will, therefore, find that this manual is your friend, guide and philosopher! It contains plenty of motivational quotes and informative tips and facts all throughout. We are sure that you will find it informative, interesting and enjoyable at the same time.

Most unique nature of this book, we feel, is the self-assessment tool that we have developed, besides the idea of self-audit. Self-assessment at regular intervals surely will help you to periodically understand the effectiveness of your training and help you in course correction, if necessary. Four such self-assessments with a subjective scoring system have been included. Following them meticulously will certainly take your training to altogether a higher level. With a variety of contents, this book will remain relevant and useful throughout your residency from the first day till you face final examination. This book is meant to be read in a relaxed way in bits and pieces. We are sure you will agree once you go through the book.

We are fully aware that it may not be perfect in the content and presentation. Suggestions from all the quarters will be taken seriously and if appropriate necessary modifications will be incorporated in future editions. It is our sincere wish that this book will be possessed by each anaesthesia resident and in this direction, we look forward to the support from Indian Society of Anaesthesia (ISA), Indian College of Anaesthesia (ICA) and all the teaching faculty from across the length and breadth of the country.

# Chapter 1

## Anaesthesia : Unique Specialty

### Interesting Inspiring Innovative

#### Preamble

Welcome to the world of anaesthesia, dear residents. You are entering a world about which most of you may not have enough idea. Not long ago, anaesthesia was used to be described as “hours of boredom, moments of terror” because of perceived monotonous nature of work, with a potential for life threatening complications at any moment of perioperative care. Nothing can be farther from truth regarding modern anaesthesia. In the last few decades, anaesthesia has transformed into a challenging and advanced specialty.

#### 1. Anaesthesia is a relatively younger medical specialty

Modern anaesthesia is less than a century old. Originally it was started as a way of relieving surgical pain, with hardly any concern for or understanding of patient safety. Over the decades, anaesthesia has evolved into a multifaceted specialty with clear objectives, centred around patient safety. Currently, even patients with multiple comorbid conditions undergo complex procedures safely. In addition, anaesthesiologists' role has now extended beyond the operation theatres.

In some of the poor regions of the world, qualified anaesthesiologists and even medical professionals trained in anaesthesia are in short supply. They also face shortages of equipment, drugs, and other facilities. This has resulted in administration of anaesthetics by basic medical doctors (MBBS or equivalent) or even the trained nurses or technicians. Often, surgeons themselves perform spinal anaesthesia or intubate a patient who is subsequently monitored by a nurse or technician. The perils of such practice can never be clearly quantified due to lack of documentation and non availability of better alternatives. This, unfortunately, creates an opinion in the minds of the public and other medical professionals that anaesthesia is so simple and easy that anybody can administer it. Again, it is a wrong perception.

#### 2. Anaesthesia is neither a therapeutic nor a diagnostic specialty

It does not clearly fit into either group. Anaesthesia team forms the core of medical professionals in any health care set-up. Quality of anaesthesia care in a hospital is one of the indicators of the overall quality of the service it provides. Without a strong anaesthesia department, no surgical specialty can progress beyond a certain level. Anaesthesiologists' contribution to the common goals of patient safety and satisfaction is enormous.

Anaesthetic drugs are unique and are used to facilitate safe surgical procedures by

inducing unconsciousness, providing pain relief and by producing immobility. Interestingly, some of the drugs which are primarily used as anaesthetics or anaesthetic adjuvants have non-anaesthetic therapeutic and occasionally diagnostic clinical applications in medicine, medical emergencies, and pain management. Classic examples are thiopentone sodium for status epilepticus, propofol for certain types of headaches, sevoflurane and ketamine for acute severe asthma and ketamine for acute and chronic pain. Also, some of these drugs are used for unconventional purposes like euthanasia, state sponsored execution, crime investigations like narcoanalysis and unfortunately even to commit suicide.

### 3. Anaesthesiology, as we know, is not always an 'exact' science

Consider these examples to underscore the above statement.

1. We still do not know how general anaesthesia, a controlled and reversible state of unconsciousness, can be produced in a way where even sick patients completely recover after prolonged hours of exposure.
2. In spite of our efforts based on current standards of care and adhering to protocols and guidelines, occasionally patients experience awareness while under general anaesthesia.
3. It is not conclusively proved whether exposure to anaesthesia can affect neurological growth and development in children and cognitive function in elderly. Despite this lack of clarity, everyday thousands of children including infants and new-borns as well as elderly receive anaesthesia worldwide.
4. Vital organs like brain, heart, kidneys and liver have varying degrees of susceptibility to perioperative hypoxia, which if occurs, can be dangerous. But there is no technology yet to routinely monitor organ specific oxygenation. Instead, the continuous oxygen saturation (SpO<sub>2</sub>) is taken as a surrogate measure of global oxygenation. Clinically, SpO<sub>2</sub> combined with various other monitors help us to prevent, detect and manage specific organ dysfunction.

Despite these “knowledge blind spots”, “grey areas” and apparent contradictions, millions of patients worldwide are safely subjected every day to anaesthesia for various surgical procedures. Interesting, is it not?

### 4. Technical Skills are very important in anaesthesia. However, it should be backed up by a solid, up-to-date knowledge base and nontechnical (soft) skills.

Anaesthetic management is not possible sitting in the comforts of an office as it needs the use of variety of technical skills. They are predominantly related to vascular access, airway management, lifesaving procedures and regional anaesthesia. Some examples are peripheral and central venous cannulation, airway management, central neuraxial blockade and arterial blood pressure monitoring. Soft skills include team working,

communication, decision making etc and are discussed in another chapter.

### 5. Anaesthesia is not just a science but an art too (Figure 1.1)

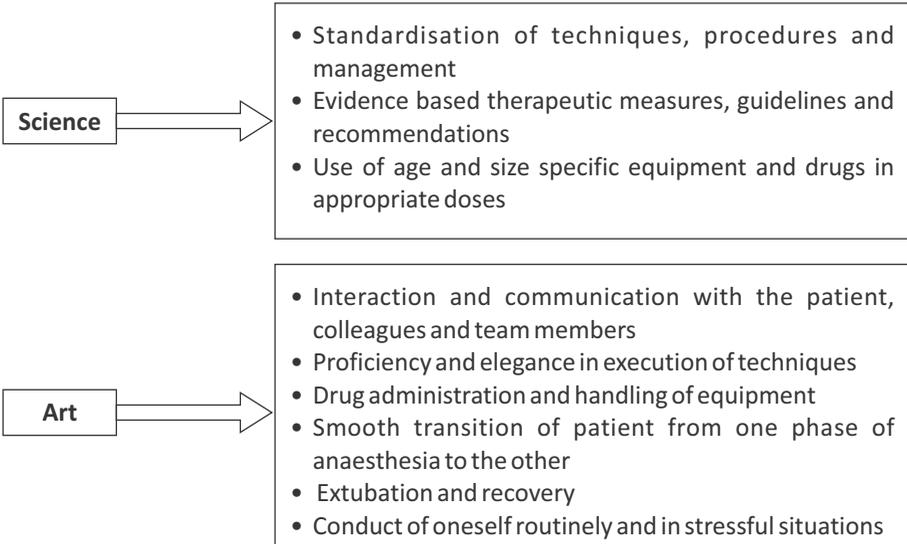


Figure 1.1: Anaesthesiology is both a science and an art

### 6. Anaesthesia is a dynamic speciality, probably the most dynamic one

Common misconceptions about anaesthesia are that it is monotonous, limited to “just to put the patient to sleep with some injections”, “it does not require much skill or knowledge” and “once you intubate then you don't need to do much till you extubate”. In reality, anaesthesia is *the most dynamic medical speciality*.

1. Anaesthesia is “customizable” and “one size does not fit all”. There is always more than one choice for the plan, technique and drug combination for the same patient and same procedure. It depends on the experience, expertise and preferences of the individual anaesthesiologist or the department/local practice. Patient factors also play a role in decision making.
2. There are multiple monitoring modalities to choose from: non-invasive to invasive, intermittent to continuous, monitoring of all vital functions of the body and monitoring of machine/ventilator. With these, minute to minute and accurate monitoring is possible.
3. Dynamic nature of the practice of anaesthesia also stems from the nature of drugs used. Being highly potent and often administered intravenously these can produce effects or complications within seconds to minutes. Drugs can be used in various combinations for more balanced effects.

4. Physiology of the patient constantly keeps changing during the perioperative period due to multiple intrinsic and extrinsic factors with a potential for a variety of complications.
5. Changes in the perioperative plan for the proposed surgery/procedure might require changes in the anaesthetic management plan.

### 7. Anaesthesiologist has diverse roles

A skilled and knowledgeable anaesthesiologist is an invaluable member of a surgical team, contributing significantly to the outcome. Teamwork improves the work efficiency, reduces stress and enhances the patient safety both at the individual and institutional levels. Anaesthesiologists perform various roles in a surgical team in the perioperative period. (Figure 1.2 and Figure 1.3)

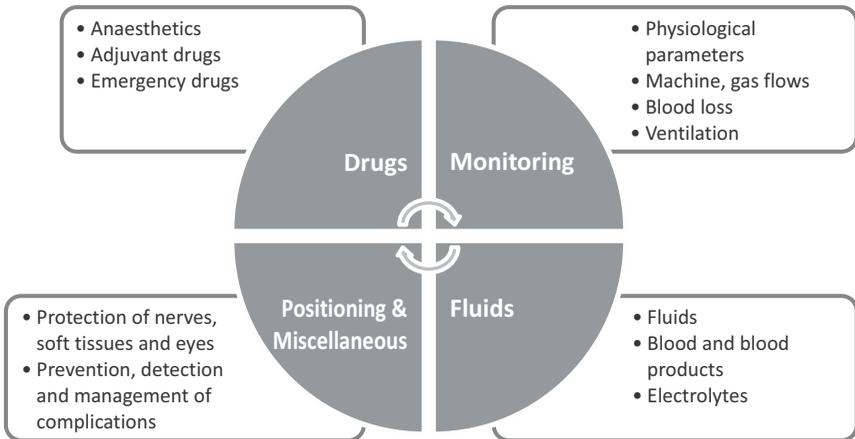


Figure 1.2: Anaesthesiologist: The silent captain of the ship!



- Ordering relevant intraoperative investigations
- Alerting surgeon to any impending complications or harm to patient
- Resuscitation of patient in emergency and trauma
- Planning for postoperative care and transfer of patient
- Maintaining operation theatre schedule and playing the role of administrator and
- Ensuring compliance to infection control or prevention.

Figure 1.3: Diverse roles of the anaesthesiologist during the peri operative period

**8. Anaesthesiology is technology intensive**

Historically, anaesthesia was started with primitive equipment with a single or two drugs, around the time when Morton demonstrated ether. An example is Schimmelbusch mask. Technology, be it hardware, software, metallurgy or electronics, has enormously contributed to the modern anaesthesia. Some interesting examples are anaesthesia workstations which are almost as sophisticated as ICU ventilators, modern vaporizers, wide range of airway equipment, elastomeric pumps, target controlled infusion machines, advanced and integrated monitoring systems, and cell savers.

**9. Drugs are most used by intravenous (IV) and inhalational routes. Other novel routes are also used for drug administration.**

Anaesthesiology is “pharmacology intensive” as much as it is technique and technology intensive. Use of multiple drugs in combination appropriately to achieve specific objectives is routine in anaesthesia practice. Intravenous route, most common route of drug administration, results in rapid onset of action and predictable effects. Anaesthesiologist should be able to establish and maintain adequate intravenous access at all the times in a way that is appropriate to patient's needs.

Inhalational route of drug administration is unique to anaesthesia. This is the only route, where anaesthesiologist has a control over the elimination of drugs after they are administered. Principles of use of inhaled anaesthetics differ from intravenous anaesthetics. In addition, there are other novel routes too (Figure 1.4).

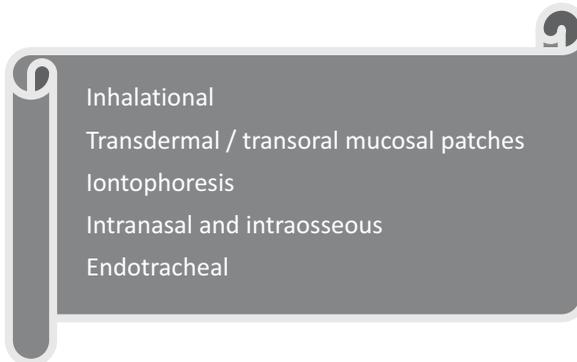


Figure 1.4: Novel routes of drug administration in anaesthesia practice

**10. Regional anaesthesia is a unique entity in anaesthetic management**

Traditionally, anaesthesia used to be equated with unconsciousness. Since August Bier's demonstration of spinal anaesthesia, regional anaesthesia (RA) became an attractive alternative in many situations. Currently, RA is used both as an alternative or supplement to general anaesthesia (GA). When used as supplement to GA, RA reduces

requirement of anaesthetics as well as analgesics (as a part of multimodal analgesia) and facilitates early recovery and ambulation.

Two broad divisions of RA are Central Neuraxial Blockade (CNB) and Peripheral Neural Blockade (PNB). RA, in the hands of experts, enables even patients with severe comorbid conditions, (consequently with high risk of complications with general anaesthesia) to safely undergo major procedures. In addition to anaesthesia, both CNB and PNB find important applications in the management of chronic cancerous and noncancerous pain.

**11. Mistakes related to anaesthesia are immediately noticed and often can prove costly to patient and to anaesthesiologist.**

Failure or mistakes during patient management by anaesthesiologists are likely to be easily observed by others, primarily due to the inherent nature of professional work. It could be a failed or messed up technique (repeated cannulation attempts, repeated epidural attempts with or without dural puncture, bleeding, etc.) or a medication error or failure to recognize or manage complications. Further, anaesthesiologist does not enjoy the “luxury of time”. Diagnosis of complications and clinical judgement must be quick and response immediate and appropriate. In some unfortunate situations, the anaesthesiologist might even be blamed for someone else's mistake. A rare case of epidural hematoma, perioperative stroke or cardiac arrest, total spinal or any major/prolonged morbidity or mortality even remotely related to anaesthesia can be enough to ruin the career of even a senior anaesthesiologist.

**12. Even a perfectly normal patient is rendered “abnormal” under anaesthesia and is brought back to normal at the end of surgery/procedure.**

This is an amazing aspect of anaesthesia wherein you “remove” the ability of the patient to breath (controlled ventilation, muscle relaxation), allow the blood pressure to be dropped (induced hypotension), even stop the heart (as in cardiopulmonary bypass), lower body temperature to extremely low levels (induced hypothermia) and induce several changes in physiology. This results in a state where patient is vulnerable to physical and physiological risks. It is your responsibility to protect the patient from injury and insults during this period. Further, most of the patients recover without any residual effects even after prolonged surgery, blood loss and sometimes severe perioperative complications. Perhaps, the most interesting aspect of general anaesthesia is the “manipulation” of consciousness that we do using a diverse group of drugs in equally diverse patient populations.

**13. Even a medically fit, healthy person can develop life-threatening complications related to anaesthesia.**

In no other medical specialty, the physical appearance, built of the patient or asymptomatic physiological abnormalities and position for the surgery are as

important as in anaesthesia. Examples are patients with syndromes and anomalies without any symptoms, inborn errors of metabolism, ECG changes like Q-T prolongation in an asymptomatic person or an incidental finding of a pulmonary bulla on the X-Ray and risk of malignant hyperthermia. These pose significant challenges for anaesthesia in terms of choice of and response to drugs, risk of positioning related complications, selection of monitors and vascular access.

During anaesthesia, often several drugs are administered within a short period. Many of these, including antibiotics, have significant risk of anaphylaxis. Rarely, it can be life threatening or fatal. Anaphylaxis is not related to previous health status of the patient. Airway management is yet another unique aspect of anaesthesia. Based on assessment, airway can be normal or difficult. Difficult airway, anticipated or undetected, can lead to various life-threatening complications like hypoxia, aspiration, or even death. Unfortunately, even with the current availability of equipment and techniques, serious airway complications are not always completely preventable. Interestingly, risk of difficult airway is not necessarily related to preoperative health status of the patient. Patients can be healthy, doing their routine activities, walk into hospital, to undergo an apparently “simple surgery”. This, however can be worsened by surgical complications.

**14. Your time is not in your control**

Anaesthesia, being predominantly a teamwork, working time is often unpredictable. Reasons include need for preoperative optimization of patient, posting of additional patients, unanticipated prolongation of surgery, unanticipated anaesthesia or surgery related complication, unexpected contamination of the theatre requiring disinfection after the procedure or due to delay in turn over. Accepting the irregular work schedules as professional commitment and inevitable aspect of your day-to-day life helps you to prevent unnecessary stress. During residency, exceeding the scheduled time of work is almost a routine and accept it so that it does not distract you from focusing on learning.

**15. Many aspects of anaesthesia practice are time critical**

It means to say that the outcomes of many of our decisions, actions and techniques depend on how promptly and correctly they are implemented. Delay or failure can prove disastrous, particularly in emergencies. Some examples with reasoning are explained in the following table;

Actions	Consequences, if delayed
1. Endotracheal intubation  2. Failure to recognize oesophageal intubation	1. Prolonged attempts increase risk of hypoxic brain damage 2. Oesophageal intubation, per se, is not dangerous. But the delay in recognizing it is.

3. Delay in / failure of intravenous access in a bleeding patient	3. Persistent hypotension due to hypovolemia
4. Perioperative embolic phenomena (Air, amniotic fluids)	4. Early detection could save the patient
5. Local anaesthetic systemic toxicity	5. Irreversible neuronal damage and cardiovascular morbidity and even mortality
6. Malignant hyperthermia	6. High mortality without immediate and specific treatment
7. Life threatening physiological derangements: arrhythmia, hypotension, pneumothorax, respiratory depression, thromboembolism, anaphylaxis and cardiac arrest	7. Events develop rapidly and unless diagnosed and managed immediately, they can lead to morbidity or mortality due to cardiac arrest
8. Medications	8. Anaphylaxis and adverse events must diagnosed and managed immediately, else can be disastrous.

**Conclusion**

Being unique, the specialty of anaesthesia provides wonderful insight into body function and reveals how anaesthesiologists manipulate the physiology for the benefit of the patient to facilitate appropriate surgical conditions. Anaesthetising a patient is both challenging and satisfying. Take pride in your chosen profession and determine to become the best.

---

**Prof. (Dr) Raveendra Ubarakda S., Dr. Anju Gupta & Dr. Vyshnavi S.**

---

Anaesthesiologist's interaction with patient is seen as "delineated, intense, and time compressed period in patient's treatment journey during which the anaesthesiologist is given a unique window of opportunity to make a difference" (Source from a journal article)

**Dear residents, read this again and again, its highly meaningful.**

Do what you can do, but do not do what you cannot do.

*Tim Cook*

## Chapter 2

# Growth and Evolution

## Past, Present and Future

### Preamble

Anaesthesia is both interesting and intriguing. Knowing how the specialty has grown is truly insightful. Anaesthesia as we understand and practice now did not develop overnight. It is a craft developed into an extraordinary blend of science and art with a humane touch. It is also about the integration of different medical specialties and disciplines of science. Anaesthesia has transformed from an unpredictable, and dangerous state of unconsciousness induced by crude and nonspecific methods into to a state where ideal conditions are provided for surgery or procedures with safety and comfort. The story of anaesthesia and the anaesthesiologists reflects efforts, sacrifices, surprises, successes, and failures. A “fearful” state of suffering has been transformed into a pleasant experience. *The present-day anesthesiologists enjoy the fruits of these developments and hence it is worth taking a peep into the history.*

### Growth of the specialty – brief historical perspective & milestones

#### 19<sup>th</sup> Century : 1846 till 1900

*October 16th of 1846 is a red-letter day* in the history of anaesthesia, and it is now celebrated every year as World Anesthesia Day. On this day, William Thomas Green Morton, American dentist and physician, demonstrated the anaesthetic properties of ether, on a patient, Edward Gilbert Abbott who underwent removal of tumor from the neck. Surgeon was John Collins Warren. Henry Jacob Bigelow, another surgeon who was a witness to the historical event said, “what we have seen today will go around the world”. Morton called ether “Letheon” to conceal its identity. Morton's demonstration was followed by extraction of tooth under ether general anaesthesia by Dr James Robinson on 19th December 1846 and amputation of limbs in surgical patients in Dumfries Scotland and in London on December 21st. In 1847, one of the earliest textbooks on anaesthesia “*A treatise on the Inhalational of the Vapor of Ether for the Prevention of Pain in Surgical Operations*” was published.

Dr John Snow, in 1853, used chloroform successfully for the birth of Prince Leopold and subsequently for the birth of Princess Beatrice in 1857. Dr Snow became the first full time anaesthetist and he popularized obstetric anaesthesia. To his credit, he administered chloroform for many patients without mortality. “*On the Inhalation of the Vapor of Ether*” and “*On Chloroform and Other Anesthetics*” were the books written by Snow. Nitrous oxide was introduced in 1863 by Professor Gardner Quincy Colton in New York. It was called laughing gas.

In 1884, first local anaesthetic, cocaine was introduced for eye surgery by Viennese ophthalmologist Dr Karl Koller. In the same year, Dr William S Halsted used cocaine for the first regional nerve block, mandibular or jaw block. The London Society of Anaesthetists, the world's first anaesthesia society, was formed in London in 1893. In 1894, first anaesthesia record of observed respiratory rate and palpated pulse rate were developed by Harvey Cushing and Amory Codman. In 1898 first spinal anaesthetic was performed by Dr August Bier using Cocaine.

### 20<sup>th</sup> Century - 1900 to 1950

During this period some of the critical foundations for anaesthesia were laid, both at clinical and academic levels ;

1901 **Riva-Rocci** cuff introduced for blood pressure monitoring.

1901 **Caudal epidural analgesia** independently described by Drs. Jean-Anathanese Sicard and Fernand Cathelin.

1902 **“Anesthesiology”** and **“anesthesiologist”** words were coined by Dr Mathias J Seifert of Chicago.

1905 **Long Island Society of Anesthetists (LISA)**, first professional anesthesia society of USA started with a membership of nine. This increased to twenty three in 1911 and LISA was renamed as New York Society of Anesthetists (NYSA).

1905 **Procaine** was developed by Alfred Einhorn, a German chemist, who named it as Novocain.

1914 **Anesthesia**, a comprehensive textbook of anaesthesia in USA, was published by Dr James T Gwathemy.

1917 **Anesthesia Machine**, first version with wooden frame, by Henry Edmond Gaskin Boyle.

1920 **Eye signs of ether anesthesia** were published in American Journal of Surgery by Arthur Guedel who also developed Guedel's airway.

1927 **Dr Ralph M Waters** developed the first university-based residency training program in anaesthesia. His trainees were known as “Aqualumni”.

1936 **NYSA** renamed as American Society of Anesthetists; whose membership reached 487 in 1936.

1937 **Sir Robert Reynolds Macintosh** was appointed as the Oxford's Nuffield Professor.

1941 **ASA Physical Status** was developed for risk stratification, considered as a milestone in anesthesia.

1942 **Direct laryngoscope** was introduced with curved blade by Sir R R Macintosh and straight blade by Sir Ivan Whiteside Magill, both amongst the tallest figures in anaesthesia.

1943 **Curare** was introduced by Harold Griffith into clinical practice to provide

skeletal muscle relaxation. This led to development of Liverpool Technique where use of curare dominated the technique with increased incidence of awareness.

### 20<sup>th</sup> century - 1951 to 2000

During these 5 decades, anaesthesia specialty saw a multidimensional growth. Rapid strides were made in the development of safe drugs, accurate and specific equipment, newer concepts and guidelines, increasing the scope of anaesthesia and development of further specializations. By the turn of 20th century anaesthesiologists were recognized as leaders in patient safety and were able to ensure safe outcome, without compromising the quality of care for wide range of patient populations.,

In addition to specific discoveries, this was the time when significant advances took place in inhalational and intravenous anaesthesia, regional anaesthesia, mechanical ventilation, monitoring, and increased role of technology in anaesthesia. In 1954, **APGAR Score** was published by Virginia Apgar. She was the first female anaesthesiologist to grace a U S postage stamp. In the same year, multidisciplinary approach for pain management was proposed by Dr John Joseph Bonica, anaesthesiologist and a professional wrestler. He established the first pain clinic in the world. Several professional bodies with specific areas of interest such as airway management, regional anaesthesia, patient safety and association/ societies for different subspecialties were established during this period. This resulted in further growth of subspecialties and multiple clinical guidelines with regular updates.

### Milestones between 1951 -2000

1951- Halothane, synthesized by C W Suckling. Introduced into clinical practice in 1956  
1956 – Goldman vaporizer for halothane, introduced by Dr Victor Goldman (UK)  
1963 – Concept of Monitored Anesthesia Care was proposed by Dr Edmond I Eger II  
1969 – Self Evaluation Program introduced by ASA for anaesthesiologists.  
1970- Post Anaesthesia Recovery Score was developed by Dr J Antonio Aldrete  
1986- ASA standards for basic intraoperative monitoring introduced.

### 21<sup>st</sup> Century...till now : Era of progress and transformation

One fifth of the “new” century is behind us already... Currently, anaesthesia, even with several unresolved issues , is one of the advanced specialties with an impressive combination of exceptional skills, instrumentation and technological innovation, rigorous training schedules and multiple subspecialties.

### Inhalation anaesthesia, intravenous anaesthesia, and balanced anaesthesia

Inhalational anaesthesia, technique of using liquid volatile anaesthetics in a mixture of oxygen and air or nitrous oxide, had its beginning in the discovery of analgesic properties of nitrous oxide(N<sub>2</sub>O) which still continues to be in clinical use extensively

(despite the controversy surrounding its use). Between the introduction of N<sub>2</sub>O and the currently used inhalational anaesthetics, several other agents were introduced. They survived for varying periods before becoming obsolete. Among those which are obsolete now are ether (diethyl ether), cyclopropane, chloroform, divinyl ether, methoxyflurane, and trichloroethylene.

Diethyl Ether	Became very popular and was extensively used for over a century	Obsolete, due to unacceptable adverse effects (by current standards), risk of flammability with cautery and availability of safer agents.
Cyclopropane	Stored in cylinders, highly flammable	Obsolete
Chloroform	After ether, historically, most popular inhalational anaesthetic. Made popular by John Snow	Hepatotoxicity and narrow therapeutic index. First anaesthetic death was associated with chloroform. Now obsolete
Methoxy-flurane	Has highest boiling point of 104.8° C	Nephrotoxicity Now obsolete
Trichloroethylene	Boiling point 87.3°C had excellent analgesic property.	Obsolete. Interaction with soda lime was a disadvantage

Sevoflurane, and to a lesser extent isoflurane are currently used. Halothane, with its advantages of low blood gas solubility (rapid induction and recovery), pleasant smell and non- inflammable nature, used to be the choice for induction in pediatric patients without intravenous access. However, the disadvantages like potential for hemodynamic instability with bradycardia, hypotension, arrhythmia, lack of analgesia, hepatotoxicity, effect on cerebral blood flow and risk of malignant hyperthermia resulted in decreasing popularity for this agent over the last couple of decades. This also led to development of safer and better inhalational agents. Sevoflurane, desflurane (introduced in 1994 and 1992 respectively) and to a lesser extent isoflurane (introduced in 1992) are the most used volatile anaesthetics. Their popularity is due to rapid recovery, hemodynamic stability, lack of organ toxicity, lack of significant metabolism in the body among other characteristics. Xenon, one of the rare elements, is considered as the future inhaled anaesthetic. Minimum alveolar concentration (MAC) is used to describe and compare the potency of inhaled anaesthetics. MAC value is inversely proportional to the potency.

Intravenous anesthesia (IVA) developed much after the inhalational anaesthetics,

despite the availability of hypodermic needle and syringe. Francis Rynd, Irish physician developed hypodermic needle (1844) and the syringe was simultaneously developed by Alexander Wood and Charles Prawaz (1853). Thiopentone sodium, was the first popular intravenous anaesthetic to be used (1931) and has survived for more than 7 decades. John Silas Lundy, one of the pioneers of anaesthesia from US, is credited with its introduction into clinical practice and is considered as father of intravenous anaesthesia. From residents' perspective it is worth going through the enormous contribution he has made to the specialty in its formative years, with nearly 600 publications to his credit. Subsequently, propofol, ketamine and etomidate were introduced to clinical practice. Each of these drugs has unique characteristics and specific applications as intravenous anaesthetics and sedatives. The term balanced anaesthesia was also introduced by J S Lundy wherein a combination of intravenous and inhalational anaesthetics is used to derive maximum benefits of both while minimizing the adverse effects of either group of drugs.

## Transformation

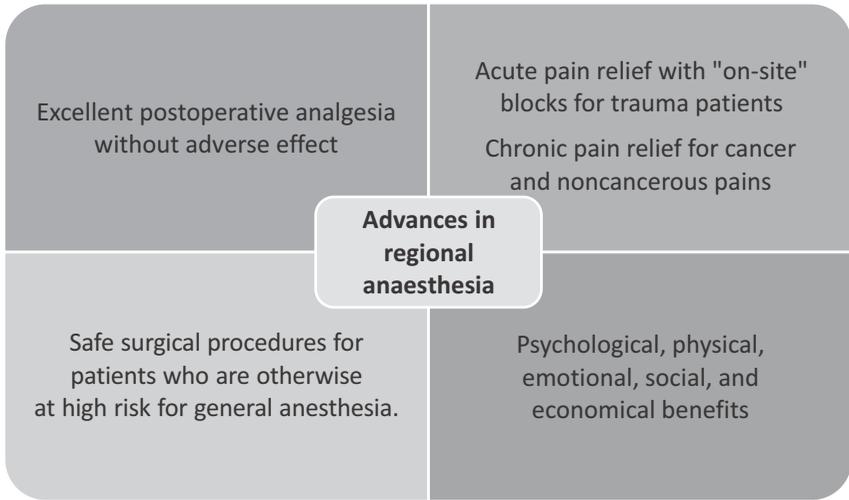
### 1. From balanced anaesthesia to total intravenous anesthesia (TIVA)

concerns regarding the effect of long-term exposure to volatile anaesthetics and their harmful effect on the atmosphere prompted search for safer alternate anaesthetic techniques. Availability of intravenous anaesthetics with excellent clinical profiles, depth of anaesthesia monitoring and introduction of infusion pumps and target-controlled infusion systems (TCI) have resulted in a shift to total intravenous anaesthesia". TIVA has several advantages such as low risk of malignant hyperthermia lack of atmospheric pollution, providing hemodynamic stability, suppression of airway reflexes, reduced postoperative nausea and vomiting and non interference with evoked potential monitoring. TCI is a specific technique of TIVA wherein it is possible to deliver the drugs (most commonly propofol and fentanyl) accurately by setting target concentration in the plasma or effect site.

### 2. Regional anaesthesia

Regional anaesthesia (RA) offers significant advantages for many types of procedures, as a safe alternative. This is because of availability of safe drugs and purpose made ultrasound machines, improvement in nerve location and blockade techniques, availability of catheters, extensive application of ultrasound and better understanding of anatomy.

RA has the unique advantage of providing nearly complete pain relief without the adverse effects associated with systemic analgesics. This leads to early ambulation and reduces postoperative morbidity. RA also reduces the stress response to surgery and improves patient satisfaction. Mild to moderate sedation May be required in some patients receiving regional anaesthesia.



### Milestones of regional anaesthesia

1. Introduction of cocaine by Karl Koller, Austrian Ophthalmologist
2. First spinal anaesthesia by August Bier on 16<sup>th</sup> August 1898
3. Intravenous regional anaesthesia by August Bier in 1908
4. First brachial plexus block by William Stewart Halsted 1885.
5. Epidural anaesthesia with further modifications like caudal and combined techniques
6. Introduction of continuous catheter- based techniques for central and peripheral neural blockades
7. Concept of multimodal analgesia wherein RA became part of GA routinely.
8. Neurolytic blocks for cancer pain – application of RA knowledge

### 3. Monitoring

Hand-on-pulse is the first monitor used in anaesthesia and has historically proven to be very effective in ensuring patient safety. John Snow's excellent safety record with chloroform anaesthesia with careful monitoring of pulse is an example. Since then, advances in monitoring technology have been astounding and virtually every body function can be monitored with the present-day technology.

Pulse oximetry, electrocardiogram and non-invasive blood pressure monitoring are considered as minimum mandatory monitors by Indian Society of Anaesthesiologists and is recommended for every procedure under anaesthesiologist's care. Capnography is mandatory for all patients requiring general anaesthesia and even those who are scheduled for receiving sedation.

Noninvasive monitors	Invasive monitors	Advanced monitors
Pulse oximeter, cerebral oximetry, blood pressure, capnogram, electrocardiogram, neuromuscular blockade monitoring, temperature, endotracheal tube cuff pressure, anaesthetic agent monitoring.	Arterial blood pressure and blood gas analysis, central venous pressure, transesophageal echocardiography, intracranial pressure monitoring,	Echocardiography, bispectral index, continuous hemoglobin monitoring, cardiac output monitoring, thromboelastography, point of care ultrasonography, entropy, evoked potential monitoring

**4. Machine to Workstation**

What started as a simple assembly of few components, for administering ether, chloroform, trichloroethylene etc. has undergone constant improvisations in design and function. While the older anaesthesia machines, commonly called “Boyles Machine” were only mechanical structures without much accuracy, control, or safety, the modern anaesthesia machines have achieved a high degree of sophistication and automation. They are advanced, safe, accurate, customizable and have in built safety features. Anaesthesia workstations have mechanical, electronic, electrical, pneumatic, and digital components. Aesthetic appeal of modern anaesthesia workstations parallels the various advanced equipment in surgical specialties.

**5. Ultrasound – multipurpose, ubiquitous tool**

Ultrasound (USG) has come up in a big way in the last two decades. Assessing airway, gastric volume, diagnosing oesophageal intubation, confirming ventilation using lung sliding sign, focused echocardiography, preload assessment using inferior vena cava (IVC) collapsibility index, urinary bladder volume, Focused Assessment with Sonography in trauma (FAST), insertion of central venous lines and arterial lines and USG guided regional blocks are some of its applications in anaesthesia. Developing diagnostic and procedural skills in USG is a necessity in contemporary anaesthesia practice. Residents are expected to be trained in the basic knowledge and skills of ultrasound related applications in anaesthesia.

**6. New drugs, routes, and delivery systems**

New and novel drug delivery routes and technologies include nasal and buccal aerosol sprays, drug impregnated lozenges, transmucosal, transdermal drug delivery systems (DDS) and closed loop systems. Other significant inventions over the past decade are the development of drugs enclosed in polymeric micelles, microspheres, etc. This technology enhances specificity, increases duration, and reduces toxicity, an example being liposomal bupivacaine.

## Present to the future- revolutionary trends

### 1. Remote monitoring and teleanaesthesia

Progress of telemedicine has led to development of teleanaesthesia in recent years. When used appropriately, teleanaesthesia can help to improve perioperative care for patients in far off areas or for patients who cannot travel. Benefits and limitations are shown in the table below.

**Table : Advantages and limitations of telemedicine and teleanaesthesia**

<p><b>Advantages :</b></p> <p><b>Preoperative phase :</b> Consultation, assessment, and optimization or prehabilitation. Reduces cost and time.</p> <p><b>Intraoperative phase :</b> Remote assistance and guidance to anaesthesiologist, monitoring and diagnosis of complications, decision making and simultaneous surveillance of multiple patients in multiple locations. Reduces risk of infection and enables safe anaesthesia in remote and limited resource settings.</p> <p><b>Postoperative care :</b> Monitoring, readiness for discharge, enhanced recovery pathway implementation and pain management assistance.</p> <p><b>Limitations :</b> Initial cost and training, inability to check the equipment, confidentiality, and inability to provide physical assistance when needed. Uninterrupted connectivity is an important technical aspect.</p>
--

In spite of limitations, as the technology progresses, teleanaesthesia could become another specialized area of anaesthetic management, especially in times of pandemic, disasters, conflicts etc. which restrict movements.

### 2 Electronic data base to integration: Anaesthesia Information Management System (AIMS) and Clinical Decision Support System to Big Data.

Documentation is an important part of anaesthetic management. Anaesthesia information management systems (AIMS) are being used in operation theatres globally for electronic paperless data recording and documentation. Clinical decision support mediated through an AIMS, which uses the software, Decision Support System (DSS), has the potential to help specialists with diagnostic or therapeutic suggestions, facilitate the use of established guidelines, reducing the incidence of error in diagnosis and treatment and correct faulty behaviors.

Advances in computer technology, patient monitoring systems, and electronic health record systems have led to the rapid accumulation of large-scale patient-related electronic data (also known as 'big data'). Big Data is data “whose scale, diversity, and complexity require new architecture, techniques, algorithms, and analytics to manage it and extract value and hidden knowledge from it”. Future implications of this ongoing

integration of big data and analytics within anaesthesia and health care will be an increase in demand for anaesthesia specialists who are well versed in both the medical and the information sciences.

### **3 Increasing application of artificial intelligence (AI) and machine learning**

AI enables a machine mimic function similar to the ways human beings associate with other human intellects, such as learning and problem solving. Machine learning (ML) is a subset of AI based techniques, A recent study has pointed out that AI, through various technologies, has important applications in anaesthesia in the following six areas, a) depth of anaesthesia monitoring b) control of anaesthesia c) event and risk prediction d) ultrasound guidance e) pain management and f) operation theatre logistics. AI can also be used to predict difficult airway and help to manage the airway safely.

### **4. Anaesthesia to perioperative care, anaesthesiologist to perioperative physician**

A perioperative physician is the one who addresses the wide range of critical issues in the medical care of the surgical patient before, during and after surgery or any procedure. Anaesthesiologists, by the nature of their training and inherent requirements of the profession, are adept at managing the patient independently during the entire perioperative period, including complications. Donning the role of perioperative physician requires a) in depth knowledge and abilities to optimize the comorbid conditions, b) ability to interpret advanced investigations, c) improving the knowledge of drugs and d) enhanced interaction and integration with other specialties.

Residents should learn to play the role of perioperative physicians, in order to build a solid reputation and achieve excellence as professional in life.

### **5. Increasing patient involvement in decision making**

Effective participation of the patients in their own medical care is essential to improve health outcomes, improve satisfaction, and reduce the costs. Patients, families or their representatives and health care experts work in active collaboration in their own healthcare decision making process to improve delivery of health care. The future of patient engagement is expected to extend much beyond the traditional realms of decision-making and self-care to include the processes such as the design of the healthcare delivery system; local, state, and national health policies and customization future research relevant to the needs and experiences of patients. Virtual interaction with patients and attenders is a reality and involves the issues of privacy and documentation. Even on a day-to-day basis, residents should learn and improve art of communication with patients and involve them in decision making. Remember, even apparently not so educated person can be well informed. Don't discriminate patients based on appearance, education or socioeconomical status and keep them out of decision-making process.

## 6. Continuing efforts for artificial blood substitutes and intravenous oxygen

A blood substitute is a substance used to fulfill some functions of biological blood, with the advantage of a longer shelf life. Artificial blood can be safely stored without the need for refrigeration and then rapidly administered to patients in emergency situations. The two main categories of 'oxygen-carrying' blood substitutes which are currently being investigated are hemoglobin-based oxygen carriers (HBOC) and perfluorocarbon-based oxygen carriers (PFC). The attempt to develop a viable blood substitute is being pursued since more than 7 decades. But, to date, no oxygen-carrying blood substitute has been approved for use by the US Food and Drug Administration. Most of the initial attempts at synthesizing blood substitutes failed because of their significant vasoactive properties leading to various adverse effects.

Similarly, attempts to administer oxygen by intravenous route also has so far not succeeded and if ever it can be achieved in future, lots of patients' lives and brains would be saved. Till such times, O<sub>2</sub> can be administered only through the airway.

### Growth and progress of anaesthesia in India

The first administration of ether anaesthesia in India was on Monday 22nd March 1847, in Medical College Hospitals, Calcutta, under the supervision of the surgeon Dr. O'Saughnessy. First chloroform anaesthesia was administered on January 12th, 1848 (Chloroform was first used by Simpson in Edinburgh UK, on 15th November 1847). The British Medical Association appointed the Glasgow committee in 1880 which concluded that "Chloroform was injurious to the heart and in comparison, more dangerous than ether". In 1888 Edward Lawrie in Hyderabad claimed that he had administered chloroform anaesthesia to 40,000 people without a single fatality and formed the "First Hyderabad Chloroform Commission". 41 animal experiments were conducted, and it was concluded "Chloroform may be given with perfect safety and without any fear of accidental death, if only respiration is carefully attended to".

This report was not accepted in England and the "Second Hyderabad Chloroform Commission" was formed to which a representative from *The Lancet Journal* was sent. This commission was formed by the Nizam of Hyderabad and consisted of Thomas Lauder Brunton from U.K., chief surgeon of British residency, Edward Lawrie, and another surgeon, Rustomji. This time experiments were conducted at the Afzalganj Hospital in Hyderabad on 430 different animals (including horses, goats, rabbits, rats, dogs, monkeys, and cats) and also, a clinical study involving 54 human subjects following which they realized that the findings of Edinburgh School was true. The place is currently known as Osmania Hospital.

Incidentally, world's first woman anaesthesiologist, Rupa Bai Furdoonji belonged to Hyderabad and had been working under the surgeon Edward Lawrie, who was also the

Principal of Hyderabad Medical School. Edward Lawrie had lauded her for her skills in administering Chloroform anaesthesia in the book 'A Report on Hyderabad Chloroform Commissions' published in 1891. She also featured in the group photograph of the second chloroform commission. Dr. Furdoonji extensively administered chloroform in Hyderabad during the years 1889-1917.

The world had begun to realize the hazards of chloroform and it almost went out of practice around 1890 in favor of ether. However it was not until 1928 in India that its supremacy was lost to ether since the latter was very cheap and easy to use. Dr. M. C. Ganguli from Calcutta and Jyoti Prasad of Jodhpur in 1928 put forward the cost effectiveness of ether. Dr M. C. Ganguli went on to become the first editor of the official journal of the Indian Society of Anaesthesia, the first edition of which was published in July 1953.

The Indian Society of Anaesthesiologists (ISA) was established in 1947 under the leadership of Dr. B. B. Sircar of Seth G. S. Medical College, Bombay. The first independent conference of ISA was held in Hyderabad under the Chairmanship of Prof. Venkatrao and Presidentship of Dr. R. P. Parulkar of Baroda. The first dedicated anaesthetists in India were from the Hyderabad Medical School, where two students were delegated specifically to conduct all cases of chloroform anaesthesia. Out of the two, one person would take detailed notes of the anaesthesia. These were the first documented anaesthesia records in India (Ind. Med. Gaz. P. Heir – 1893; 27, 80). The first postgraduate teaching program (diploma) was started in Bombay in 1946 and the first degree course in anaesthesia(M.S.), was started in Muzaffarpur and Darbhanga.

### **Growth of professional and academic bodies in India**

1947-Indian Society of Anaesthesiologists(ISA) was established on 30th December.

1953- Indian Journal of Anaesthesia, official scientific journal of ISA, was started. Dr MC Ganguly was the first editor.

1956- World federation of Society of Anaesthesiologists (WFSA) formed, with India as a founding member

1965-ISA became independent body and held it's first conference in Hyderabad where the pioneers, Prof R R Macintosh and Cecil Gray were the special guests.

1991- South Asian Confederation of Anaesthesiologists(SACA) was formed and Dr V M Divekar was the first president

2008 - Indian College of Anesthesiologists was established to promote academic anaesthesia

2010- All India Difficult Airway Association (AIDAA) and Association of regional Anaesthesia (AORA) were established.

2018- *Airway*, world's first journal dedicated for airway management was started with Prof. Dr. Ramkumar V. as it's cheif editor.

### Interesting Events

Mahatma Gandhi was operated upon on 12th January 1925 and it was an eventful emergency appendicectomy in Sassoon Hospital, Pune. Dr. Date administered open drop Chloroform. Interestingly during the surgery electricity failed; a torch was brought in, which got fused; Surgeon Col. Maddock completed the operation in the light of a kerosene lamp!!

Alexander Crombie of the Presidency General Hospital, Calcutta, started using hypodermic morphine in 1880 for smoother course of chloroform anaesthesia; this is the first documented report of premedication in the world, confirmed by Gwathemy and Rene. F. Miller of U.S.A. (Ind. Med. Gaz. 1888, 23, 34). Chloroform and ether continued to be used till mid – fifties in many hospitals. Trilene was introduced in the late 1940s and is no more in use. Halothane appeared on the scene in 1960. First case of halothane hepatitis was reported in 1972. Isoflurane was introduced in 1992.

Thiopentone was introduced by Dr. M.M. Desai and Dr. B.N. Sircar (Bombay) at the G. S. Medical College in early 1940s. Dr. Desai had the misfortune of being the first and perhaps the only anaesthetist to die in a dental chair following thiopentone, given by his own resident. Id-tubocurarine was introduced in 1949. Cocaine 4% was first reported as a local anaesthetic in 1894 for removal of a facial tumor. Spinal anaesthesia was first reported by Capt. A Chalmers of Trichinopoly with hyperbaric stovaine. Lumbar and caudal extradural analgesia were reported by Dr. G. R. Kokatnur (Belgaum, Karnataka). He had been doing that since 1925 with 40–60 c.c. of 1% Novocaine with no risk in over 400 cases (J. Ind. Med. Assoc. – 1946, 15, 342). First death due to spinal anaesthesia was reported by W. Gabbet of Madras, following spinal block at T11-12 with strychnine and Novocaine mixture. This was published in 1954.

The first native “Boyle F” was manufactured in 1950 with imported parts from Indian Oxygen Limited (IOL), Calcutta. First oxygen plant was installed in Calcutta in 1935 and nitrous oxide plant in 1962. Central pipeline supply was first installed in Vellore (1954) and by 1979 over 150 centers had their own pipeline systems for oxygen supply. Liquid oxygen tanks is the currently preferred storage technology and oxygen manufacturing plants have been set up in major institutions following the lessons learnt from oxygen shortage in the Covid 19 pandemic.

(Primary source of contents for Indian history of anaesthesia is an article by Divekar and Naik, published in 2001. It is included in the suggested reading below.)

### Conclusion

Gone are the days when surgery invoked dreadful images about surgery and anaesthesia in the minds of the patients, which surpassed the concern for the disease itself. Modern anaesthesia should be “a pleasant experience” and patients need not

fear the operation theatre anymore. Once we know the history, it is our responsibility to put efforts to create history!!!!AND YES, WE CAN....By learning from the success and failures of the past, making best use of present and putting our heart and mind to our profession to create a better future.

**Prof. (Dr) Raveendra Ubaradka S., Dr. Anju Gupta & Dr. Vyshnavi S.**

### Woolley and Roe case

Albert Woolley and Cecil Roe were normal middle-aged men who were posted for some minor surgery in Chesterfield Royal Hospital on Oct 13, 1947. Spinal anaesthesia using the same drug Cinchocaine, was administered on the same day by the same anaesthesiologist Dr Malcolm Graham (1916-1997). Unfortunately, as much as it was devastating for the patients and relatives, so it was for the practice of spinal anaesthesia in the UK, both the patients developed permanent post surgical paraplegia. In 1953, Professor MacIntosh provided evidence to the court saying contamination of local anaesthetic drug with phenol through the invisible cracks in the ampule, dipped in phenolic sterilizing solution was responsible for this catastrophe. The court upheld this decision in 1954 based on the fact that the anaesthesiologist was not aware of this hypothetical risk and the victims were not compensated, as there was no evidence of negligence.

In 1983, Dr Graham, in a private interview to Dr Maltby, revealed an unpublished fact that the theatre nurse who normally supervised the sterilization process of needles and syringes was not present due to a severe bout of headache and vomiting on that particular day. Hence, the acid descaling liquid in the sterilizer was not replaced with water, which contaminated the drug aspirated from the ampule in the syringe and needle placed in that sterilizer for sterilization. Later, in 1990, Hutter reexamined the case and postulated that it was the acid descaling liquid and not phenol, which caused the neurological damage.

Graham revealed that he and his colleague had unsuccessfully tried numerous techniques to produce cracks in the ampule, they could be broken or remained intact with all methods of causing damage, but only touching with a hot wire could produce cracks. Graham was also aware that a third patient on the same day as Woolley and Roe with intestinal obstruction who died 3 days following surgery also suffered similar neurological injury. So he had a strong contention that three cases on the same day could be caused only by a common factor, which is sterilization. However, the court ignored Graham and also to the neurologists opinion that phenol couldn't cause paralyses.

There was great public outcry following this case and spinal anaesthesia was virtually discontinued in the UK for 25 years until Selwyn Crawford used it in obstetrics in the late 1970's in Birmingham.

**Contributed by Dr. Sarika M. Shetty**

## Chapter 3

# Scope of Anaesthesia Specialty

### Insignificance to prominence

"No longer is it just "put to sleep"  
 Many are the roles, diverse and deep  
 Roles in emergency, resuscitation, and disaster  
 Wide is the scope, dear newcomer"

#### 1. Preamble

Anaesthesia, as a specialty, is no more limited just “to put a patient to sleep” or to performing spinal or epidural anaesthesia. It has grown into an advanced medical specialty the scope of which extends well beyond the realms of the operation theatre. Modern anaesthesia is defined by specific goals, structured training courses, use of multiple drugs, technological innovations, guidelines and protocols. Reflecting the growth of the specialty, many departments of anaesthesia have been variously renamed as *Department of Anaesthesia and Intensive Care*, *Department of Anaesthesia and Pain Medicine* or *Department of Anaesthesia and Perioperative Medicine*.

#### Scope of modern anaesthesia

1. Anaesthetic management for surgical procedures
2. Anaesthesia services for non-surgical diagnostic and therapeutic procedures
3. Ambulatory anaesthesia services
4. Emergency medical services: Resuscitation, stabilization, lifesaving procedures, transfer of patients
5. Acute and chronic pain management including labour analgesia
6. Intensive care management
7. Disaster management
8. Highly specialised areas like hyperbaric anaesthesia, high altitude anaesthesia, foetal anaesthesia and experimental anaesthesia
9. Research

#### 2. Anaesthetic management for surgical procedures

This is the primary responsibility of the anaesthesiologist and a key reason for the progress of anaesthesia. General anaesthesia (GA), regional anaesthesia (RA) and monitored anaesthesia care (MAC) are the three main divisions which are not necessarily mutually exclusive. Advances in anaesthesia have matched the developments in modern surgery. Surgical patients are of different ages and complexities undergoing variety of procedures. They present with challenges for safe

management and opportunities to use a wide variety of techniques and drug combinations, rendering the conduct of anaesthesia a dynamic process.

Within the broad specialty of anaesthesia, several subspecialties have been developed with a view to improve quality of care for specific subset of patients. Cardiothoracic and neuro-anaesthesia are among the earliest subspecialties and now paediatric anaesthesia, bariatric anaesthesia, transplant anaesthesia, onco anaesthesia, ambulatory anaesthesia, maxillofacial anaesthesia etc have been added. In addition, fellowships in specialised areas like airway management and regional anaesthesia have also been introduced.

### 3. Anaesthesia for non-surgical and diagnostic specialties

In this context, anaesthesia services include monitored anaesthesia care, sedation, regional anaesthesia and general anaesthesia. Non-surgical procedures require services/ presence of anaesthesiologist to a) manage pain and discomfort associated with procedure and positioning, b) monitor the patient and d) diagnose and manage complications. Non-surgical procedures requiring services of anaesthesiologist is mentioned below.

1. Upper and lower gastrointestinal endoscopy
2. Airway endoscopy for preoperative assessment
3. Endoscopic Retrograde Ccholangio-Pancreatography (ERCP)
4. MRI
5. Ablation procedures for intractable arrhythmias
6. Mediastinoscopy
7. Brachytherapy
8. Radiotherapy and chemotherapy in children
9. Electro convulsive therapy (ECT)
10. sleep studies in patients with Obstructive Sleep Apnoea (OSA)
11. Digital subtraction angiography (DSA)

The location of many of these procedures could be away from the operation theatre, the comfort zone of anaesthesiologists. This imposes additional responsibilities on the anaesthesia team in terms of logistics, preparation, availability of equipment and drugs, necessity to shift items, transfer of patients and monitoring. Additional implications arise from the nature of the procedures, specific steps of procedures, characteristics of environment (MRI compatibility) and specific complications associated with the procedures. You will be posted in 'non-operating room' locations after at least six months into your residency. This is because a reasonable training in basics, knowledge of drugs and sedation etc are prerequisites.

#### 4. Ambulatory anaesthesia

Day care procedures have gained popularity for a range of therapeutic and diagnostic indications. This is due to availability of short acting and safe drugs, advances in non-invasive monitoring, avoidance of hospital stay, and the necessity for cost effectiveness. Success of an ambulatory set up depends on safe anaesthesia services. Patient selection, choice of anaesthesia technique and drugs, monitoring and adhering to established discharge criteria are important. Despite the best facilities and optimal care, an occasional patient may require overnight admission due to unexpected complications.

#### 5. Emergency services

An anaesthesiologist can play a key role in emergency management, due to the inherent nature of training. Anaesthesiologist is well trained in basic and advanced cardiopulmonary resuscitation and management of respiratory arrest. The various interventions that can be managed by anaesthesiologist in an emergency are,

1. Recognition and management of respiratory or cardiac arrest and resuscitation.
2. Initial assessment, resuscitation, and stabilization of a polytrauma patient
3. Management of massive bleeding as per massive transfusion protocols
4. Medical management of emergencies like anaphylaxis, bronchospasm, convulsions, hypoglycaemia, acid base disorders, electrolyte abnormalities and life-threatening arrhythmias
5. Management of life-threatening emergencies such as tension pneumothorax
6. Establishing vascular access and invasive monitoring
7. Acute pain management, especially with regional techniques including “on-site blocks” when the patient arrives in the emergency department
8. Initial ventilatory management, in emergency department, ICU or postoperative ward
9. Transfer of patients, inside hospital and in between hospitals

#### 6. Acute and chronic pain management

Pain management has become a highly specialized area. Inadequately treated acute and chronic pain can lead to significant physiological and psychological sequels in the patient. When persistent, pain has negative consequences on the family and the society at large. Providing pain relief is one of the primary responsibilities of the anaesthesiologist and part of any anaesthetic plan. It should be remembered that amnesia or narcosis or simply being unconscious and immobile does not ensure adequate analgesia during general anaesthesia. Adequate pain relief improves patient satisfaction after surgery and painful procedures.

With modern drugs and the current understanding of physiology and technological advances, it is possible to provide a satisfactory level of analgesia for each patient. Multimodal analgesia (MMA) is the modern concept of acute pain management. In MMA, different drugs, routes of administration and modalities are combined to achieve maximum pain relief. Acute pain management is protocol based, with solid scientific and physiological foundation. Several pain assessment tools are available. Visual Analogue Score (VAS) is one of the most used pain assessment tools.

While acute pain is a symptom of underlying tissue damage or inflammation or both, chronic pain is considered as a disease itself. This results in several long-term pathophysiological changes in the body, especially in the nervous system and significant psychological effects. Chronic pain, unlike acute pain, is not a predominant domain of the anaesthesiologist, unless he/she is specially trained in pain management. Regional blocks and use of some of the anaesthetic or anaesthesia related drugs play an important role in chronic pain management. Examples of such drugs are low dose ketamine, lignocaine and bupivacaine.

## **7. Resuscitation Services**

Patients require resuscitation and life support(basic/advanced) for respiratory arrest and cardiac arrest. Periodically updated guidelines are available for Basic and Advanced Cardiac Life Support (BLS and ACLS), Trauma Life Support (ATLS), Paediatric Advanced Life Support (PALS), Neonatal resuscitation and basic and advanced hazardous material life support (AHLIS).

Anaesthesiologist is better placed to provide effective resuscitation across different clinical scenarios and ages. Reasons for this are a) principles of management of anaesthesia and resuscitation have similarities, b) familiarity with drugs used in resuscitation, c) expertise in establishing non-invasive and invasive monitoring, central venous access for fluid resuscitation, d) ability to transfer patients between different critical areas and simultaneously take up the patient for life saving surgical procedures and e) experience from management of near cardiac arrest, cardiac arrest, and other life-threatening complications intraoperatively.

Anaesthesia trainee should ideally have the knowledge of (if not hands on training) surgical airway, pacing, thoracocentesis and intercostal drainage. Training in emergency ultrasound aids in real time diagnosis. All these further enhance the quality of care.

## **8. Intensive care unit (ICU) management**

Because of expertise in anaesthetic management of all ranges of patients, in terms of age (neonates to elderly) and complexity (ASA 1 to 5 elective and emergency and difficult airway), anaesthesiologist is well placed to perform the role of intensivist when called for. This is especially true in the initial period of critical illness for a) diagnosis and

management of life-threatening illness/complications/trauma b) airway management c) establishing invasive monitoring and d) providing mechanical ventilation: management and weaning and e) procedures in intensive care unit. Postings in intensive ICU for a period ranging from 3 to 4 months, over a period of 3 years, is a part of training. Similarities between the ICU and anaesthetic monitoring are, 1) a i r w a y management: techniques and strategies differ, but principles remain the same, 2) management of hemodynamic changes including invasive monitoring, fluid, and electrolyte imbalance, 3) blood management, 4) management of Intracranial pressure and 5) ventilation (invasive & noninvasive): by and large more complicated and complex in ICU compared to perioperative ventilation.

### 9. Disaster management and prehospital care

Disaster basically denotes the magnitude of the destruction, usually with loss of human life, which exceeds the ability of the available resources to manage. Anaesthesiologist can play both administrative and clinical roles in times of disasters, epidemics, and pandemics. Clinical roles include a) triage-classifying the victims according to the survival chances to prioritize the utilization of resources; b) initial resuscitation; c) organizing make-shift operation facilities and anaesthesia for life saving procedures and d) transfer of patients.

### 10. Other specialized areas

These include patient transfer in air ambulance, high altitude anesthesia, military anesthesia (management in conflict zones and management of war casualty), etc where, though the fundamental principles remain same, specialized training is required. Novel areas like foetal anaesthesia and experimental anaesthesia and huge research opportunities have further widened the scope of the specialty. Since most of these are not included in the conventional curriculum, acquiring a reasonable theory knowledge is desirable for those residents who want to go beyond routine.

### Conclusion

The specialty of anaesthesia has enormously expanded its scope over the last few decades, with many of above described areas having been incorporated in the residency training. Understanding the scope should help you to appreciate the “width and depth” of the specialty. Appreciating the nuances of each subspecialty, helps to improve the care. Residents can really make use of the vastness of the specialty to build a bright future for themselves.

---

**Prof. (Dr) Raveendra Ubaradka S. & Dr. Vyshnavi S.**

---

Be a disciple of life

## Chapter 4

# Curriculum

## Go beyond

### Preamble

Curriculum for anaesthesia residency is designed to create anaesthesiologists capable of providing high quality health care to the community with ability to contribute to advancement of medical science by way of “research, training and continued upgradation of knowledge and skills”. Curriculum focuses on theory, skills (practical) and attitude of the residents. Different aspects of curriculum with brief description are discussed in this chapter. Details and official timeline may differ between the MD and DNB courses and among different Universities. But the overall contents remain same. Broad objectives of training are shown in the box below,

#### Residency training objectives

1. Ability to recognize the health care needs of the community
2. Competence to handle medical problems effectively
3. Acquisition of broad range of clinical, technical, and non-technical skills
4. Basic teaching skills to teach medical/para-medical students.
5. Knowledge of the principles of research methodology and modes of consulting a library

Special emphasis is placed on attitude, behavior, safety, communication, presentation, audit, teaching, ethics and law and management.

#### Specific objectives for anaesthesia training

“The resident is expected to acquire in-depth knowledge of the subject from various textbooks and journals. Emphasis should be on the diseases/health problems most prevalent in that area. Knowledge of recent advances and basic sciences as applicable to anaesthesiology should get high priority. Competency in anaesthesia skills commensurate with the specialty (actual hand on training) must be ensured.”

### Subject specific competencies (Cognitive, affective, and psychomotor)

#### Cognitive domain

Anatomy	<ol style="list-style-type: none"> <li>1. Airway, cardiorespiratory system, central, peripheral and autonomic nervous system, coronary and cerebral circulation, renal and hepatic systems.</li> <li>2. Applied anatomy related to intravascular access (arterial, peripheral and central venous, and intraosseous), intramuscular, injections and central neuraxial and peripheral nerve blocks.</li> </ol>
---------	--

Physiology	<ol style="list-style-type: none"> <li>1. Respiratory, cardiovascular, hepatobiliary, renal, endocrine, hematological and neuromuscular physiology, changes in pregnancy, regulation of temperature and metabolism, stress response, cerebral blood flow and ICP, central, autonomic, and peripheral nervous systems, and metabolic response to stress and trauma.</li> <li>2. Applied physiology : Effects of disease, injury and anaesthetics on physiology, range of abnormal values, safe limits, effect of surgery and positioning and special techniques, monitoring of different organ functions in anaesthetized patients and critically ill.</li> </ol>
Biochemistry	Fluid and electrolyte balance and abnormalities, acid-base homeostasis, glucose metabolism and abnormalities, congenital errors of metabolism and clinical effects.
Pharmacology	<ol style="list-style-type: none"> <li>1. Basic principles: pharmacokinetics and dynamics, distribution, and metabolism.</li> <li>2. Specific drug groups directly relevant to anaesthesia such as induction agents, inhalational agents, muscle relaxants, sedative analgesic drugs, local anaesthetics, reversal agents and emergency drugs.</li> <li>3. Knowledge of commonly used medications for comorbidity.</li> <li>4. Drug interactions and medical errors.</li> </ol>
Physics	<ol style="list-style-type: none"> <li>1. Gas laws, medical gas supply system, fluidics, electricity, diathermy.</li> <li>2. oxygen therapy.</li> <li>3. Physics related to anaesthesia machine and other equipment such as breathing systems, monitors, infusion pumps, blood gases, sterilization etc.</li> </ol>

**Clinical Knowledge** (brief and partial list)

1. History and development, scope and techniques and types of anaesthesia
2. Assessment, planning and clinical management, monitoring
3. Interpretation of lab results and other investigations
4. Perioperative diagnosis and management of complications
5. Use of blood and blood products and including massive blood loss management
6. Acute and chronic pain management
7. Principles of sterilization, universal precautions, Infection control, cross contamination in OT and ICU
8. Knowledge of special techniques like hypothermia, induced hypotension etc.

9. Regional anaesthesia
10. Anaesthesia in different settings including non-operating room locations
11. Sedation for different procedures
12. Management of emergency procedures
13. Resuscitation in cardiac arrest, trauma, in adults and children
14. Research methodology, ethics, biostatistics and data collections

### **Affective Domain**

Residents should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis and treatment. They should develop communication skills to write reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

### **Psychomotor domain**

Psychomotor domain involves various skills and hands-on ability to manage the patient safely throughout the perioperative period. Neither the patient's condition, nor the requirements of the procedure is static during anaesthesia. It is always dynamic with minute-to-minute changes. Residents are trained to differentiate between the normal and abnormal variations in patient's condition and to detect and treat the abnormalities while continuously providing optimal conditions for surgery or procedure.

Desired/expected skills/abilities under this domain include patient management during the entire perioperative period, outside the operating room, patient transfer and management of critically ill patients in the ICU.

### **Management of surgical patients in operation theatres**

#### **I Preprocedural**

1. Preanesthetic assessment, further consultation, and investigations
2. Optimization and preparation, premedication, fasting guidelines and medication management
3. Consent and discussion with patient (risks, benefits, clearing doubts, rapport)
4. Recognition of special needs related to patient, procedure, and situation
5. Airway management : Normal and difficult
6. Preparation for regional techniques
7. Equipment: selection, checking and preparing
8. Drugs : select, load, dilute and label
9. Preinduction monitors and fluid lines

## II Perioperative or during procedure

1. Induction of anaesthesia, airway management or establishing regional anaesthesia or sedation
2. Patient positioning
3. Techniques : arterial and ventral venous lines and emergency techniques like intraosseous route of injection, defibrillation and cardioversion, needle thoracocentesis
4. Perioperative mechanical ventilation
5. Monitoring : Setting up and interpretation of invasive and noninvasive monitoring.
6. Recognition of complications and management , including use of perioperative ultrasound
7. Management of fluids and electrolytes
8. Patient blood management
9. Communication with surgical (or clinician in case of nonsurgical procedures) team
10. Resuscitation

## III Postoperative care

1. Patient transfer to recovery and handover
  2. Monitoring and oxygen therapy
  3. Detection and management of complications#
  4. Discharge from the recovery/ postoperative ward
  5. Transfer of patient to ICU in case of deterioration
- # Complications may be related to airway, respiratory system, hemodynamic instability, pain, nausea and vomiting, cognitive dysfunction, bleeding, convulsions, hypoglycemia, shivering etc.

You should appreciate that patients coming under your care belong to all surgical specialties and super specialties, patients for nonsurgical diagnostic or therapeutic procedures, patients from all the ages, from newborn to very old, and of all risk categories, ASA 1 to 5. In obstetric anaesthesia, you will be trained to manage a physiologically and anatomically unique patient population i.e., the parturients where the management involves taking care of the mother and the fetus. Pregnant patients with additional risk factors are even more challenging.

Management of anaesthesia for emergency surgery is another essential component of training. Some examples include burns, trauma, head injury, fractures, hemorrhage, abdominal emergencies, emergency obstetric procedures, etc. Here, you will be dealing with potentially unstable, unprepared patient with limited information, often in a constrained environment limited by logistics, support, and help.

Sedation/anaesthesia outside operating room for MRI suite, endoscopy room, cardiac catheterization lab, lithotripsy, and other locations is another aspect of your training. This is often referred to as Non-Operating Room anesthesia (NORA).

### Specialized aspects anaesthesia training

#### Regional anaesthesia(RA)

Key aspects of training include, a) applied anatomy including sonoanatomy, b) indications, contraindications, special considerations for different techniques, c) general principles of pharmacology of local anaesthetics and various adjuvants and d) assessing adequacy of regional anaesthesia, management of complications including failures and supplementation of sedation and general anaesthesia.

Training also includes performing the following regional anaesthesia techniques: Brachial and cervical plexus block, stellate ganglion block, lumbar plexus and lumbar sympathetic block, sciatic nerve block, femoral nerve block, 3 in 1 block, wrist block, popliteal nerve block, trigeminal nerve block, retro bulbar blocks, paravertebral blocks, TAP block, erector spinae block, intercostal blocks, caudal block – adult and pediatric, ankle block, epidural block/catheter, subarachnoid block, Bier's block, and peripheral nerves of the upper and lower limbs.

#### Thoracic Anaesthesia

1. Knowledge of bronchopulmonary segments, pulmonary circulation, and physiology of thoracotomy and one lung anaesthesia. 2. Assessment of patients requiring thoracotomy, pulmonary resections, lung volume reduction, thoracoscopy, mediastinal surgeries, airway stenting and related procedures, 3) Prediction of postoperative pulmonary function and need for ventilation and understanding the influence of comorbidity especially myasthenia gravis in this context and 4). Postoperative care including ventilation and pain management. This includes paravertebral block, anatomy, and physiology.

#### Obstetric anaesthesia

- Theory :** Anatomical and physiological changes in normal and abnormal pregnancy and their implications for anaesthesia, placental circulation and transfer of drugs, the process and stages of delivery, safe use of drugs in pregnancy, causes, effects and implications of obstetric hemorrhage, amniotic fluid embolism etc.
- Hands-on :** 1. Assessment and preparation of obstetric patients including risk stratification. 2. Management of airway and regional techniques in obstetrics, anesthetic management of emergency and elective caesarean sections, labor analgesia, management of hemorrhage, intrauterine resuscitation, pain management and management of other complications. In obstetric anaesthesia, you are taking care of two lives, maternal and fetal. Also, remember that

parturients are at higher risk of difficult airway, aspiration, and hypoxia. Regional anaesthesia may be technically more difficult.

**3. Labor analgesia :** Different techniques and drugs, conduct and management of labor epidural analgesia

**Cardiovascular anaesthesia.** Key components include,

1. **Theory:** a) applied anatomy of heart and valves, coronary circulation and their territories, b) physiology and pathophysiology related to coronary, cerebral, pulmonary, and visceral circulations, c) blood volume distribution and control, microcirculation, venous pressure and controlling factors related to circulation and d) regulation of blood pressure.

Theory also includes pathophysiology of ischemic heart disease and valvular heart diseases, cardiomyopathy, right to left and left to right shunts and implications of congenital cardiac diseases (cyanotic and noncyanotic), and coarctation of aorta. Another aspect of applied physiology is the understanding of principles and management of cardiopulmonary bypass (CPB), intra-aortic balloon pump and effect of drugs in cardiac patients. Physiology and pharmacology related to anticoagulation is also a part of the essential theory knowledge.

2. **Assessment** of cardiac patients for cardiac surgery and related procedures such as ablation procedures and cath-lab procedures. Assessment includes current cardiac status, special investigations related to cardiac procedures, indications and contraindications for different procedures and optimization of patients. It is important for residents to appreciate the teamworking involved in cardiac surgery.
3. **Clinical management and techniques :** a) insertion of lines, often preinduction, induction of anaesthesia and airway management, b) Initiation and management of CPB, and monitoring and management cardiac surgery without CPB, c) robotic cardiac surgery, d) detection and management of perioperative complications and e) principles and management of different complications.

### Transplant Anaesthesia

a) Application of knowledge of basic pathophysiology of renal and liver failure and principles of anesthetizing an immuno-compromised patient and b) principles of anaesthetizing patient with end stage renal/liver disease and patient with organ transplantation and perioperative management.

### Pediatric Anaesthesia

1. Anatomy, physiology, and pharmacology : unique features and implications in neonates and children
2. Preoperative assessment and preparation (premedication, consent, optimization,

rapport)

3. Age and size specific equipment for neonates, infants, and older children
4. Anaesthetic management : induction techniques, airway management, regional techniques, blood and fluid management, ventilation , resuscitation, sedation, and postoperative care
5. Recognition and management of apnoea, laryngospasm, acid base abnormalities, hypothermia, etc. Also, management of convulsion and bleeding.
6. Management of children ( including neonates) with special requirement : differently abled and those with congenital defects and anomalies.
7. Patient transfer, ICU care basics, resuscitation, pain management

### Neuroanaesthesia

1. **Knowledge and theory** : a) cerebral circulation, intracranial pressure and its implications b) principles of neuroanaesthesia including common neurosurgical procedures, emergency neurosurgery and diagnostic procedures c) anaesthetic implications of neurosurgical procedures including positioning, techniques, monitoring and perioperative care, d) ability to interpret the radiological investigations including MRI and CT are additional competencies residents need to acquire to improve the effectiveness of care and e) diagnosis of brain death.
2. Assessment, optimization, preparation, and planning for different neurosurgical procedures.
3. Clinical management of a) anaesthesia for neurosurgery and diagnostic procedures including positioning, drugs, and monitoring, b) management of intracranial pressure, c) head injury, d) electrophysiological monitoring including evoked potentials e) medical management of head injury, cerebral vasospasm, and f) management of intracranial pressure.

### Acute and chronic pain management

- a) Perioperative and postoperative pain management including practice of multimodal analgesia
- b) Management of pain also includes WHO ladder of cancer pain management, organization of pain services, use of regional techniques in pain management and pain management in special patient populations. Examples are those who are terminally ill, elderly, children, critically ill, preexisting analgesic therapy, persistent pain and those who are addicted to opioids. Opioid addiction is not uncommon and is one of the major public health problems.
- c) Management of chronic cancer and non-cancer pain, including use of special techniques like patient-controlled analgesia, use of novel routes and drugs.

### Critical care (ICU management)

1. Assessment of severity and criteria for admission to ICU. Trauma, sepsis, acute respiratory distress and failure, postoperative management, poisoning and management of life-threatening emergencies are some of the broad categories of patients requiring ICU care.
2. Resuscitation, stabilization, use of scoring systems, guidelines for management and prognosis
3. Monitoring, ventilation, oxygen therapy, fluids, electrolytes, and blood management
4. Special procedures in ICU: observation and performance under supervision
5. Safe use of drugs in critically ill patients with altered drug handling. Sedatives, muscle relaxants, antibiotics, steroids, are some examples.
6. Nutrition; enteral and parenteral
7. Ethical issues and clinical decision making

### Research

Resident should be able to demonstrate ability to 1) analyze data and write a thesis, present scientific data, participate in anaesthesia audit and 2) demonstrate ability to critically review and acquire relevant knowledge from the journals about the new development in the specialty.

### Clinical postings

As residents, you are posted in different locations, usually on a monthly rotation. Broadly, you will be posted in different surgical specialties, preanaesthetic assessment clinics, pain clinic, super specialties like cardiothoracic, neuro, maxillofacial, pediatric and oncological theatres. You may have peripheral postings in allied departments like medicine, surgery, and radiology, etc.

Purpose of rotation is to expose you to each specialty required. Be well prepared before starting each postings. You will be able to learn something new in each postings. Whatever experience and knowledge you acquire from different postings will be invaluable for you in future professional career. How each posting can be useful uniquely is shown in the table below.

The list above is an example and is not complete. Purpose of this table is to stress that *each clinical posting is important and unique*. What you miss to learn in one of them cannot be compensated by you performing very well in another postings. For example, you cannot learn about labor analgesia in any posting other than obstetrics. Similarly, you can learn best about cardiopulmonary bypass and lung isolation only in cardiac and thoracic theatres. Hence, be careful to give due importance to each posting.

Postings	What you can learn	Remarks
General Surgery	All types of patients, ASA 1 to 5, all ages, elective and emergency, short to long duration, laparoscopic surgery.	Routine management, problems of long duration surgery, importance of positioning, drugs by infusions, etc. Probably maximum number of patients belong to this category during your training.
Neurosurgery	Positioning, ICP management, managing traumatic brain injury, long duration surgeries, stereotactic and functional brain surgeries and spine surgeries.	It is one of the subspecialties you can choose for the future. Involves all ages. Evoked potential monitoring and general anaesthesia without muscle relaxants, awake craniotomy.
ENT and maxillofacial	Usually general anaesthesia, airway challenges, sharing of the surgical site, difficult access after surgery starts, intraoperative airway issues, extubation problems, LASER surgery in ENT, surgery on the airway.	Learn and improve upon the airway skills, attention to details, management of perioperative problems, and special requirements for individual procedures.
Obstetrics and gynecology	Normal and complicated pregnancy, elective and emergency, difficult airway, life threatening bleeding, risk of aspiration, risk of embolism, GA vs RA issues, labour analgesia.	Again, one of your potential future super specialities. Can be very challenging. Obstetric patients form a good percentage of your patient population.
Onco-anaesthesia	Long procedures, blood loss, difficult airway, unanticipated difficult airway, robotic surgery, role of regional anaesthesia, perioperative challenges, postoperative pain management.	Learn about the role of anaesthetics in the spread of malignancy, multimodal analgesia, and postoperative pain management.
Orthopedics	Wide range of procedures, different positions, different goals, blood loss, fat embolism.	Intravenous Regional Anaesthesia, use of tourniquet, nerve blocks of all kinds, pain management.
Pediatric anaesthesia	Handling the children and neonates, induction techniques, pediatric airway and regional	Learn gentleness and tender care of the little ones, with extreme vigilance and finesse. Techniques,

	techniques, pain management, etc.	monitoring and interpretation vary.
Pain Clinic	Patients with chronic pain and sometimes with acute pain. Detailed assessment of pain, diagnostic tests, protocols and plan for treatment	Liaison with other specialties, use of analgesics, primary and secondary, adjuvant drugs and neurolytic blocks.
Cardiothoracic anaesthesia	Coronary bypass surgery, valvular surgeries and vascular surgeries. Cardiopulmonary bypass, management of patients with poor cardiac reserves, postoperative management	Application of knowledge, interpretation of investigations, planning for perioperative management, extubation, cardiac assist devices like intra-aortic balloon pump, extracorporeal membrane oxygenators. In thoracic anaesthesia you will learn about lung isolation (double lumen tube and bronchial blockers) and resection (anaesthetic management of), one lung anaesthesia and video assisted thoracic surgery like decortication

### Conclusion

Curriculum contains the contents of your residency and they are interrelated. You need to periodically go through the same to know the direction of your training and to ascertain that you are doing well. By doing this, you will be able to do course corrections whenever you feel that you are lagging behind.

---

**Prof. (Dr) Nalini Kotekar & Prof. (Dr) Raveendra Ubaradka S.**

---

Talk to yourself once in a day - otherwise you may miss meeting an excellent person in this world

*Swamy Vivekananda*

"What we are and what we have been has no bearing on what we can be. We can be, what we choose to be"

*Mahatria Ra*

## Chapter 5

# Technical Skills

### Essential & Indispensable

Besides the pricks and pills,  
Also learn the basic skills.  
Observe, study, practice and evolve,  
Around this does your efficiency revolve.

#### Preamble

Proficiency in various techniques are indispensable for the anaesthesiologist. Residency is the best period to lay a strong foundation in this regard. A combination of skills, dexterity and knowledge enhance your confidence and enables you to provide the best professional service to your patients. From your viewpoint, there are mandatory skills and desirable skills.



Peripheral Venous Cannulation



Bag Mask Ventilation Procedure



Endotracheal Intubation Procedure



Subarachnoid Block

## 2. What constitutes a technical skill?

Any skill is the amalgamation of three components- cognitive, psychomotor, and affective. (Figure 5.1)

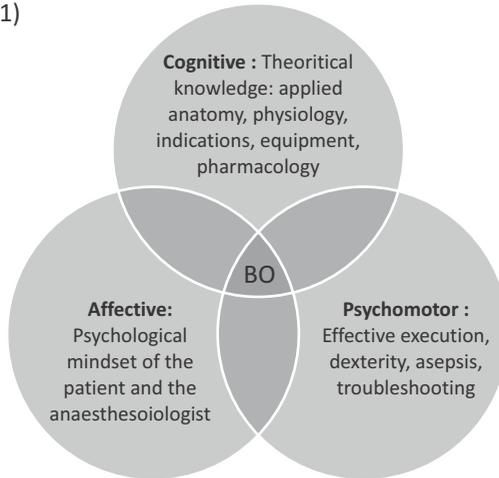


Figure 5.1: Components of a skill. BO - Best outcome

### Role of knowledge in relation to skills

The knowledge component is often overlooked in a zeal to learn the technique per se. Knowledge gained by in depth studying about a skill forms the foundation and has several advantages (Table 5.1)

1. Enables you to make informed choice regarding a technique
2. Helps in better and safer execution of the technique, which includes better micromanagement (management of details)
3. Understanding of indications, role of the technique in each context and complications, particularly the rare ones
4. Over a period, with repetition, you acquire deeper insight into every technique you perform, leading to improvement, modification, and refinement.

Table 5.1: Advantages of sound knowledge to master technical skills

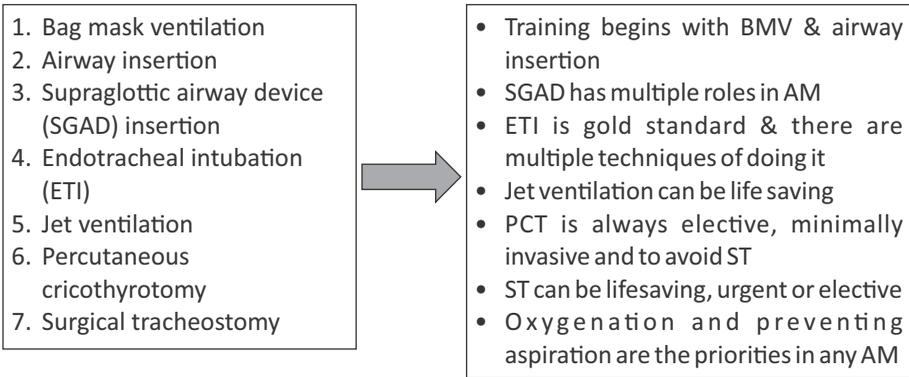
## 3. Categories of Skills

### 3.1 Vascular Access

<ol style="list-style-type: none"> <li>1. Peripheral venous cannulation(PVC)</li> <li>2. Arterial line placement (AL)</li> <li>3. Central venous catheter placement (CVC)</li> <li>4. Peripherally inserted central venous access (PICVA)</li> <li>5. Intraosseous route (IO)</li> </ol>		<ul style="list-style-type: none"> <li>• PVC, CVC and arterial line are mandatory skills without which you feel handicapped.</li> <li>• IO is a part of resuscitation and alternate to PVA</li> </ul>
--	--	---

### 3.2. Airway management (AM)

When you say, “ I am an anaesthesiologist” it implies that you are better than other medical professionals in this critical area of patient management. There are basic as well as advanced AM technics. It is wise to consider all the airway skills as mandatory and make all-out efforts to master them. Getting trained in surgical or percutaneous techniques can be a “jewel on the crown”, enormously strengthening your capabilities to manage a whole range of complex situations.



### 3.3 Regional anaesthesia (RA)

This is another set of skills which you cannot do without. It is essential that you must achieve a reasonable level of competence by the end of your residency, if not earlier. Two major divisions are are a) central neuraxial blockade (CNB) which includes spinal or subarachnoid block (SAB) and epidural (EA) and b) peripheral nerve blockade (PNB) such as brachial plexus block or single nerve blocks. RA is governed by a set of safety principles which you must become familiar with.

#### Importance and role of RA

1. Spinal and epidural anaesthesia are usually the first of RA techniques you learn, and which will remain important for life due to multiple advantages they have. Similarly, PNB are also increasingly used as a part of anaesthetic management.
2. RA, when perfectly executed, enables early surgery in many patients who are at high risk of complications otherwise.
3. RA techniques are used for acute and chronic pain management as well.
4. RA often comes to help in resource limited set up as they can be cost effective.

### 3.4 Other techniques

1. Defibrillation and cardioversion : two critical electrical therapy techniques required for cardiac arrest and as antiarrhythmic treatment modality respectively. You should know the differences between them clearly and how

to perform.

2. Flexible video endoscopy (fiberoptic) guided airway management techniques
3. Noninvasive monitoring and oxygen therapy#
4. Cervical spine protection : important during airway management and during patient transfer and include cervical collar and manual inline traction
5. Nasogastric and orogastric tube insertion
6. Needle thoracentesis : for relief of tension pneumothorax
7. Transoesophageal echocardiography
8. Applications of ultrasound : anatomical landmarks identification, RA, assisting vascular access and diagnosis of medical emergencies
9. Intercostal drainage
10. Urinary catheterization

# Not strictly techniques, but important to be familiar with.

#### 4. More information on important skills

##### 4.1 Intravenous access

**No safe anaesthesia/sedation is ever possible without safe, stable, and appropriately sized intravenous access**

This is probably the first technique you learn, from day one. It is the first step and prerequisite for any type of anaesthesia. Its neither as simple as you can imagine nor as difficult as you might be worried about. You are expected to have minimum skill in establishing intravenous access, which you are supposed to have gained during the internship. Expertise comes only with practice. Till you develop confidence, do not lose any opportunity to insert an intravenous cannula. Learn it in a proper way applying the underlying the principles listed below.

Primary purpose of venous access is for administration of drugs, fluids, blood, and blood components.

##### **Venous access - important considerations**

1. Always wear gloves for your protection.
2. Assess for the ease of venous access during preoperative evaluation. Identify the “difficult- for- venous access” patients, inform them about the difficulty and document it. Elderly, children, obesity, syndromic patients, prolonged hospitalization, recent chemo, or radiotherapy, etc are associated with difficult venous access.
3. Select the appropriate size of cannula – you need to know the different sizes of cannula available 12G to 26G. All are even numbers and vary with difference of 2 and size is inversely proportional to number and flow is inversely proportional to the size.
4. Regarding the site of cannulation, remember a) preference is for upper limb

more than lower limb b) look or begin with the dorsum of wrist c) avoid joints and tortuous segments c) avoid limb with arteriovenous fistula in patients with chronic kidney disease d) beware of aberrant radial artery which can be mistaken for vein. This mistake is particularly likely when patient is in shock or hypotension in which arterial pulsations cannot be seen or felt well.

5. Make the vein prominent with dependent position of the limb and tourniquet.
6. Prepare the area with antiseptic solutions.
7. Cannulate, remove stylet and fix properly
8. Disposal of the sharps and other wastes in appropriate containers and bins.

**Needle stick injury is one of the most common and potentially dangerous occupational hazards for healthcare workers, especially associated with IV access.**

*A sort of elegance in your technique should be visible over a period as a reflection of your expertise. As you progress through residency, you must be able to cannulate even the most difficult patients, in a least painful way, in the quickest possible time and with no/least spillage of blood.*

### **Non - invasive monitoring**

Setting up noninvasive monitors appropriately and quickly is another set of skills for you to acquire as residents in the initial couple of weeks itself. Some important aspects to remember are,

- They include pulse oximeter (SpO<sub>2</sub>), electrocardiogram (ECG) and non - invasive blood pressure (NIBP). These are considered as minimum mandatory monitors, which are attached to patient before induction of anaesthesia as soon as patient is positioned on the theatre table.
- Proper placement of electrocardiogram leads is essential. You must know all the 12 lead positions, though clinically either a 3 or 5 electrode system is used. Also, there are modified chest lead positions for specific clinical indications.
- Appropriate size selection for the blood pressure cuff is important. There are very few relative and absolute contraindications for use of non-invasive blood pressure monitoring. Cuff is usually applied to the arm on either side.

#### **NIBP : More information**

1. Usually upper limb is preferred. Values vary between upper and lower limbs, but usually not more than 5 mmHg. If patient has coarctation of aorta, there can be significant difference.
2. Finger cuffs are available for oscillotometric method.
3. Interval for repeat measurement can be set. However, routinely 2.5 min is preferred during induction and intubation. Subsequently, 5 min interval is ideal. Too frequent measurement can predispose to nerve and muscle

damage in susceptible patients.

4. If intra-arterial measurement is established, then the NIBP is either kept in manual mode or interval of 30 to 60 min is chosen.
5. Contraindications to NIBP include extensive muscle injury, neurological deficit, edema, post mastectomy and axillary lymph node dissection, sickle cell disease, thalassemia, hereditary spherocytosis.

### **Bag Mask Ventilation**

Bag mask ventilation is a basic lifesaving technique. The skill is apparently simple, yet requires understanding the basic anatomy of airway, physiology of airway obstruction and techniques for relieving the obstruction and lastly components of bag mask ventilation unit. For an anaesthesia trainee this is a primary and most basic skill, which gets tested unlimited number of times during training and for ever as long you practice anaesthesia profession.

The trainee must learn to 1) identify patients requiring bag mask ventilation 2) detect/recognize patients with difficult mask ventilation 3) identify the signs of adequate ventilation 4) diagnose difficult and failed ventilation 5) concepts of aspiration risk during mask ventilation and 6) management of difficult or failed mask ventilation. BMV should be learnt within the first three months and with practice you will be able to hold mask properly for longer periods of time without tiredness.

### **Oral and nasal airway insertion**

One of the components of training in anaesthesia is management of an unconscious patient or patient with reduced level of consciousness. This involves use of oral / nasal airways which are simple but very useful devices to aid in relieving airway obstruction. Insertion of an oral airway is a part of basic life support training as well.

### **Endotracheal intubation (ETI)**

A life saving procedure and mandatory skill for the anaesthesiologist. It is performed for multiple clinical indications on emergency, urgent and elective basis in operation theatre, ICU, emergency department, sites of disaster or emergency, and in any other locations if there is a life- threatening emergency. ETI requires skill, drugs, equipment and monitoring. Oral or nasal route is used. Failure to intubate can have disastrous consequences if not properly managed.

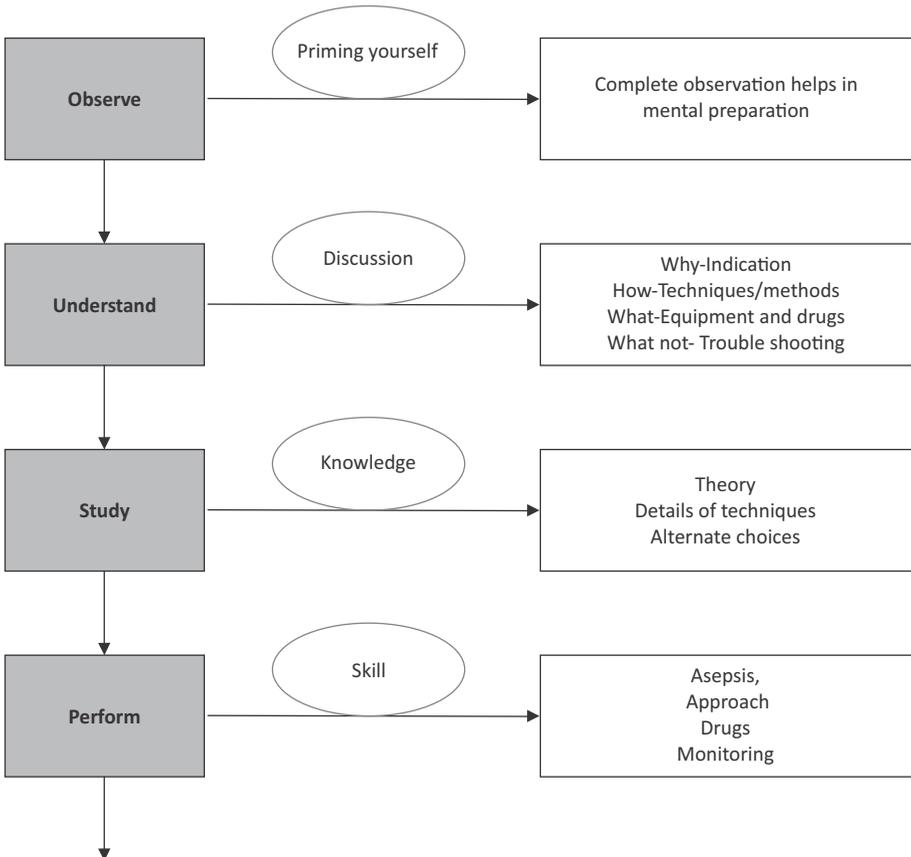
### **Oxygen administration and oxygen therapy**

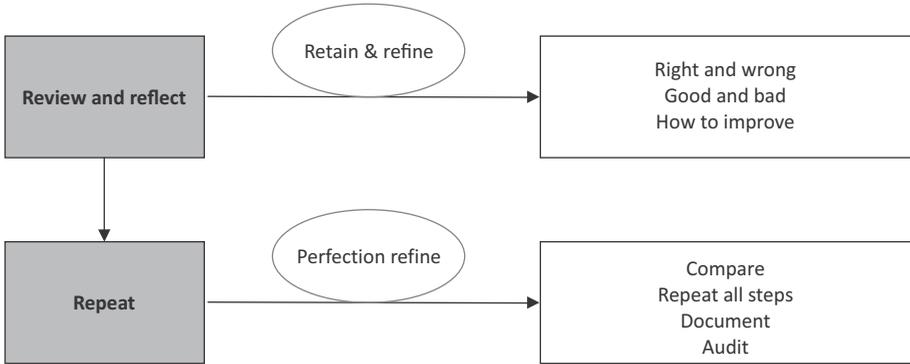
Oxygen is a drug when administered during anaesthesia or for any medical indications. It is called oxygen therapy. Increasing the partial pressure of oxygen to safe levels in the blood is the primary objective. There are different ways of administering the oxygen effectively and efficiently in different types of patients. Residents must learn the

indications, equipment available, proper use of equipment, appropriate flows, monitoring and adverse effects of oxygen therapy. Timely oxygen therapy can save the life or can “buy” time till the definitive therapy is instituted. Examples of oxygen use during anaesthesia are preoxygenation, apneic oxygenation, intraoperative higher inspired oxygen concentration, postoperative oxygen administration and oxygen supplementation during sedation. Of all the specialists, anaesthesiologists administer oxygen most extensively, scientifically, in many different ways in multiple clinical contexts.

### 5. How do you develop skills?

Skill cannot be learnt by reading and listening only. Nor can it be assumed that you have mastered the skill only by learning how to perform without a sound background knowledge. A suggested structured approach to learn, master, and retain technical skills for residents. (Figure 5.2)





### Conclusion

Technical skill is the backbone of your professional life. You must make all efforts to acquire, consolidate and perfect your skills with all the essential supporting attributes so that you deliver the best possible care to your patient at all the times.

---

**Dr. Vyshnavi S. & Prof. (Dr) Raveendra Ubaradka S.**

---

#### **Anaesthesia Tips : Airway Management**

- During intubation, when in doubt always remove the tube. During extubation when in doubt never remove the tube. Ultrasound and capnogram are the most reliable real-time diagnostic tools.
- When in doubt, intubate instead of supraglottic airway device.
- Always rule out endobronchial intubation if there is bronchospasm after intubation.
- Avoid fixation error when you are in trouble.
- Follow guidelines and algorithms

**Right person in the right place at the right time using right equipment improves outcome**

Skill is the unified force of experience, intellect and passion in their operation

*Vincent Van Gogh*

## Chapter 6

# Nontechnical Skills

### Success enhancers

#### Preamble

Technical skills in anaesthesia must be complemented by nontechnical skills (NTS) or soft skills for a successful career. A simple description of NTS is that they are “cognitive, social and personal resource skills that complement technical skills and contribute to safe and efficient task performance”. This chapter deals with the non-technical skills in an informal way. Initially, these concepts were adopted by aviation industry where their importance was recognized much earlier.

#### 1. Importance of nontechnical skills in anaesthesia

Good team work, cooperation, and involvement of all the stake holders are essential to deliver safe and high-quality care. Stakeholders include colleagues, supporting staff, administrators, and other speciality professionals. With a good set of soft skills, (see box below) you will be a better team member and when this is combined with technical skill and knowledge, you will deliver a still better care.

#### Nontechnical skills

Communication	Teamwork
Interprofessional relationship	Leadership
Situational awareness	Decision making
Error management	Task performance
Crisis resource management	Stress and fatigue management
Conflict management	

Operation theatre is a unique workplace where due to the inherent nature of the system, things can go wrong easily. Hence, it is essential to achieve a fail proof system. This begins with the understanding of the uniqueness of the operating theatre environment, your primary work area (Table 1).

**Table 1: “Functional” features of operating theatre environment**

<ol style="list-style-type: none"> <li>1. Space limitations</li> <li>2. Dynamic and constantly changing teams</li> <li>3. Different specialities</li> <li>4. Residents to senior consultants</li> <li>5. Medical, paramedical, technical, and miscellaneous staff</li> </ol>	<p>Mutual respect, recognition, clear communication, attention to details, courtesy, calm and composed attitude, humility, avoiding conflicts and arguments are vital to achieve the best from the team.</p>
--	--

6. People with different personality traits	<b>Priority is always patient safety and comfort</b>
7. Work related stress	
8. Cultural, language and religious diversity	Secondary objective is efficient functioning of theatre and optimal utilization of resources.
9. Peer pressure	

*All the above factors, and many more, are in an interactive state with a potential for errors, mistakes, negligence, hazards, injuries, arguments, conflicts. Remember, none of these can be managed with technical skills whereas appropriate use of nontechnical skills can improve the entire perioperative care process. From residents' perspective, they can be considered as follows;*

### **Anaesthesiologist-patient interaction**

Good communication (speaking and listening), empathy and respect to patients' wishes dignity will have enormous benefits ;

- a. Good rapport with patient leads to anxiolysis and improved cooperation
- b. Enables patients/parents to comprehend the risks and benefits of procedures and ability to take informed decision regarding choice of anaesthesia
- c. Compliance with the preoperative instructions
- d. Tolerance to painful procedure and better acceptance of failures and complications
- e. Overall improvement in patient satisfaction

### **Anaesthesiologist- anaesthesia team interactions**

This team consists of anaesthesia staff(faculty), one or more residents of different batches, anaesthesia technician and possibly student technicians. Number and composition of the teams vary from situation to situation. Good team dynamics include a) preoperative discussion of the plan in terms of technique, drugs, devices, monitoring and complications b) mutual respect and scope for healthy discussion, suggestions, criticism and c) use of closed loop communication. A positive culture leads to,

1. Coordinated action by the team, each performing his/her role better and understands the others role as well
2. Reduced errors related to medication, equipment, process, and communication
3. Early recognition of complications and effective management
4. Better crisis resource management
5. Reduced stress and conflict

**Anaesthesiologist – surgical team interaction**

Good communication and co-operation with surgical team leads to,

1. Better planning and execution
2. Mutual support when in trouble and better management of complications
3. Anaesthetic drugs and techniques can be modified to improve the outcome with the surgeon's cooperation
4. Relaxed and pleasant atmosphere

**Others: with the administrators, media, public and academic forums**

1. Better presentation of the knowledge, performance, and achievements
2. Improves image of the self, department, institution, and the country (in international context)
3. Better cooperation from the public in times of difficulty, disaster, resuscitation etc
4. Reduced medicolegal consequences

Broad categories of nontechnical skills are shown below.

**Table 2 : Components of NTS (modified from the original framework, for broad understanding)**

<b>Task Management</b>	<b>Team working</b>
<ol style="list-style-type: none"> <li>1. Plan and prepare</li> <li>2. Prioritize</li> <li>3. Establish and maintain standards</li> <li>4. Resource management: Identification and utilization</li> </ol>	<ol style="list-style-type: none"> <li>1. Coordination</li> <li>2. Information exchange</li> <li>3. Assertion of authority</li> <li>4. Capability assessment</li> <li>5. Support to others</li> </ol>
<b>Situational Awareness</b>	<b>Decision making</b>
<ol style="list-style-type: none"> <li>1. Information gathering</li> <li>2. Recognition and understanding</li> <li>3. Anticipation</li> </ol>	<ol style="list-style-type: none"> <li>1. Identify options</li> <li>2. Select options and balance risks</li> <li>3. Re-evaluate</li> </ol>

**Situational awareness (SA)**

Situational awareness helps you to understand the dynamics of the environment at any given point of time. For example, if you are in theatre, you are expected to be aware of actual interactions taking place such as patient-surgeon-anaesthesiologist, anaesthesiologist-technician, equipment-human beings, monitors, machines, displays, alarm sounds etc. Your response should be appropriate to the task you are performing, responsibilities you are entrusted with and safety of patient. During your work, you need to synthesize multiple inputs into meaningful interpretation and diagnosis. Subsequently, you need to treat or manage and communicate.

We suggest that you go through some of the reference articles included at the end of this book. They are more than worth the time you spend.

**3. Communication**

Importance of communication, verbal, nonverbal and paraverbal, has been repeatedly emphasized in this book in different chapters in different contexts.

Verbal communication	Nonverbal & paraverbal communication
<ol style="list-style-type: none"> <li>1. Speaking slowly, courteously</li> <li>2. Complete sentence</li> <li>3. Clarity and appropriateness</li> <li>4. Assertiveness, when required</li> <li>5. Avoid interruption, disruption, argument, being rude</li> <li>6. Avoid “talking down”</li> <li>7. Avoid dysfunctional communication patterns</li> <li>8. Avoid being aggressive</li> </ol>	<ol style="list-style-type: none"> <li>1. Calm and pleasant appearance</li> <li>2. Attention to good posture, expression, and eye contact</li> <li>3. Gentle smile, if appropriate</li> </ol>

**Good communication in critical situations**

- Communicate congruently
- Speak unambiguously – be clear in what your message is and who you are addressing
- Close communication gap using “read back/hear back” (see standardization of communication)
- Brief your team members so that all are aware of the situation
- Be assertive but not aggressive
- Listen actively
- Be patient and do not interrupt
- Ask questions
- Eye contact
- Be able to talk about communication failure and address it at the right time

**Standardization of communication**

Standardized communication helps to strengthen the system by minimizing errors, improving clarity of communication and makes learning easy for new team members. It also helps to overcome the language barriers and reduce misunderstanding. Most important, standardized communication helps in better management of crisis, which is not uncommon in anesthesia practice.

The components of standardized communication are use of standard terminology and ensuring that messages are clearly heard and understood using call out, read back, and hear back. Callout is a concise statement with pre defined terminology (example: “I am going to defibrillate now, please charge to 200J). Read back and hear back are meant to ensure that both sender and receiver understand what is said (assistant responds with “charged to 200” and you confirm “ready to defibrillate, clear” – examples of read back and hear back respectively)

We often tend to dismiss this procedure as unnecessary. But the fact is that standardization can help reduce misunderstanding in noisy and stressful situations.

#### **4. Interprofessional relationship (IPR)**

Components of a good relationship includes communication, mutual respect, both as individuals and professionals, conflict management and a desire and determination to give the best of care to your patient. As a resident you can begin this with developing a cordial and healthy working relationship with residents from other clinical departments. Ensure to avoid false ego and excessive pride about yourself and your specialty. Your own personal values, integrity, commitment, and sincerity will contribute to better interpersonal relationship even without your knowledge. Develop respect for others knowledge and professional skills, keeping aside your personal opinions and bias. Behaving professionally in the workplace ensures a healthy environment resulting the best possible care being delivered to the patient through a multidisciplinary participation.

Building a good interprofessional relationship has advantages far beyond the patient specific immediate benefits. You will be contributing to improved efficiency of the entire system, minimise the errors and mishaps, and you will be able to learn from other specialists or residents. As anaesthesia trainees you need to interact with residents and faculty from other surgical specialties, physicians, cardiologists, paediatricians regularly. It will be beneficial to you to learn from others what they are good at or know better.

Lastly, good IPR is a part of your long-term image building as a professional and is a gateway to excellence

#### **5. Leadership**

Leadership is neither a position nor is it applicable to any one position of power. It is a quality which you might be inherently gifted with, or you can develop during your training. Leadership includes communication, knowledge, team working and personal attributes. What further differentiates a leader is the way he/she conducts in a situation of stress and how much he/she can be there for others when required. What you do beyond your minimum responsibilities and duty matters. How much concern and care you show to others contributes to your leadership. Finally, leadership calls for sacrifices of personal comfort and freedom when needed.

## Conclusion

Nontechnical skills complement your technical skills. They are also important for career progression, prevention and management of conflicts, reduction of stress and most importantly it helps in creating a more conducive working environment. A good working environment improves professional satisfaction which in turn is reflected in the improved quality of care. Thus, improving our soft skills initiate a cascading phenomenon of “better from good”.

---

**Prof. (Dr) Raveendra Ubaradka S. & Prof. (Dr) Nalini Kotekar**

---

### **Human error can prove fatal to the patient**

Elaine Bromiley case is a tragic incident of mortality due to anaesthesia which was preventable. This incident showed that a) even an experienced anaesthesiologist is prone for mistakes, b) repeated attempts of intubation without adequate attention to oxygenation can convert a failed intubation situation into a failed oxygenation, c) early recognition, call for appropriate help and aggressive management as per the evidence based guidelines are crucial and brain saving d) importance of documentation including timeline of events and e) proper continuum of care from perioperative to postoperative period.

This incident led to the establishment of "Clinical Human Factors Group", by Martin Bromiley, husband of the deceased patient. CHFG ([chfg.org](http://chfg.org)) works to improve the role of human factors in enhancing patient safety by working with the various stakeholders of the health care system.

Residents are recommended to go through the entire event available on public domain.

Human clinical factors are organizational, individual, environmental and job characteristics that influence behavior in ways that impact patient safety

Success should never feed your ego. But it should feed your sense of responsibility.

Success is not a status, but a responsibility

*From V M Diwekar Oration by Dr Balavenkat*

## Chapter 07

# Knowledge of Allied Subjects

### Widen the horizon

#### Preamble

Successful practice of anaesthesia requires application of knowledge of various allied medical specialties/subjects. Good knowledge of applied aspects of anatomy, physiology, medicine, surgery, paediatrics and radiology will boost your self-confidence. In addition, knowledge of medical ethics, research methodology, physics and computers too adds to your performance and capabilities as an anaesthesiologist.

Anaesthesiologists usually work as a team, cater to a wide variety of patients and often work at odd times of the day where help or support may not always be available from colleagues or other specialists. Self-reliance is the only way to manage the patient in such situations. Apart from this, anaesthesiologists with good knowledge of non-anaesthesia aspects of patient management are in a better position to manage patients with multiple clinical problems or complex clinical scenarios (Table 1)

**Table 1 Benefits of knowledge of allied subjects**

<ol style="list-style-type: none"> <li>1. Increases self-confidence. Remember, “knowledge is power”</li> <li>2. Helps to choose right drugs during emergencies, e.g.: amiodarone, phenytoin etc</li> <li>3. Ability to interpret the results of radiological or non - routine investigations</li> <li>4. Management of medical emergencies and critically ill patients in the absence or nonavailability of intensivists and emergency physicians, as in case of low resource settings.</li> <li>5. Better contribution to academic activities in the department or other fora</li> <li>6. Ability to prevent and deal with medicolegal issues</li> <li>7. Leads to innovation, stimulates thinking and motivates towards excellence</li> <li>8. Better quality of research and publication</li> <li>9. Improves image of the profession</li> </ol>
---

#### Anatomy and physiology

In-depth knowledge of anatomy and physiology, beyond what is prescribed in curriculum, enables the resident to become a better anaesthesiologist. Knowledge of physiology helps in better understanding the principles and mechanisms of general anaesthesia. Equally important, the changes in physiology which occur under anaesthesia are better appreciated. As a result, you will be in position to manage the patient even in presence of deranged physiology or the physiological changes due to any reason during anaesthesia with confidence and competence.

It is advisable to put extra efforts to acquire thorough knowledge cardiorespiratory physiology, cerebral physiology, physiology of sleep, neuromuscular physiology, renal physiology, and acid-base physiology. Similarly, excellent knowledge of applied anatomy is highly desirable, particularly for excelling in regional anaesthesia. An interesting and important addition to the traditional knowledge of anatomy is sonoanatomy, that is the anatomy as visualized with ultrasound.

### **Clinical benefits from in-depth knowledge of anatomy and physiology**

1. Improved confidence and success, and reduced complications with regional techniques.
2. Flexible video endoscopic assessment of airway for management of difficult airway or for other indications becomes easier and more meaningful.
3. Optimal choice and use of drugs, based on the knowledge of patient's physiology and pathophysiology.
4. Diagnosis and management of complex clinical problems and complications in the perioperative period becomes easier when viewed or analysed from physiological perspective as well. This naturally improves quality of treatment and outcome. Treating a condition/complication purely based on a predefined number or symptoms is not a replacement for understanding of the situation or correct diagnosis.
5. Arterial blood gas analysis becomes more meaningful and insightful. This benefits patient care.
6. Troubleshooting and differential diagnosis becomes easier in rare and unusual clinical situations such as perioperative stroke or delayed recovery after a seemingly normal anaesthetic.

### **Pharmacology**

Conventionally, anaesthesiologist's knowledge of pharmacology is limited to the safe use of the commonly available routine and emergency drugs, about 25 to 30 altogether. Difficulty is encountered when a need arises to use an uncommon or unfamiliar drug. Similarly, management of patient's preoperative medications for comorbid conditions like hypertension and diabetes, become more difficult for anaesthesiologist without support from physicians. Further, new drugs are introduced into the market regularly. In such circumstances it is often difficult to decide which of the existing drugs need to be replaced, continued, or stopped prior to surgery and when to restart. Limited pharmacology knowledge increases the frequency of such situations.

A thorough knowledge of pharmacology stands you in good stead in such situations. It includes principles as well as clinical applications of pharmacodynamics and

pharmacokinetics, receptor pharmacology (there are several drugs we use which act on specific receptors), interaction among the drugs used for anaesthesia as well as with the patients' pre-existing medications. Every drug that the patient is receiving, is a potential cause of adverse drug interaction.

Extensive knowledge of antihypertensives, inotropes, bronchodilators, beta blockers, etc and at least a limited knowledge of chemotherapy agents, antipsychotics and other groups of drugs is desirable. Pharmacogenetics is the answer to many key questions related to variations in patient response to drugs including variability in the risk of adverse reactions.

### Medicine

Many of the patients you anaesthetize have more than one comorbid condition which will have a direct bearing on anaesthetic management and consequently on the outcome of anaesthesia and surgery. One of the basic rules of anaesthesia is to optimize the comorbid condition(s) before any elective surgery. However, for emergency surgery, patients are often accepted in a compromised physiological state with higher risk. Medical knowledge helps anaesthesiologist to achieve a better quality of care in the services provided (table 2)

**Table 2: Benefits of medical knowledge for the residents**

<ol style="list-style-type: none"><li>1. Better preanesthetic assessment of extent and severity of organ dysfunction and functional impairment</li><li>2. Decision making regarding further investigations, beyond the routine ones</li><li>3. Reducing further consultations avoiding delay in surgery and cost containment</li><li>4. Optimizing patient's condition prior to elective surgery, whenever needed</li><li>5. Better understanding and management of the additional risks due to uncontrolled status of comorbid conditions when patients come for emergency surgery</li><li>6. Recognition and management of life-threatening complications of comorbid conditions, if any. Examples are bronchospasm, adrenal crisis, thyrotoxic crisis, ketoacidosis, sepsis and myocardial ischemia and infarction.</li></ol>
--

### Please note

There is always a tendency for surgeon and public to assume that a “fit for surgery” opinion from a physician implies that patient can be safely subjected to anaesthesia. You would soon realize that there are several patient related factors, beyond the purview of physician's assessment, which can affect the safety of anaesthesia and surgery. The classical example is difficult airway. (See chapter one).Also, physicians whose “clearance” is often sought for surgery cannot be expected to be familiar with the unique nature of the anaesthetic agents, techniques, and the dynamic situation

that the anaesthesiologist deals with.

It is strongly advisable that you put in extra efforts to strengthen your medical knowledge so that your dependency on physicians slowly reduces and you will be transformed into perioperative physicians.

### **Surgical Procedures**

*Knowledge of surgical procedures, especially the critical steps, increases the importance and contribution of anaesthesiologist as a member of surgical team. This obviously doesn't develop during residency but certainly you can make a beginning now. Consider the following:*

1. When you know the surgical procedure and the steps involved, you would be able to “customize” (select the most appropriate among the generally accepted drugs/ techniques to achieve a specific goal) your drugs and techniques, to facilitate the surgical procedure, to reduce complications and improve outcome.
2. During critical stages you will be able to observe the field more keenly looking for the needs of surgeon, impact of the procedure on patient, and to guide surgeon when needed. *What the mind does not know, eyes do not see.*
3. You will be able to manage better the perioperative management of fluids, blood, and blood products by anticipating blood loss, implementing strategies for optimal patient blood management (PBM). It involves minimizing transfusion with various strategies, appropriate transfusion when needed (whole blood and / components) and retrieval of the lost RBCs.
4. It becomes easy to titrate the drugs to optimize depth of anaesthesia and muscle relaxation to facilitate the surgical procedure and prevent delayed recovery and inadequate reversal.

### **Physics**

Anaesthesiology is one of the medical specialties where principles of physics in various forms are extensively applied, both directly and indirectly. The applications include design and functioning of anaesthesia delivery systems and their components, administration of inhaled anaesthetics and their uptake, behaviour of gases and fluids, monitoring of various parameters from simple pulse oximeter to the more sophisticated parameters, and the equipment like ultrasound machines. Gas laws, fluidics, electronics, thermodynamics etc are different forms in which physics is applied in anaesthesia. Having a basic knowledge of physics helps anaesthesiologists to apply them clinically and manage the profession more confidently.

### **Radiology**

From simple time-tested X Ray to virtual endoscopy, radiology has enormously contributed to the progress of anaesthesiology. Many a times, we, anaesthesiologists,

depend on radiologists or other more knowledgeable medical colleagues to interpret many investigations, especially advanced imaging techniques. As a resident you can learn the basics of these radiological investigations and their clinical interpretation and correlation, making you less dependent on others (table 3). In the current scenario, it is not just desirable, but mandatory.

Use of ultrasound in anaesthesia and emergency medicine has grown beyond imagination in the last one to two decades. It is used for preoperative assessment, diagnosis of complications and performance of vascular or neural blockade techniques. It is real time, cost effective, not very difficult to learn, non-invasive and causes no harm to the patient. Principles and basic applications of ultrasound are included in the curriculum for training.

**Table 3: Suggested radiology knowledge for residents**

<ol style="list-style-type: none"><li>1. Interpretation of chest X Ray, normal and abnormal</li><li>2. Radiological assessment of airway: X ray, CT and MRI</li><li>3. Basics of CT and MRI</li><li>4. CT/MRI features of intracranial pathology: raised ICP, midline shift, cerebral oedema, ischemia, bleed, fractures, tumours etc</li><li>5. Diagnosis of life-threatening conditions such as tension pneumothorax, oesophageal intubation etc.</li><li>6. Assessment of lung function</li><li>7. Gastric volume assessment</li></ol>
---

**Research methodology and medical statistics**

Basic knowledge of research methodology and its fundamental principles is mandatory to all residents. You must understand that there are many dimensions to health research. Initially, we do health research for theoretical purpose and when we have some good evidence created out of that we go for applied research. There are few important basic principles like planning, conducting study, teamwork and review of literature, results and finally conclusion.

Knowledge of medical statistics is not just desirable but mandatory for residency training. Though slightly difficult to grasp, a good understanding of this subject opens new avenues for the residents with respect to 1) interpretation of scientific research articles, 2) Interpreting the results and conclusion of their dissertations and 3) planning appropriate study design for future research activities. Being able to decide the sample size and interpret the results of one's study independently is a huge confidence booster. Basic Course in Biomedical Research conducted by ICMR – National institute of Epidemiology has become mandatory for residents.

### **Medical education**

Many of today's residents are tomorrow's teachers. The foundation stones are laid now and one of them is training in medical education. Every institution has a dedicated medical education department which organizes the training programs for residents. Learning the basic principles and scope of the medical education, with a focus on the anaesthesia specialty, helps the resident to broaden their views and perspectives of the specialty and to develop the teaching abilities.

### **Medical Ethics, Ethical aspects of anaesthesia and morality**

Even as residents you have ethical responsibilities towards patients, medical colleagues, health care facilities in which we work, community and to society. Ethics affects virtually every area of patient care in anaesthesia starting from the first contact with the patient. Ethical issues can be related to decision making, choice of techniques, drugs, disclosure of information, management of errors and even mistakes and wrongdoings of colleagues and the issues related to work system and environment.

A clear understanding of fundamental principles of medical ethics and their application in the specialty of anaesthesia is crucial for residents. Morality and ethics are closely related and often a thin line separates them. An ethically inclined and morally conscious resident will turn out to be a more professional anaesthesiologist and more valued asset to the society. This topic is dealt with in more detail in a separate chapter.

### **Knowledge of computers**

Knowledge of computers is no more just desirable for the residents, rather mandatory. The list of applications of computer knowledge in anaesthesia can be long. From simple and basic to advanced, they include:

1. Power point presentation: Preparation, editing, sharing, presenting, and storing
2. Word documents for any purpose
3. Management of photos/images: Storage, editing, sharing, organizing. Use of photos or images enhance learning during training period. Also, this ability can be used to develop an image bank for yourself and for the department. They can also be used for case presentation, discussions, and conference presentations. It is important to organize them properly in an easily accessible way.
4. Use of internet : This has become a part of life now. It is as much an advantage and source of knowledge and learning as it is a distraction and source of false and unreliable information.

Uses of internet for residents

1. Access to journals, articles, tutorials, and websites
2. Information on specific topics
3. Practice advisories, guidelines, protocols
4. Medicolegal knowledge
5. Online assignments, tests, applications, notifications
6. Emails
7. Online assessment, courses
8. Software development for academic, clinical and research purposes
9. Website development
10. Development of anaesthesia apps and contactless technology

**Conclusion**

Knowledge is multidimensional, ever expanding and often has ill-defined boundaries. Today's truth can be tomorrow's fallacy. Given the complexity of patients' condition and surgical procedures, anaesthesiologist is always in a better position to deliver high quality care when equipped with a strong knowledge base which should include allied specialties and allied branches of science.

---

**Prof. (Dr) Raveendra Ubaradka S. & Dr. Vyshnavi S.**

---

Human body is capable of surviving a wide range of physiological trespass, whether hemodynamics or respiratory parameters. That's what we encounter every day in our work. It's our responsibility to learn the possible limits of change permissible for a given patient, which can vary from one to another and manage them within acceptable limits.

We use drugs which have a narrow therapeutic index. More than the drug profile it's the ability to use the same in a safe way is what is important. Keep this in mind during your training.

Learn to integrate the values you observe on the monitor and make clinical sense out them as a routine during the regular anaesthetics. For example, try to analyse the relationship between BP and HR, SpO2 and EtCO2. You will build a wonderful foundation of clinical expertise.

If you are not willing to learn, no one can help you. If you are determined to learn, no one can stop you.

**Ramesh Venkateswaran** in *Happiness Trail*

## Chapter 8

# Timeline for Study

### Journey to success

#### Preamble

Structuring of residency training makes it more effective and less stressful. Short term goals can be set within the larger objectives to streamline the process of training. Such a systematic approach makes the entire training an ongoing preparation for your final examination.

Duration of residency is 36 months. However, effectively much less time is available for actual training (clinical work and active interactions) if you deduct the time taken for initial orientation and “acclimatization”, sundays, holidays and leave, dissertation, tests, and examinations, attending conferences, workshops, continuing medical education(CME) programs and preparation for the final examination. All together these will take away around 6 months from the 36 months leaving you with only 30 months for the training.

In this chapter, entire training period is divided into 3 phases. First 6 months for orientation, basics, and adaptation, second 18 months for skill acquisition, consolidation of basics and overall maturity. Last 12 months is for reviewing, learning recent advances, preparing dissertation, and preparing for the final examination.

#### First 6 months – Initiation, orientation and rapid learning

##### A. Get familiar with the workplace and work schedule

1. Introduce yourself to and interact with faculty and fellow residents. Initial interactions are often memorable. Try to memorize the correct names. Senior residents are your guides, mentors, and often saviours. Your own batchmates are your extended family.
2. Get oriented to your workplace: theatres, class, wards and central manifold or cylinder banks. **Note the fire exits and emergency assembly areas.**
3. Familiarize yourself with work schedule and patterns and responsibilities.
4. Learn to observe keenly everything that happens around, primarily focusing on patient management.
5. Machine checking, selection and preparation of equipment and loading drugs can be considered as the initial triad of your learning objectives in the OT.
6. Know about the local practices, guidelines, sterilization and understand the safety culture.
7. Build the ethical and moral foundations of your professional career.

**B. Techniques: Skills and Related Theory (Table 8.1)**

**Table 8.1 Basic skills in first 6 months**

1. Intravenous (IV) access: sizes, types, sites, proper techniques, and IV fluid set up
2. Proper patient positioning, connection to and setting up of monitors (Table 8.2)
3. Airway skills: a) mask ventilation: selection of appropriate size and type of mask and proper mask holding, b) insertion of oral and nasal airways, c) use of supraglottic airway devices including theory and knowledge of different devices available in the department and d) principles and techniques of endotracheal intubation using direct laryngoscopy
4. Spinal anaesthesia under supervision, after observing a prescribed number of procedures
5. Basic simulation course

**Table 8.2 Brief descriptions of aspects of monitors which residents should learn**

1. Pulse oximeter: types of probes, sites to monitor, normal values and ranges, artifacts and trouble shooting
2. Non invasive blood pressure: sites of measurement, cuff size selection, proper application, settings on the monitor (interval, start, stop, hold, alarm settings) and contraindications
3. Electrocardiogram: selection of appropriate leads, size of ECG complex, changing site of electrodes and 3 and 5 electrodes system, modified electrode positions etc
4. Capnogram – Monitoring of end tidal carbon dioxide (ETCO<sub>2</sub>); side stream, mainstream and micro stream capnogram, normal values, range, shape and “signature capnogram”
5. Neuromuscular blockade monitor: principles and techniques
6. Setting up of arterial and central venous pressure monitoring

**C. Theory Knowledge (Table 8.3)**

Resident should focus on refreshing and updating knowledge of basic sciences from anaesthesia perspective, principles and types of anaesthesia, mechanisms and theories related to the skills.

**Table 8.3 Examples of theory topics for first 6 months (minimum)**

<ol style="list-style-type: none"> <li>1. History of anaesthesia, international and Indian perspective</li> <li>2. Applied respiratory, cardiovascular, cerebral, hepatic, and neuromuscular physiology</li> </ol>	<p>Ethics, code of conduct, standards of care</p> <p><b>Learning resources</b></p> <ol style="list-style-type: none"> <li>a) Orientation classes</li> <li>b) Recall of MBBS knowledge</li> <li>c) Initial few chapters of Miller's text book</li> </ol>
--	---

3. Basic pharmacology principles	of anaesthesia
4. Anaesthetic drugs: Induction agents, muscle relaxants, analgesics, reversal agents, local anaesthetics, vasoactive drugs, emergency drugs etc	d) Text- books e) Discussion with seniors f) Observation of practical management
5. Principles and mechanisms of general and spinal anaesthesia	<ul style="list-style-type: none"> <li>• Start preparing your own notes</li> <li>• Develop good communication skills</li> <li>• Observe team dynamics</li> <li>• Observe changes in monitored parameters during anaesthesia</li> <li>• Know normal limits</li> </ul>
6. Basic anaesthetic equipment	
7. Monitoring principles	
8. Preanesthetic evaluation and risk stratification	

**D. Dissertation : Topic selection and synopsis presentation**

This is a crucial aspect of your training, and you should do it with sincerity and in an elegant and time bound manner. Detailed guidelines for dissertation are provided in a separate chapter.

**6 months - 24 months : Skill acquisition, consolidation and maturation**

By now you must be familiar with the work schedule, have acquired basic knowledge and skills so that you can focus on further learning. From now on, your learning must go on at a higher intellectual and professional level. Aim for in depth knowledge, perfect skills and safe patient management (table no. 8.4). When you enter 2<sup>nd</sup> year of residency, you are already middle level seniors as your next batch of residents are about to join. You must demonstrate appropriate level of knowledge, skills, responsibility and behavioural maturity. At the same time, you continue to be mentored and guided by seniors. In addition, you would be attending conferences, continuing medical education programs etc and start preparations for presentations and publications. You must have enough knowledge to teach your juniors and enough humility and “appetite” for knowledge to continue to learn from seniors.

During this phase you are exposed to subspecialties like cardiac, neuro, reconstructive and oncosurgery, maxillofacial and craniofacial surgery, urology, gastrointestinal endoscopy, nonoperating room anaesthesia services, pain management including neurolytic nerve blocks etc. Hence, this phase should be an intensive learning phase. Working in cardiac, neuro and other subspecialties gives you enormous confidence and skills to manage complex patients (unstable, multiple comorbidities,) major surgical procedures and difficult airway patients.

**Optimal utilization of second phase - some suggestions**

1. Preparing for every class meticulously, particularly if it is your own presentation
2. Make notes regularly and keep them organized

3. Try to balance clinical learning with your studies and also focus on skills
4. Consolidate the knowledge of drugs, monitoring and equipment
5. Start working on the dissertation and aim to complete it within this phase

**Table 8.4 Skills (minimum) for the second phase, beyond the previously mentioned ones**

Airway Management (AM)	AM in emergency, paediatrics and patients with difficult airway, decision making, <b>safe oxygenation during AM.</b>
Central neuraxial blockade (CNB)	<ul style="list-style-type: none"> <li>• Spinal anaesthesia both for elective and emergency cases, including for caesarean section, with supervision in difficult situations.</li> <li>• Lumbar epidural anaesthesia for general surgical procedures, labour analgesia and for pain relief</li> <li>• Caudal epidural, under supervision</li> </ul>
Peripheral nerve blockade	Single shot and continuous, catheter based
Central venous cannulation	Anatomical and ultrasound guided approaches
Arterial line for invasive blood pressure management	Different sites (radial, dorsalis pedis and posterior tibial) and techniques
Invasive and non-invasive monitoring interpretations	Central venous pressure, intracranial pressure, neuromuscular blockade monitoring, anaesthetic agent monitoring etc.
Transoesophageal echocardiography	Basic principles and observation
Ultrasound	Basics, equipment, sono-anatomy, clinical applications

### 24 months onwards - critical and crucial phase

Beginning of the end of your residency! Review and refresh your knowledge and skills acquired so far. Plan and Prepare for the rest of your training period.

- Introspect your learning in the last two years (table 8.5) so that you realize what remains to be learnt. Take into consideration the curriculum-based skills and theory. Think beyond, keeping in mind your future prospects, ambitions and plans.
- Go through the international courses and training programs like FRCA or anaesthesia residency training in reputed universities if you wish. This will help you to appreciate the breadth and depth of specialty of anaesthesia and related topics.
- Review the progress of your dissertation and progress of publications and

conference presentations so that you still can make up for shortcomings. Inability to complete and submit the dissertation can cost you one whole term and lot of agony.

- Review the adequacy of your clinical training: is it up to your own expectations? are you satisfied? are you confident of routine techniques even in difficult cases and situations? are you capable of managing difficult and complex cases on your own or with minimum supervision?
- This may be the time to complete the left-out or forgotten topics in theory.

Take pediatric life support course and/or trauma life support course. Become more responsible, improve leadership qualities and integrity. Remember the emotional bank account!

**Table 8.5 checklist for skills ( and applied theory), by the end of 2 years**

<p><b>Airway management (AM)</b></p> <p>Knowledge of recent assessment techniques including virtual bronchoscopy, advanced intubation techniques, video laryngoscopes, surgical airway, extubation of difficult airway, prevention and management of airway complications, role of ultrasound in AM, national and international guidelines, pediatric, neonatal, obstetric and ICU airway management. Knowledge of advanced techniques like fiberoptic guided intubation is highly recommended.</p>
<p><b>Regional techniques</b></p> <p>Thoracic epidurals, combined spinal epidural, plexus and peripheral nerve blocks including ultrasound guided techniques.</p>
<p><b>Vascular access</b></p> <p>Central venous and peripherally inserted central venous access, dialysis catheter insertion, arterial cannula placement etc.</p>
<p><b>ICU management</b></p> <p>Initiation and management of ventilation, invasive and noninvasive, ICU protocols, fluid management, weaning and procedures in ICU</p>
<p><b>Ventilation</b></p> <p>Advanced ventilation techniques in the OT, modes, machine-patient interactions etc</p>
<p><b>Others</b></p> <p>Intraosseous access</p> <p>Cervical spine protection</p> <p>Intercostal drainage</p> <p>Ultrasound use for assessment, diagnosis, vascular access, and nerve blocks</p>

### Theory

Focus on recent advances and current trends in anaesthesia. An in-depth knowledge of the subject, with strong basics is what will help you to score better and aim for gold medal or distinction. Understand and learn basics of biostatistics. Try to independently analyze the studies and journal articles and analyze the data for your dissertation or publications. You should know about the classes and levels of evidence.

### Recent advances : some topics as examples

- |  |                                  |
|--|----------------------------------|
| 1. Anaesthesia at high altitude        | 8. Xenon                         |
| 2. Brain death and organ donation      | 9. Total intravenous anaesthesia |
| 3. Disaster management                 | 10. Opioid induced hyperalgesia  |
| 4. Extracorporeal membrane oxygenators | 11. Frailty and anaesthesia      |
| 5. Fires in OT                         | 12. Amniotic fluid embolism      |
| 6. Hyperbaric oxygen therapy           |                                  |
| 7. Implanted cardiac devices           |                                  |
- Knowledge about history and important historical events is also desirable

### Last 6 months

1. Organize yourself with completed log book and work diary. Best way is to fill them daily from the beginning.
2. For maximum benefits, your study should be systematic, continuous, focused, and intense.
3. Complete the publication if you haven't done it yet.
4. Go through old question papers regularly. Focus on case discussions, drugs, equipment, ECG, ABG, CPR, X Ray etc. Don't expect the same ABG report or X Ray or ECGs you saw during preparation, to appear in the exam. They should be only directional, and you should be prepared for any surprises.
5. Learn to relax. Having adequate sleep, time with friends, music, or other hobbies, playing etc. should be helpful if they are within reasonable and responsible limits. Achieving a balance between work and relaxation in the phase of a busy schedule is a challenge, but you can achieve. Take mock exams seriously. By doing so you will “lose exam tension”, be able to understand where you stand in your performance. With conscious effort, you can overcome the deficiencies. Lastly, hone your soft skills as well.
6. Proceed with reading the chapter on “Facing the Examination “

### Conclusion

“Journey of thousand miles begins with the first step”. But this must be followed by

systematic and regular studies and learning to complete the “journey” of residency and to begin the “journey” of a qualified professional. Remember the anecdotal race between the tortoise and rabbit. Be the tortoise than the rabbit.

**Prof. (Dr) Nalini Kotekar & Prof. (Dr) Raveendra Ubaradka S.**

**Can you believe it?**

Have you ever wondered what techniques would have been used in ancient civilizations to produce effects similar to anaesthesia. Few of the chemical substances used in modern anaesthesia practice has its origin in the early concoctions of indigenous plant origins like opioids and arrow poison.

Chinese physician Hua Tuo developed an analgesic potion called “mafesian” a mixture of wine and herbal mixture. Dioscorides, a Greek surgeon in the Roman army used mandrake boiled in wine to cause insensibility in people who had to be cut. In Homer's Odyssey, the Greek goddess Circe used deliriant herbs like Mandragora or Datura in a brew to cause transient hypnosis. Extracts from opium and mandragora soaked sponges were used for surgical pain relief in Europe.

Assyrians used carotid compressions to produce brief unconsciousness before circumcision or cataract surgery

Inca Shamans chewed coca leaves mixed with vegetable ash and dripped their cocaine laden saliva into the wounds of patients

India's Sushruta used cannabis vapors to sedate surgical patients.

Babylonians relieved toothache using henbane

Acupuncture was practiced in China by the Shang dynasty.

The 'knock out blows' to the head obviously caused some amount of stupor, but can you imagine this amount of crudeness. Hypnotism or animal magnetism or mesmerism was effectively practiced in susceptible individuals. In 1800's soldiers were made to bite a bullet too endure the excruciating pain of surgery. Hence, the famous English idiom 'bite the bullet' came into existence.

*Contributed by Dr Sarika M Shetty*

What is right is more important than who is right

## Chapter 9

# Survive and Succeed

### Aim for true success

#### Preamble

Bring out the best in you with a balance between personal, professional & social life.

Though the title is “tips for survival and success”, your aim should never be just to survive. Here are simple, easy to follow suggestions based on observations, expectations of residents, opinions of colleagues or former students and experience. Certainly, my own experiences as resident and as a faculty in different institutions also have influenced my thoughts. These suggestions are divided into personal and professional parts for the purpose of clarity.

Go through this chapter without “I know it all” attitude. Otherwise, it will only make you stagnate. In general, as a specialist, you can have an average of 3 to 4 decades of active professional life. Your maximally productive time of the day is spent in your workplace. What you do/learn as a resident will shape your personality, both for the good and bad. Some aspects may be very difficult to change later, even if you would like to.

#### 1. Personal Sphere

Taking care of personal life is important to prepare for a successful and satisfying career. These suggestions made here may appear simple, but do not underestimate their power to influence you as well as others around you. Core values, generally accepted as virtues universally, do not change with the profession you choose.

- Maintain **personal hygiene** and cleanliness. You live in a community in the workplace, not alone.
- **Be always neatly dressed.** First impression always matters. Developing a good dressing sense will help you lifelong. Also, It is better to wear shoes or formal footwear to workplace.
- **Regular hand wash** is a very important habit which should be practiced at workplace. Do it in the way it is recommended to be done. Begin and end your day at work with a hand wash and also wash hands in between the cases. It is hugely beneficial both at personal level and from patient's perspective. By making hand washing a habit, you can also influence those who are around you to follow the same.

**Always wear a gentle, warm smile.** A genuine smile has a powerful impact on your surroundings as well as on your own inner self. It instills confidence in your patient. Also, it helps the patients to easily communicate and provide correct history. However, one must understand the difference between a smile and laughter. Also,

a fake smile or a too formal smile is not of great help. Laughing loudly at work or in front of the patients may have a negative impact as it is a bad professional behavior. It has been observed quite a few times that doctors do not maintain professional discipline in wards or OT surroundings and this has earned them a bad reputation or even landed them into trouble. Please remember that you must win the confidence of not only the patients but also those who accompany them, by maintaining the decorum appropriate to the workplace.

- **Develop good communication skills and improve them constantly:** While individuals can differ in their ability to communicate, a reasonable level of competence in communication is not difficult to develop and is an essential pre requisite. Proper communication prevents/solves conflicts and reduces stress, creating a positive environment at workplace and enhancing productivity. Making efforts to learn the local language and a fair knowledge of local culture helps you to be better accepted and it also prevents cultural shock/mishaps due to lack of awareness.(Figure 9.1)

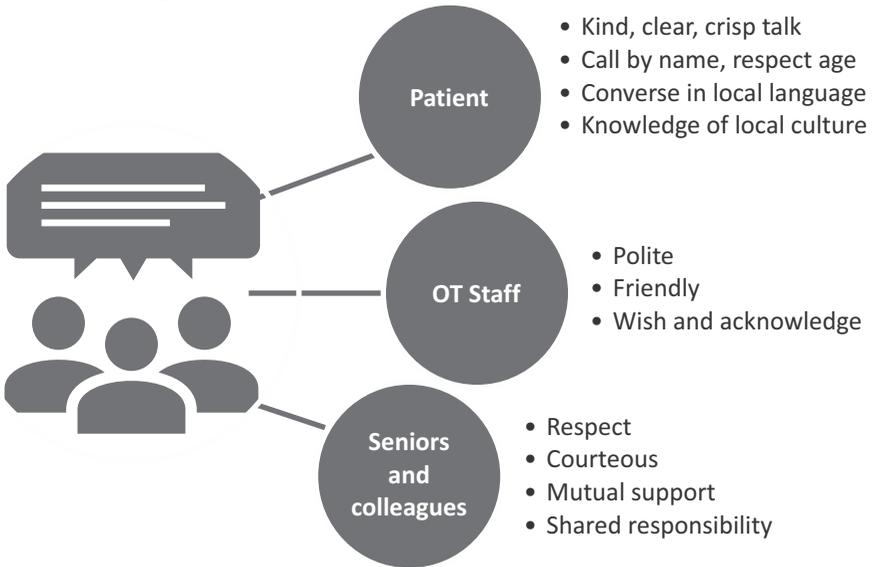


Figure 9.1: Conversational skills- an essential component for success

- **Be punctual.** Be it for assessment of a patient, for starting the list, for emergency cases, for the lectures, for meetings, or for any other reason related to work, timings must be observed strictly. Punctuality is one of the hallmarks of professionalism and excellence. I still remember how one of my mentors, late Prof P N Vishwanathan, used to be there at sharp 3PM everyday for preanesthetic assessment during my residency. In fact, it is safer to be present at least 10 minutes

before scheduled time, especially to the operation theatre. This gives you time to “settle down”, think, plan, prepare with the tasks ahead and can save you from mistakes, errors, stress and humiliation. You are likely to do more mistakes if you are late or irregular. Punctuality gets you the respect and trust of your colleagues, team members and everybody with whom you work or those who watch your work.

- **Develop Internal discipline.** This is another very important attribute. It means having a reasonable control over and harmony between your mind, body, and tongue. Discipline is not the favorite word of students, I understand, though eventually it should become the way of life for doctors.
- **Make lifelong learning your mission.** The scope of anaesthesiology has extended with an ever-increasing number of procedures performed outside the theatre and requiring the presence of anaesthesiologist. You must regularly update your knowledge as well as share with colleagues and seniors. This consciously acquired knowledge comes in handy while dealing with difficult cases and in the long run will earn you a solid reputation as a professional.
- **Be technology savvy.** Not being so in today's world can hamper your growth more than you can imagine. Irrespective of your prior knowledge and aptitude, make efforts to improve yourself in the technology component of clinical and academic training. It can become a powerful tool in learning, providing an easier way to share and discuss different aspects of case management making use of audio – visual aids. Of course, being “techno” savvy improves your patient management skills and confidence as well.
- **Learn to be polite and courteous, but firm.** This does not mean that you need to be too soft, too humble and obedient. Politeness and courtesy should be a part of your nature rather than a temporarily adopted behavior for certain advantages. Politeness coupled with firmness helps you to achieve the goodwill of others. These are among the core human values.
- **Learn to say 'No' as much as you oblige.** We have to help and oblige each other, considering it as our responsibility, otherwise the patient might be the sufferer. At the same time there are situations where you need to learn to say no. May be when you are tired or when you genuinely feel that you are being exploited, or you feel that you are not the best person to do the work in question. In the last instance, it becomes a reflection of high integrity.
- **Control temperament and show a positive caring attitude.** Words once spoken cannot be taken back. Before you speak ill of others/ talk rudely, think for a moment, if you were the recipient, would you have liked the other person,

whoever it is, speaking to you in the same manner? certainly you would not. I am sure, you got the message.

- **Do not get into unethical, illicit relationships in workplace** which may have the potential to ruin your residency. You have joined the residency after hard work and with a desire to transform yourself into an excellent professional and to build a bright future for yourself. Also remember the expectations from your parents, teacher, society and lastly, very important, your own expectations. When your attention is diverted it pushes you into a vicious cycle of downward trend of your career. The sequence can be called “professional suicide” which one should never commit.
- **Beware of the risk of habituation and addiction to drugs or harmful substances.** Anaesthesia is a high-risk medical profession with potential for stressful experiences almost daily. Also, you have an easy access to drugs like opioids and ketamine, meant for clinical use in your patients. Misusing these drugs will be a sure way of spoiling both your health and career. Legal consequences could be still worse.
- **Value the career you have chosen as anesthesiologist.**  
Often some residents seem dissatisfied over having become doctors or for choosing anaesthesia because of some preconceived notions. Anaesthesia is not 'chloroform' anymore. It has evolved over decades into a highly specialized field dealing with some of the most challenging medical situations. During the recent Covid-19, pandemic anaesthesiologists have emerged as valiant front liners world over battling this evil. Our commitment to the patients should be very strong and unwavering. We are one of the strongest pillars of the health care system, we just need to believe.

Do not participate in or encourage any derogatory, demeaning, or controversial discussions/comments regarding our own specialty nor indulge in mudslinging on other specialty or individuals.

It is just that you choose anaesthesia, or anaesthesia has chosen you. This doesn't make you neither less nor more important than the other residents in any way. We are all part of the larger picture of health care professionals and responsible citizenry. Each has a role to play and let us pledge to do that to our best of capabilities.

## 2. Professional Sphere

### A. General

- a. From the day you have decided to join the profession, shed all the doubts and negative opinions about the specialty. Begin your residency with an open and receptive mind. This will help you not to get influenced by your own bias or

opinion of others. Only an open mind can be trained in unbiased manner. Remind yourself how many have failed to get the seat you got and how much you have struggled to reach where you are now.

- b. Prepare mentally for a hard and systematic professional and clinical work for the next 3 years. More you work during residency, coupled with studies and a systematic approach, better you will fare in your professional career. Have it imprinted on your mind that residency is the foundation upon which you will build a career. Sacrificing many small comforts is a necessity to achieve the larger goal of achieving professional success.
- c. Participate in all the departmental activities with your "full might" especially the teaching programs. Prepare well for your seminars, lectures by staff and participate even in undergraduate teaching when you get an opportunity. This also helps in learning and preparing important topics from exam point of view. Further, it helps in building better communication skills which may come in handy while giving lectures at workshops or conferences later in your career.
- d. Participation in and contributing to academic and non-academic activities at the departmental and institutional levels, academic and training programs organized by professional bodies, conferences, mock drills and simulation help you to improve your career prospects by leaps and bounds. I know of a simulation expert who is also an intensivist. He developed interest in simulation during anesthesia residency itself.
- e. Aim for consistency and predictability in your professional behavior, work and actions. Let there be complete synchrony between what you do, talk, believe and behave. This will improve your trustworthiness and reliability in the eyes of those whom you work with. While being with professional colleagues or patients, always be mindful of your body language and the words you speak. Your "unspoken words" – the body language and expressions can have lot of impact on others, both good and bad.
- f. Your professional work involves patient management, study, academic and professional activities. Achieving a balance between these different phases of learning will destress your training and make it more effective. This is achieved by being punctual, inquisitive, attentive and by being genuinely interested in what you do.
- g. Professionalism is the way you behave as a true professional. Keep safety and care of the patient at the center of work and learning. In all your activities, consider their impact on the patient and on yourself, short term, and long term.
- h. Be a good team member. This is even more important in anaesthesia where you work in a team consisting of surgeon, surgical assistant, resident, senior/junior anaesthesiologist, nurses, technicians, specific experts like perfusion

technicians etc. Each member has a different level and set of knowledge, skill, perspective and personal attributes. Good teamwork involves working towards a common goal of successful procedure or surgery in the most efficient manner by working cohesively and each team member giving their best in a coordinated manner.

- i. Learn proper documentation. You may be an extremely skilled, hardworking and compassionate professional but lack of systematic documentation on case sheets may land you into trouble despite all your efforts to salvage the situation. You may also get wrongly framed for another clinician's mistake which may even lead to a legal action. Only a prior documentation of facts could save you in such circumstances. That is why it is of vital importance to keep case sheets updated and signed by faculty.

## **B. With patients and their attendants**

1. Patients are the reasons for our existence. Be courteous with them. Take time for assessment, never do it in a hurry. Establish rapport. Allow the patient to express and clear the doubts and fears. If it's a child, take parents into confidence and talk to the child as well. Never be rude or impolite with patient, even when you are under stress. Be gentle in transferring, positioning, during cannulation, attaching monitoring etc., mindful of their dignity, sentiments and religious practices. Always take informed consent and consider the ethical aspects of each case carefully. It will be good to remember that what is routine for you is an unknown field to them. Hence, they should never be ridiculed for their lack of awareness about something.
2. Maintain confidentiality about patients. Never disclose the personal information about the patients to anyone even if the patient is your own relative. This compromises the patients right to privacy as well as erodes the confidence patient and colleagues have in you.
3. Never misbehave or be abusive or rude with the patient. Just like "customer is God" for a businessman, patient is God for us. This is irrespective of patients' background, personality, economic status, or any other extraneous considerations.
4. Be empathetic to patient's sufferings and try to understand from their perspectives. By default, "patient is always right". But at the same time, it is better not to get emotionally involved in patients' sufferings or problems because throughout our professional life we will encounter various kinds of problems on the patient front and therefore cannot allow the emotions to take over us. It could compromise our professionalism.
5. Be always sensitive to the patient's concerns and dignity, from socioreligious

and cultural point of view. Also important is the gender sensitivity when you position the patient, apply monitors like ECG electrodes, perform awake regional techniques etc.

6. Remember that the patient will usually be in a state of helplessness and they might be scared, anxious, worried and frustrated. Reassure the patient at every stage when they are awake and be gentle with techniques like intravenous cannulation. Clearly explain in advance, any procedure you may perform.
7. Informed consent is extremely important for any surgery/procedure and further consent may be required for additional procedures or for interventions like blood transfusions.

### C. Operation theatre, procedure rooms like MRI and recovery area

1. **Maintain sterility wherever it matters.** One needs to scrub in strictly according to the protocol before entering the OT and scrub out while leaving after proper disposal of gloves, mask, and the OT dress. When managing multiple cases, disinfection and sterility should be maintained in between the cases too. Every institution has certain OT protocols laid down by competent authorities to maintain asepsis. You should familiarize yourselves with these guidelines, including those related to hospital waste management. Learn correct ways of wearing gloves, mask, handling sharps and equipment. A callous attitude towards asepsis can have serious impact on your health. A proper donning and doffing routine should be learnt and practiced with PPEs now in these COVID times.
2. **Understand the logistics and implications of nonoperating room locations.** MRI, dental clinics, radiotherapy suites are examples of Non- Operating Room Anesthesia (NORA) locations. You require a good understanding of the location and logistics in addition to actual patient management.
3. **Contribute to a cordial atmosphere** in operation theatre and other work areas. There are enough reasons in your everyday professional life to get upset, irritated and angry with people around in workplace. But controlling them or at least concealing them is good for everyone. Imagine the chaos and vitiated atmosphere if everyone keeps getting irritated and upset every now and then for every reason!!
4. **Be vigilant and focused** on patient care at all the times. **Eternal Vigilance** is the motto of Indian Society of Anaesthesiologists. Few minutes of negligence on your part during the anesthetized phase or critical periods can lead to irreparable harm to the patient and your own reputation .
5. **Ensure that you contribute your best** to the team you are working with, irrespective of your personal relationships with individual members. All your actions should be patient centric ensuring complete safety and comfort of

- patient and providing ideal conditions for surgery.
6. **Take care of all the equipment you use** as if they are your own and ensure their longevity. Take adequate precautions to prevent their fall and damage. Check them before every use, ensure sterility as recommended and calibrate as appropriate.
  7. **Machine checking and documentation** must be meticulous without giving any scope for complaints. Checking the anaesthesia machine is a daily ritual for the anaesthesia resident which should be done with the same seriousness as a pilot would go through the initial checklist before every flight. As you check regularly, you get to know the working of machines more intimately and in detail. Eventually, you will master it and can teach others.
  8. **Begin each day with a fresh mind and clarity of thought.** Having a primary and a back -up plan for each patient is a good clinical practice which minimizes errors and maximizes efficiency and improves outcome. This always helps to internalize safe anesthetic management.
  9. **Learn to recognize and manage complications in a calm manner.** All of us, even after decades of experience face complications, many of which may not be preventable. What differentiates one anaesthesiologist (or resident) from the other is the way of responding to and managing these situations.
  10. **Indiscriminate use of mobile** in the OT should be guarded against. Unrestricted use of mobiles has a potential to cause harm to patient care while it could be helpful in times of emergency.
  11. **Minimize medication errors with vigilance and care.** Anaesthesia is one of the specialties where there is increased risk of medical errors due to large number of drugs we use, need for different concentrations for different age groups of patients, need to administer drugs sometimes in a hurry, presence of look alike and sound alike drugs and human factors.
  12. **Follow the guidelines and protocols meticulously.** They are meant to help develop an organized thought process in patient management reducing chances of omission, preventing wrong steps being taken and increasing the chances of right actions. Evidence based, scientifically developed guidelines and protocols should be followed whenever possible.
  13. **Take responsibility for your actions.** It is a part of developing professionalism and is one of the qualities of true leader. It enhances your trustworthiness. Accept your own mistakes and wrongdoings. Learn from your and other's mistakes as well. Apologize if it has caused any harm, or distress to anyone, including those who are working under you, like technicians, nurses, house keeping staff etc. Remember that sorry and thank you are the two most powerful words.

**14. Recovery**, or post anaesthesia recovery unit (PACU) is where you routinely transfer your patients to, after anaesthesia. You must ensure proper handover and patient's stability before you return to your next patient or go after the day's work. Please remember that life threatening complications can develop in PACU and are mostly preventable.

#### **D. Relations and conduct with the faculty**

As a trainee you spend the entire 3 years of MD/DNB period nearly with the same team of teaching faculty. They are your teachers, and you will be learning all your fundamentals from them. Usually, the faculty in a department is a mix of a) seniors like professors or readers with lot of experience and expertise, b) middle level faculty like associate professors who can have a right mix of experience and expertise and c) junior faculty like assistant professors, lecturers and senior residents who might have just joined or with 5 to 6 years of experience. You have something to learn from everyone.

It is up to you to make the best of the available facilities and opportunities during the training period. There are periods when life for you may not be smooth in the department for reasons related to you, related to faculty or even simply due to some misunderstanding where nobody is really at fault.

1. Be respectful to each of your teachers. Be humble to receive the knowledge. Humility is the key to the process of learning. It should come from within, not because you just want to please someone or for some benefit. Ignore the personal weaknesses or deficiencies of your faculty as much as you can. Follow the instructions in letter and spirit, may be in studies, clinical work, additional responsibilities, or deadlines for different tasks.
2. It's a good practice to wish the faculty in the morning. It creates a pleasant feeling in both and provides a foundation to build a happy day with a positive atmosphere all-around. It also helps to increase your own efficiency and likely to reduce the negative feelings. Discuss your anaesthetic management with the faculty directly. It helps to reduce mistakes and makes your learning more solid and systematic. Patient will be the ultimate beneficiary. This should become routine in the beginning and may be more focused on the difficult cases as you learn the "art" of anaesthesia over a period.
3. If there is any difference of opinion with your faculty, sort it out at the earliest. Ask and clear the doubts, do not assume and thereby save the subsequent part of the day from unpleasantness. If you have done a mistake or hurt someone, sincerely apologize. Greatness lies in accepting our mistakes, errors, and wrongdoings, intentional or accidental. Apologizing sincerely reflects a positive personality.
4. No need to be bullied by anyone including your own staff. Make everyone

understand their limit, in a polite yet firm manner. You can always approach the higher authorities when you feel that you are on the right side of the dispute or when you feel you are the victim. All these is assuming that you understand your limit!

### **E. Relations with other residents of the department**

1. Get involved in professional discussions whenever you get the opportunity. Listen and try to understand viewpoints of your seniors, colleagues, surgeons, or other specialists. Respect others' knowledge and right to differ. Understand the difference between healthy discussion and needless argument, difference between constructive criticism and negative comments.
2. Never take pleasure in setbacks and failures of others. Do not show undue interest in issues not directly related to you. Whatever goes around comes back around. Rather, try to sympathize with them, be supportive and help in any way you can. You will never have any enmity around you if you show kindness and concern. These are universal antidotes for anger, hatred, revenge, and arrogance. Do not be unhappy about others happiness or happy about others unhappiness!
3. Learn to manage failures professionally. All of us are not destined to live or work in the same way, nor our abilities, talents, skills and knowledge are similar. Each of us face success and failure at different periods of training and professional practice. Most of the times these are transient. It is during these failures that we realize our potential and our true nature and abilities come out.
4. Aim for continuous updating of your skills and knowledge. Nothing provides you more protection against failures than the constant efforts to improve your skill and knowledge. Coupled with good personal traits, these help make your training and professional life enjoyable and memorable.
5. Healthy competition with co-residents is good and will help to create a good learning environment in the department. It contributes to the growth and evolution and increases the credibility of the department and the institution.
6. Use simulation, if available, as a means of learning, to supplement your clinical work. If your institution has facilities make full use of it. The benefits of simulation in anaesthesia includes learning and assessment of skills, knowledge, teamwork, communication and crisis resource management. Simulation based exercises, called Simulated Clinical Exercises (SCE), help to "hone" your skills and improve your preparedness to manage critical situations in real life. It is all the more important in the present context of COVID19 pandemic.

### **F. With surgical and non anaesthesia residents and staff**

1. Maintain a cordial relationship with surgical and other non anaesthesia

colleagues. How you behave during residency is likely to leave a long-lasting impression about you in the minds of all those who are part of your workplace. If you cultivate and exhibit a genuinely good behavioral and work pattern, managing all your problems with a smile, you are sure to reap a rich benefit in future. On the contrary, if your behavioral traits include untruthfulness, laziness, lack of punctuality, uncourteous behavior, they can harm your professional life seriously without you even realizing it.

2. Do not indulge in arguments and fights either for professional or personal reasons. Differences of opinion, discussion and constructive criticisms are not uncommon in any team. However, arguments in any manner, inappropriate, threatening, and hostile body language, rude and hurting words, screaming, or shouting are not tolerated anywhere and they are not acceptable even when you deal with your juniors (if you are a senior), nursing staff, technicians, or anyone for that matter. This kind of nature can become such an obstacle to your progress that you may not be able to rectify it.
3. Do not carry your issues or problems inside the theatre or from the hospital to outside. Life is temporary, so are most of the problems. If they are solvable at your level, do it. Or else, take it to the higher level in a “matter of fact” manner not as a complaint. Look at the issue, not the person.
4. Learn to respect the differences with others. This may be related to attitude, culture, food habit, language, or religious differences etc. Let these not affect the patient management and safety, which is the reason why all work together. Also, learning to manage differences will help you to work in different environments, in India and abroad, with much ease and comfort in future.
5. Appreciate that other residents also have their own opinions, compulsions, rights and privileges just like you have your own. Even when you are feel you right, try to solve the issue elegantly without compromising other person's self-respect or dignity. No one is immune from doing mistakes.

### **G. With authorities and administrative staff in the hospital and institution**

A hospital is a part of a medical college which itself could be a part of a larger institution or a deemed university. Make it a part of your personality to be polite and respectful to the higher authorities and staff, irrespective of your personal likes and dislikes. They include medical superintendent (or any equivalent), the Dean and vice Deans, college, and hospital administrative staff. They are all there to guide and help you. Do not hesitate to approach the higher authorities whenever you need help. Also, maintaining a genuinely good relationship will help you in enhancing future career prospects in terms of testimonial or a job. Whether you like it or not, you certainly need the goodwill and support from everyone for a smooth residency.

### 3. Social sphere

Many might argue that for a resident there is no social life. But having a low profile social life balancing with your professional work helps you to maintain good energy levels, to de-stress and to improve performance.

- A. Have a good circle of friends outside your own department. This includes residents from other specialties and friends outside the profession. Relate to them. Anaesthesia and surgical residents are not enemies! You can be best friends or who knows, some of you might even find your life partner among your co-residents.
- B. Participate in cultural events in the institution or representing the institution or at least be among the audience cheering your friends.
- C. Spend time regularly in the sports you love or in your hobbies. Do not allow an artist or a photographer or a trekker inside you to become dormant.
- D. While attending conferences take a break for a couple of days and visit nearby places, but only before or after the conference.
- E. Get involved in charity work, get associated with some voluntary organization. These are some of the ways with which you can give back something to the society.

### Conclusion

The above list of “tips” is only to serve as a guide or reminder. Follow them meticulously, surely you will be on the right path. Those of you who are already practicing them, our salutes.

---

**Prof. (Dr) Raveendra Ubaradka S. & Dr. Anju Gupta**

---

The human mind once stretched by a new idea never goes back to its original dimensions.

*Oliver Wendell Homes*

We cannot solve our problems with the same level of thinking  
we used when we created them.

*Albert Einstein*

Live with dignity and integrity

*Prof Elsa Varghese, Professor of Anaesthesiology (Retd)*

## Chapter 10

# Stress Management

### Caused more by thoughts than by situations

#### Preamble

Life is all about changing, adapting and growing. It can be quite stressful at times, especially when you are in unfamiliar environments. But often it is in those situations that your character shines. As a resident, you can develop stress due to various factors. (Table 1) While a “positive” stress can be a stimulus for better performance, a “negative” stress can lead to multiple problems if not recognized and managed early.

#### A real life story, to begin with.

Priya (name changed), from United States joined for anaesthesia residency in India with a plan to return to USA after training. Suddenly, she faced with a difficult situation: either give up further training and return to USA or to continue the training in India and give up the USA option. The dilemma of giving up one for the other led to depression. she became lethargic, dejected, unenthusiastic and took out her frustration and anger on her parents and family members, and was not willing to make the best of her situation for the first few months of her residency. Finally she opened-up to her family about how she was feeling that she realized she needed to make the best of her situation. She made a pros and cons list, talked to professionals, and tried to be more productive than she had in the past few months. It was on their advice that she allocated time for her professional life, for her personal life to do justice to both. She learned to open, talk about her feelings with close friends and family, worked hard, and learned to appreciate the curve ball that life had thrown her.

#### What must we learn from this?

Life hits you with unexpected turns at every step. You have joined for residency to be trained as a specialist in anaesthesia. Maybe it was not your first or even second choice and not the institute that you were aiming for. Maybe you find yourself in a department where you don't feel like you fit in. You might be stressed about juggling around all your new responsibilities or worried about managing your time and do justice to all aspects of your life. You could even feel like you're losing control! But take a step back, take a deep breath, re-evaluate, reassess, and find out the problem areas (table 1). Identify what you can change and what you can proactively adapt to.

#### Managing Stress

Stress is bound to be a part of our lives and could adversely affect the professional performance, physical and emotional health and overall well being. Challenging situations will keep creeping up, there will never be enough hours in the day, and work

Clinical	Academic	Others
<ul style="list-style-type: none"> <li>• Long working hours</li> <li>• Stress of patient management</li> <li>• Repeated failure of techniques, complications</li> <li>• Overcautious and too casual approach to patients</li> <li>• Inability to apply the knowledge to actual management</li> </ul>	<ul style="list-style-type: none"> <li>• Difficulty in understanding</li> <li>• Peer pressure</li> <li>• Tests, assessment</li> <li>• Coping with expectations</li> <li>• Peer pressure</li> <li>• Less time for studies</li> <li>• Poor academics in the department</li> </ul>	<ul style="list-style-type: none"> <li>• Anxiety, obsessive and impulsive behaviors</li> <li>• Conflicts with people</li> <li>• Conflicts with teachers</li> <li>• Health&amp; Personal issues</li> <li>• Social and economic issues</li> <li>• Relations</li> <li>• Habituation and addiction</li> </ul>

**Table 1 Causes and sources of stress during anaesthesia residency**

and family responsibilities will always be demanding. But you have a lot more control than you may think. Effective stress management helps you break the hold that stress has on your life, so you can be happier, healthier, and more productive. The goal is a balanced life with time for work, relationships, relaxation, fun and the resilience to hold up under pressure and meet challenges head on. However, stress management is not one-size-fits-all and that's why it's important to work out what's best for you.

**Tip 1 : Check out the sources of stress in your life.**

This may not be easy always. While it's easy to identify major stresses such as change in living conditions (moving from a secure home environment to an entirely new city and institution) or adjusting to the rigors of the residency life. It is all too easy to overlook how your own thoughts, feelings and behaviors contribute to everyday stress levels. Many times, worries could be just your procrastinations than reality.

**Tip 2: Follow 4 As of stress management**

**Avoid:** unnecessary stress can be eliminated! Set your upper and lower limits and distinguish between the 'shoulds' and the 'musts' and give them their due weightage. Avoid stressful people or limit your time with them. Avoid stressful environments if possible. If not, practice coping mechanisms such as “This too shall pass!” or “I'll be done with this pretty soon!”. **Alter** the situation. If you can't avoid a stressful situation, see if you can alter it. This could be done by small changes in the way you communicate or operate in your daily routine.

**Adapt** to the stressor: If the stress can't be changed, change yourself, change your expectations and attitude. *The only part of the universe you can change is yourself.* Understand that there is a difference between “reacting” and “responding” to a

situation. **Accept** the things you cannot change. Some sources of stress are totally unavoidable. Accept rather than worrying about the situations which you cannot change. You can remind yourself of the serenity prayer whenever you find yourself in challenging times, *“God, grant me the **serenity** to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference.”*

### My Story

Having spent almost all my life and my MBBS days in the “happening” city of Bangalore, I was devastated when I missed my PG seat in Bangalore and got selected in Mysore. I hated just about everything about Mysore (now I realize that back then I had shut out the idea of any other place except Bangalore) and tried everything possible to get a transfer to Bangalore. Even when I did join the college at Mysore, I did it with the sole idea of getting a mutual transfer to Bangalore. I avoided the thought that I may eventually continue in Mysore. I kept myself cheered up with thoughts of a temporary life in Mysore and continued dreaming of doing my residency at my parent college at Bangalore. This gave me strength for the initial four months because I could do precious little to alter the situation. Gradually, I learned to adapt to my surroundings, including the department, the hostel, my teachers, and colleagues, all the while with a comforting thought that this was temporary, and transfers do happen till 6 months! As I began to get along with my Mysore crowd, I realized that they were nice people after all, just like my crowd back in Bangalore. The workload at the hospital left me with no time for self-pity and days turned into months and what followed was acceptance. Once that happened, I looked back and realized that God had given me a trying period, no doubt, but the adversity had bought with it the seed of equivalent benefit. I set upon the job of postponing my ultimate happiness (Bangalore) and putting all my efforts into making the first few months as a postgraduate as fruitful as possible. After all, these days would never repeat in my life. I grew mentally strong, popular, and a trusted hand for my teachers and seniors over the next few months. I began to realize that Mysore had grown on me, and I loved the new personality that I had developed into. Probably the best thing that happened to me was that ultimately, I never got my transfer to Bangalore!

The only variable you can really control in any situation is you: your behavior, your workmanship, and your attitude. Rarely can you control the environment that you are put into, the situations that you face, and the people whom you might work with. By managing your time, your priorities, your mindset, and your outlook, you can drastically change your approach to any challenge you face, and confront it head on.

### Postpone happiness for a happier You

There was a famous marshmallow experiment carried out by Professor Walter Mischel, where small children were offered a choice – they could either have one marshmallow now, or if they waited 15 minutes, they could have two. The children were left unsupervised for 15 minutes with a plate having one marshmallow. Some were as young as 3 years old! A couple of kids grabbed it and gulped it down. Some licked it, and placed it back, and a few totally resisted the temptation and earned their reward. Here, the academic point is that of delayed gratification. These children were

followed up and it was found that those who were able to delay their gratification scored higher academically and were able to better resist immediate temptation. The ability to let go a bit of happiness now for a bigger dollop of happiness later is a crucial habit to reap long-term benefits.

Like other emotions, happiness is not something you obtain, but rather something you inhabit, which means that happiness is an ongoing life experience. Happiness is often equated to pleasure derived from good food, entertainment, parties, friends, popularity, or new cars, etc. Pleasure so achieved is great, but it is not the same as a deep sense of happiness. A drug addict will tell you how their pursuit of pleasure turned out. Happiness and positivity derived from a series of jobs well done in a day will serve as an incentive for making a commitment a habit. Remind yourself of the marshmallow story!

### **Happiness and gratitude are first cousins**

The fact that you are a resident means you are richer and more educated than 99.5% of people in human history. Your family may frustrate you but remember over a third of the world's population has only one parent, and 143 million children are growing up without any parents at all. You have been to a university, and that makes you a part of the lucky 7% worldwide elite. 60% of the world population is struggling for their daily subsistence, and 25% of people world over are starving. You don't belong to that segment. Be grateful. Conscious practice of gratitude is sure to result in a happier you. Look around you and you notice that people who are happier tend to be more grateful and appreciative for what they have.

You have good reasons to exchange any self-pity you might have for gratitude. Should your residency days be wasted wallowing in self-pity or feeling sorry for yourself thinking that you deserve better? Exchange it with gratitude, i.e. **“I have more than I deserve.”** Open your eyes to the good in the world and you will be happy to be yourself. People nurturing gratitude don't fall sick as often as others. They have better immune systems, sleep well, and have healthy lifestyles. Gratitude evokes more positive emotions which make you cheerful and energetic. Grateful people are more forgiving, gracious, and compassionate, and hence feel less lonely and isolated.

### **Worrying - if you must worry, make it productive!**

Use worrying to your advantage and turn it into productive energy. When you worry, there better be a reason for it. It is probably your mind and body telling you that there is an important issue that you need to attend to. According to Edward Hallowell, author of the book, “Worry”, the best medicine for worrying is to worry with someone else. Start by talking to a friend or someone in your department (may be your seniors or junior faculty) who can be very helpful in managing the stress . Use the “worry signal” from your system to act towards your long- term goals. Non-judgmental and

supportive buddies are just what you need when you get stuck. These are your “accountability buddies” whose primary role is to listen, so that you can “think out loud” and solve most of your problems on your own.

### **Connect with others**

There's nothing more calming than spending a little time with another human being who makes you feel safe and understood. It's nature's stress buster. Make it a point to connect routinely, and in person, with family and friends. Build a network of close friends, and you are sure to improve your resiliency to life's stressors.

### **Manage your time better with “Day Tight Compartments”**

The year was 1871. A young medical student was worried about passing his final exams, worried about what to do, where to go, how to build a practice and how to make a living. He went on to be knighted as Sir William Osler. Twenty-one words that changed his fears into achievements were words from Thomas Carlyle, **“Our main business is not to see what lies dimly at a distance, but to do what lies clearly at hand.”** Osler advised students of medicine to live in 'Day Tight Compartments', just like the massive ocean liners which have 'water-tight compartments', where a defect in one part of the ship's basement can be cut off from the rest by tight doors at the touch of a button. He advised them to touch the button and hear at every level of their lives, the iron doors shutting on the past – the dead yesterdays and the unborn tomorrows. The load of tomorrow, added to that of yesterday, carried today, makes even the strongest falter. The future is today. There is no tomorrow. Waste of energy, nervous worries weaken the steps of a man who is anxious about the future. The best possible way to prepare for tomorrow, is to concentrate all our energy, enthusiasm, and intelligence on doing the best today.

Life in academia often calls for long hours in the hospital, sleep deprivation, and little or no time for self-care. Decide to do one thing for yourself each day. It may be 30 minutes of exercise, a lunch break with a friend or a sport. Endless cups of coffee, tough working conditions as an anaesthesia resident and sleepless nights may sound like a standard operating procedure, but these are a recipes for poor physical and mental health. Hence, committing yourself to eating right, exercising, having a comforting company of a good friend or two, and getting good sleep is the formula for reduced stress and best academic outcomes.

**Find out what works best for you:** Experiment with a few different schedules. If you are a morning person, set aside a couple of study hours for the morning. Multi-tasking dominates residency life. Your mindset keeps shifting to various routines every day, juggling regular theater work, seminars, pre-anaesthetic evaluations, power naps, and catching up on studying apart from personal chores. Large chunks of these occupy an average day. Creating a slot for every chunk including studying helps in persisting and

scheduling each day, day after day, until it becomes a habit.

Take a week to keep track of exactly how you spend your time. Be it doing cases, PAE, attending classes, eating, sleeping, social media, every activity should be tracked. A clinical psychologist, Scheidt says, “Every single hour in my calendar is accounted for, so that I have a very clear view of what I'm doing.” Then when he needs to find extra time to write a paper or study, he just looks at the calendar and re-prioritizes. He prefers to use Google Calendar to schedule and color code everything he does. “It's just as helpful to know where every hour is going, because then you can really control your time better,” he says.

It is a good habit to leave no room for negotiation or bargaining. If you have planned a post dinner two-hour study chunk at 9:30 PM, then 9:45 PM is not to be allowed, or else you would be setting a precedent telling yourself that these rules don't matter. Reward yourself with allowable chunks of recreation time too! Incentives help you stay motivated. Believe me, the only hitch is getting started and overcoming the, “Oh, I don't feel like it right now” thought process. Once your attitude is set in the right direction, you will be surprised by your renewed interest in the task as you go on to make steady progress. Seemingly small chunks add up big time when we realize how many tempting breaks, we take surfing the net or on social media. It pays to keep tempting gadgets out of reach - know that these are the procrastinator's best friend. If you need help to stay on task, download a productivity tool that allows you to block certain sites for certain periods of the day, such as [Leech Block](#), Google's [Stay Focused](#), or Apple's [Focus bar App](#). These apps can help eliminate distractions such as Instagram, or YouTube. It is amazing how much you can accomplish in a short time when you are focused and uninterrupted.

If you put everything that you have to do into the calendar, things like working, eating, sleeping, buying groceries – you see right away that you really don't have time. This input is especially important for residents because they have so many concurrent projects, something that is likely to continue throughout your careers. Get your schedule under control.

### **Maintain a balanced and healthy lifestyle**

In addition to regular exercise, you need to make healthy lifestyle choices, which can increase your resistance to stress. Eat healthy and sleep enough. Well-nourished bodies are better prepared to cope with stress. Be mindful of what you eat, and how you eat. You could restrict caffeine, alcohol, junk, sugar and add a mix of nutritious diets. The temporary “highs” that caffeine and sugar provide often end with a crash in mood and energy. Good sleep fuels your mind and body while feeling tired and groggy can increase your stress and cause you to think irrationally.

### **Are you a morning Whatsapper?**

Do you instinctively reach out for your cell phone to check out your social media the first thing in the morning? When you begin your day by reading messages, you are prioritizing giving your precious time to people (whom you don't consider important in your life) before acting towards your long- term goals. You get distracted from your priorities and your concentration may be disturbed all day. To make consistent progress, begin your day by doing the highest priority task; especially one that you have been putting off for a while. Your concentration is at its peak in the morning – aim at starting the day right.

Haven't you noticed that ideas and errands pop into your head just when you try to focus on serious stuff? Our natural urge is to act upon these chores right away, and make a call or check your chats, or do one of those hundreds of little meaningless things. The result is that the train of thought is lost, sometimes for the rest of the day, and boom goes the day! On the other hand, if you try to resist the urge to act upon these lists of to-dos, the urge will just become stronger. But that's no reason for you to give in to the urge and make that call or check your chats. Why not capture the idea in a small notepad, tuck it away, and attend to them once the work on hand has been attended to? Do you know something? That seemingly important, not so important chore will not seem so urgent by the time you get to it! However, they will at least be out of your head and collected in one place, so you feel good having attended to everything you needed to.

### **Being an overachiever may burn you out!**

Setting unrealistic goals for yourself may drive you to work harder for longer hours, sometimes to the point of a burnout and in due time, lead to poor time management and reduced productivity. Simplify your life. Instead of trying to do too much at once and you just may create a shorter route to achieving your goal in a relaxed manner. Slow down and stop trying to do everything perfectly. You will realize that you feel more focused and make tangible progress every day. Perfectionism sometimes kills creativity and productivity. Hauling yourself up for not having given your very best, leads to a vicious cycle of low productivity, followed by loss of self-esteem, and a complete loss of motivation. If you think being a perfectionist every time and beating yourself up leads to better performance, you may continue.

On the other hand, looking for an alternative solution that will help you reach your goals sooner seems to be the best way forward. Look at the bright side. You are one in a million who has reached so far, you are still hanging in there, working in the trenches, putting up long hours into what you do and that's enough reason to feel good, to celebrate. Oprah Winfrey, who was born poor and is now worth over 3 billion dollars advises, "The more you praise and celebrate your life, the more there is in life to

celebrate.” Goals are reached a lot faster when you acknowledge every baby step forward. Then, why not start today? Keep a gratitude journal and write down one thing you are thankful for each day – it makes you more creative, and it makes you sleep better.

It is easy to think that we can and should be able to handle all our problems on our own. However, the reality is that human beings are not lone islands and need each other to thrive and survive. Accepting this during your residency will make your life infinitely richer. These three years aren't supposed to be easy, but nothing prevents you from living a fruitful life with the right mix of hard work and fun. Remember this is just the beginning of a lifetime of facing difficult people and situations. So, giving the right master strokes of hard work, honesty and integrity on the canvas of your residency life paves way for a brilliant future.

If you were to interview an accomplished anesthesiologist 10 years after his residency, he/she will have nostalgic memories and stories of doing 36-hour schedules without sleep and about tough superiors breathing down his neck. But the fact of the matter is, he has moved on; he has a satisfying job, a good family and not doing too bad in life at all! All those years of doubt, stress, and pressure only toughened him to face adversities that are a part of routine life.

Don't worry! You're entering an exciting part of your career, and though it seems daunting now, if you can manage your stress and your time, this can be one of the best periods of your life!

### **Conclusion**

Positive stress helps you to do better, by acting as a motivation. What you should watch for and avoid is the negative stress. Rather than focusing on how stressed you are, shift your attention to realization of how blessed you are to be a doctor, to be a specialist and to be getting trained in a specialty which can make a huge difference in others life.

---

**Prof. (Dr) Nalini Kotekar & Prof. (Dr) Raveendra Ubaradka S.**

---

When you lead with your nice foot forward, you will win everything. It might not be today, it might not be tomorrow, but it comes back to you when you need it. We live in an age of instant gratification of immediate likes, and it is uncomfortable to have to wait to see the dividends of your kindness. But I promise you, it will appear exactly when you need it.

*Kristen Bell, Actor (In Readers Digest)*

Chapter 11

# Conflict Management

## Help ever hurt never

### Preamble

Conflicts in the workplace are not uncommon, even if you are a resident. It can be with anyone in the team or around and can arise in a highly unpredictable manner. Avoiding and managing conflict is an art and communication is the most important key. All conflicts are not necessarily negative and can be inconsequential. When handled constructively it can help you to stand up for yourself and others. On the contrary, a poorly handled conflict can cause anger, hurt, divisiveness and more serious problems.

### Genesis of conflicts

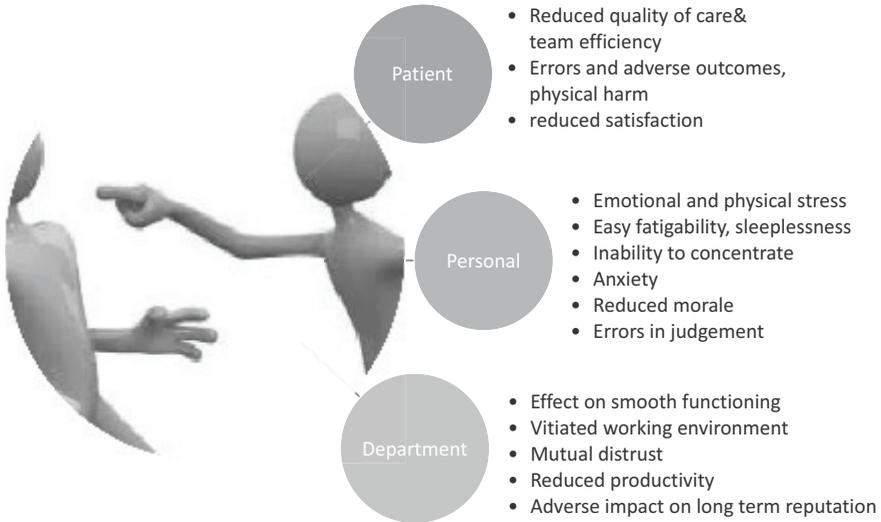
Conflict underlies many interpersonal interactions. Various factors underlying the conflicts are listed in the box below.

### Factors underlying causation of conflicts

**Causes**

1. Work stress
2. Inherent personality traits
3. Ego clashes
4. Unhealthy competition
5. Difference of opinions
6. Peer pressure
7. Poor communication skills
8. Excessive hierarchy
9. Undue interferences, actual or perceived
10. Personal issues
11. Humiliation
12. Sleeplessness
13. Cultural and social issues
14. Dishonesty, deceit, and disobedience
15. Wrong information, rumours
16. Misconceptions
17. Lack of trust
18. Wrong assumption
19. Clash of ideas, actions, egos, and choices

## Consequences of conflict at workplace



### Examples of conflicts in day-to-day work

*Example 1:* A 40-year-old, 110Kg woman had pain abdomen for three days which has worsened and localized to the right upper quadrant for the past 24 hours. She has nausea and vomiting and has eaten 3 hours earlier. Surgeon insists on emergency cholecystectomy. Anaesthesia resident informs his chief (who wants to wait 4 hours more) about patient being on table at the insistence of the surgeon. Unhappy with this, the chief instructs the resident to manage on his own, if he thinks the surgeon is his boss (a sarcastic comment). This is an example of conflict between anaesthesia resident and faculty.

*Example 2:* A third-year anaesthesia resident refuses to follow institution's policy regarding sterility during central venous placement, when reminded by the staff nurse. Here is a conflict between ICU nurse and anaesthesia resident.

*Example 3:* Surgery resident (on instructions from his chief) refuses to delay elective procedure of patient with multiple co-morbidities, hyperkalaemia, and overdue dialysis. Example of conflict between surgery and anaesthesia residents.

*Example 4:* A first-year anaesthesia resident (R1), gets a chance to intubate a difficult airway, thanks to her professor. This is in spite of assessment and work up being performed by a second-year resident (R2). Worse, 20 min into the case, R1 disappears from the scene leaving the patient to R2. Here there is a conflict between R1 and R2, both anaesthesia residents.

*Example 5* : 2<sup>nd</sup> year anaesthesia resident, AL, has a soft corner for a 1st year lady resident in obstetrics and gynaecology, but his parents have called him home to meet a girl of their choice. He tries to explain that he is too stressed, and these matters must wait till he completes his MD. Parents refuse. Conflict is between AL and his parents.

Conflict may be resident-resident, resident-patient, resident-faculty and faculty-faculty. They can range from minor disagreements and differences of opinion to personality clashes, to blatant hostility including physical confrontations. According to duration, a conflict can be acute, sub-acute, chronic and interminable. Incorrect, inadequate, or poorly communicated information is a frequent source of misunderstanding among operation theatre (OT) personnel.

Conflicts arising from role expectations are especially prevalent in critical areas of the hospitals such as the OT. In most setups there is a well-established pattern of hierarchical decision making with the consultant at the apex of the hierarchy. However, this hierarchy is blurred in the OT where clinical decisions are particularly complex and each of the team members may act as the final authority at various times and in various circumstances. Personality traits commonly found among surgeons and anaesthesiologists such as perfectionism, compulsiveness, reliance on scientific evidence, etc can make it more difficult for them to acknowledge others' expertise and to relinquish control. Probably the most pernicious effect of inadequate conflict resolution is its corrosive effect on professional relationships and teamwork necessary for good patient care.

### **Communication and its importance**

The Accreditation Council for Graduate Medical Education has mandated that effective communication is one of the 6 core competencies that must be demonstrated for successful completion of residency. In the opinion of many anaesthesiologists, interpersonal interactions and conflict constitute the most challenging and stressful aspects of their job. Conflict in the OT can contribute significantly to stress and hinder safe and effective anaesthetic care.

### **Personal conduct in conflict management**

1. Anticipate conflict and develop communication skills, 2. Identify the source of conflict and try to resolve. Establish rules of conduct and adhere, 3. Establish shared standards and goals and recognize any shared frustrations with the system, 4. If confrontation with a colleague is necessary, it should be conducted in a private setting and in a mutually respectful manner and 5. If conflict is ultimately irreconcilable, transfer patient care to an uninvolved colleague.

### **Prevention of Conflicts**

Prevention of conflicts is as important as solving. Respect the differences in gender,

culture, generation, and values of those around you. Maintain a professional behaviour in workplace which implies that you focus on the shared objective of patient care without bringing in personal personal matters. Good communication, maintaining a distance and being constructive in your approaches are sure to go a long way in prevention of majority of conflicts in the workplace.

### Resolving Conflict

Knowing how to deal with conflict is important. Maintaining and respecting privacy and confidentiality is the first step in conflict resolution. The whole process can be a dignified affair with only the concerned parties with genuine interest and role being involved. Resolution should be attempted at the earliest after the tempers cool down. Discussion should be focussed on specific objectives avoiding bringing in unrelated incidents or generalizations. Sarcasm, anger, excessive and inappropriate humour should be avoided.

### Dealing Constructively with Anger

Conflict can result in anger and vice versa. Anger can range from annoyance to absolute rage. Each person's anger "triggers" are different. Consider the following ideas to help deal constructively with anger:

1. Two crucial skills in managing anger are self-awareness and self-control. Try to master them, it is worth it. **Self-awareness** is being conscious of thoughts and feelings and introspecting how and why you are feeling angry. Once you have answers there begins management. **Self-control** means stopping and considering actions before taking them. Learn to stop and think before you act or speak in anger. Explore techniques to calm down such as counting backwards from ten to one, deep breathing, or just walking away.
2. **Relax and think positively** Try relaxation exercises, such as breathing deeply from the diaphragm (the belly, not the chest) and slowly repeating a calming word or phrase like "take it easy." Or think of relaxing experiences, such as sitting on a beach or walking through a forest. Remind yourself that no one is out to get you, you are just experiencing some of the rough spots of daily life. Learn the art of stress management.
3. **Solving the problem.** Identify the specific problem that is causing the anger and approach it head-on, even if the problem does not have a quick solution. When angry, you tend to jump to conclusions and speak without thinking about the consequences of what you want to say. Also, listen carefully to what the other person is saying.
4. **Change the scene or find a distraction.** A change of environment may help reduce angry feelings. For example, if your co-workers or friends are angry frequently

and/or make you angry, consider spending time with people who may contribute more to your self-confidence and well-being. This is particularly true when you are managing a patient or when a lot of people are around. Even if you feel you are right, it's safer to move away from the place or surrender to silence till you regain composure.

### **Aggressive behaviour**

Aggression arises from the experience of being prevented from reaching an expected goal (frustration). Modulated by social learning and perceived intentions, situational factors such as pain and sense of hurt make aggression more likely. Conversely, good communication skills can mitigate aggression. In the context of healthcare, frustration comes in the form of feeling disrespected, not being listened to, and being treated unfairly.

### **De-escalate Aggression**

- Stay calm and respectful, approach in a warm, friendly, open manner.
- Speak softly and clearly in short sentences, maintain nonthreatening eye contact
- Use facial expressions or nodding to convey attentiveness & understanding.
- Avoid distracting activities such as writing or looking at the computer
- Show compassion and consideration
- Ask open-ended questions to get the other person's point of view
- Acknowledge frustration and the importance of the issue
- Give a clear message that you understand and want to help
- Explore solutions and provide choice whenever possible

### **The Emotional Bank Account (EBA) Concept**

Our financial bank account is very familiar to us as we are constantly making deposits to it, building up reserves from which we can make withdrawals as and when we need to. An EBA is as important. This is a metaphor that describes the amount of trust that has been built up in a relationship. It is the feeling of safety you have with another human being.

You should build up a reserve in your EBA by depositing courtesy, kindness, honesty and keeping up your commitments to others. Uncourteous behaviours, disrespect, betrayal, dishonesty, anger, aggressiveness etc lead to reduction of "balance" in your EBM. If a large reserve of trust is not sustained by continuing deposits, a relationship (be it any thing: peer to peer, teacher to student, superior to subordinate, family member to family member) will deteriorate to one of hostility and defensiveness. It results in verbal battles, slammed doors, refusal to talk, emotional withdrawals, cold wars, and self-pity. The EBA lighthouse can be used either to break ourselves against it

or as a guiding light. There are no quick fixes, building and repairing relationships take time. Believe me, the relationships you build as a student can sustain you throughout your lifetime, especially when difficulties arise. You just never know who might bail you out of trouble in years to come. Make a habit to deposit in this long-term investment.

### Seven major deposits into the EBA

Understand, attend to little things, keep commitments, clarify expectations, develop personal integrity and honesty, apologize when needed, unconditional love and kindness

1. **Understand** others the way you want to be understood. Everyone has his/her share of emotional baggage. Do not be unreasonably judgemental.
2. **Little kindness and courtesies** are so important. Similarly, even small discourtesies, little unkindness, little forms of disrespect make large withdrawals. In relationships the little things are BIG Things! Regardless of age, tough exteriors, or experience, people are very tender and sensitive inside and these little things can evoke positive vibes towards you.
3. **Keeping a commitment** or a promise is a major deposit and breaking one is a major withdrawal. Never make a promise which you cannot keep. Bridges of trust get stronger when commitments are kept.
4. Who does what and as to how much of responsibility is expected out of you? Many expectations are implicit and are not explicitly stated or announced. Making expectations clear and explicit is a major deposit and takes time and effort but is well worth it as it avoids negative situations and misunderstandings. As a resident you are required to live up to these expectations to build a lifetime of goodwill.
5. **Personal integrity and honesty** generate trust and is a huge deposit. An important way to do this is to be loyal to those who are not present and in doing so, we build the trust of those who are present. Belittling, criticism, betrayal or gossiping about others behind their back will make people lose trust in you. Integrity also means avoiding deceptive and mean communications which are unbecoming of our noble profession.
6. **Apologise sincerely** when you make a withdrawal from the EBA. Do not think that it will make you appear soft and weak. Gentleness can only be expected from the strong.
7. Do so without strings attached because all the good we do have a way of coming right back to us. No man is an island, we all are dependent, independent, and interdependent, all at the same time! This may look like a paradoxical statement but take a closer look and think. You will agree. Look at problems as opportunities to build relationships instead of perceiving them as negative, burdensome irritations.

## Conclusion

Even if you are hardworking, sincere and a knowledgeable resident, poor communication or conflict prone nature can be a big setback to your progress in life. Learning conflict management with focus on ways to prevent should be a serious component of your journey to professional and personal excellence.

---

**Prof. (Dr) Nalini Kotekar & Prof. (Dr) Raveendra Ubaradka S.**

---

Chronic stress leads to activation of hypothalamus-pituitary- adrenal axis, which can eventually lead to Burnout syndrome (BOS), one of the new-age professional hazards, often with severe consequences. Burnout was described by Maslach and Jackson as a syndrome of emotional exhaustion, depersonalization and low personal esteem. As can be expected, it can be associated with alcoholism, depression and in extreme cases suicidal tendency as well.

Prevention, monitoring (self and your co-residents), peer support, and developing the right attitude are among the strategies which can effectively help you in stress management and preventing BOS. Also, you should be open to using the grievance redressal systems available at the department as well as the institutional levels.

(Excerpts from an article by Dr Pallavi Lande- Margadhe, Journal of Anaesthesia and Critical Care case Reports, January-April 2017 and personal views)

Ikigai is a Japanese word for “a reason to live” or “a reason to jump out of bed in the morning”. Some of the rules of ikigai, as explained by authors Hector Garcia and Francesc Miralles, are “live in the moment, reconnect with nature, give thanks...”. Practicing ikigai will help you to destress. For this, view your daily work, as a life-long passion and a great opportunity to make a difference in the life of fellow human beings, even if you often felt it to be “boring routine”. Make yourself a part of the system in which you work in. This establishes the “flow” in your work. That's what ikigai is about. The key factor is to constantly realign your attitude to the changing realities around you.

## Chapter 12

**Patient Safety and Quality of Care****Make safety your culture and quality your habit****Preamble**

Hippocrates's famous quote, "*primum non nocere*" – first do no harm, still continues to be the guiding principle of patient care. Patient safety was defined by Charles Vincent as "the avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the process of health care". During the process of perioperative care, there are several preventable situations and actions. If they are allowed to happen and the consequences not recognized or not managed, they can be harmful to the patient. Literature shows that about 50% of the perioperative adverse events (AE) are preventable. AE are known to occur in about 30% of hospitalized patients during perioperative care.

Anaesthesia related morbidity and mortality has consistently declined over the past several decades, as patient safety has become *numero uno* priority. In a surgical patient, there are potential situations at every stage of perioperative care where patient's safety can be compromised. Safety should be developed as a culture both at the individual and institutional levels. Anaesthesiologists work in an environment that is both complex and dynamic. Accuracy, appropriateness, and effectiveness of care can make significant impact on outcome.

The word "anaesthesia" is invariably associated with fear in patients' minds and is reflected in their actions, verbal/ nonverbal communication, and responses. Fear is usually about the pain, losing consciousness and control over the self, delayed recovery and neurological damage. It is worsened by their own past experiences, hearsay from friends and relatives, from media reports and from different so-called patient education websites. Anaesthesiologist should address these concerns carefully.

**Patient safety****How the patient safety can be compromised in the perioperative period?**

Potential sources of dangers are patient himself/herself, anaesthesiologist, surgical team and the environment (table 1). Consequences of breach of safety precautions/measures can be physical injury, physiological harm, or emotional stress to the patient. It can be immediate or delayed, temporary or permanent, minor or serious, resulting in morbidity or mortality. Delayed recovery, prolonged hospitalization and increased cost of treatment are other potential consequences. In addition, it adversely effects the morale, image and reputation of the individual, team, department and institution.

**Table - 1 Sources of compromise in patient safety**

Patient safety related incidents can occur in the preoperative, intraoperative or postoperative phase or in more than one of them (table 1). Most of these events or errors are preventable with meticulous planning.

Patient	Concealing information, wrong information, failure to comply with instruction, lack of cooperation, smoking, anxiety, and agitation
Medication : In anaesthesia, a single drug be used in different ways for the same purpose in different patients. Also, same drug can be used for different purposes in different patients. Consequences can be often irreversible and life threatening.	1) Lack of knowledge/familiarity with the drug, 2) Errors in drug, dose, route, dilution, concentration, and frequency, 3) Drug interactions, 4) Look Alike and Sound Alike Medications (LASA) and 5) Failure to take aseptic precautions as required.
Equipment	1) Failure to check anaesthesia machine, 2) Nonavailability of back up O <sub>2</sub> cylinders, 3) Faulty equipment, 4) Wrong choice, 5) Improper use, 6) Physical harm 7) Wrong connections and 8) electrical failure etc.
Process	1) Wrong identity/site/procedure, 2) Fall at any stage of care and 3) Premature or delayed actions
Anaesthesiologist	1)Wrong or failed technique (inadequate training/lack of exposure), 2) Communication errors, 3) Fixation errors and 4) Errors of judgement.

**Role/Duty of the residents in patient safety**

1. You are directly in contact with the patient performing techniques, administering anaesthesia, monitoring, and managing the patient. Hence you can be either the “savior” for the patient by virtue of your quality of care or you can be the “destroyer” with your negligence, absentmindedness, distraction, lack of interest and improper communication. How you behave as a resident is a sort of “preview” of your future performance as a professional.
2. You may not be medicolegally fully responsible for patient safety, but the faculty under whom you are managing the patient is. It is your responsibility to gain the confidence of your teacher, and colleagues by being truthful, honest and hard working.

3. Safety should be a culture and quality should be your habit. Understand/ identify the sources of compromise of the patient safety, in your daily working environment. Anticipation and early recognition are critical
4. Specific actions by the resident at different stages of patient care which can improve safety:

**Preoperative Phase**

- a. Assess the patient before anaesthetizing, even during emergencies
  - b. Establish rapport and elicit patient cooperation
  - c. Optimize comorbidity and physiological derangements
  - d. Preparation for blood management ( correct hemoglobin, autologous transfusion )
  - e. Continue/discontinue/ substitute existing medications
  - f. Ensure compliance with fasting guidelines and premedication
- Report to and discuss with the staff, read, analyze, discuss, plan, and prepare

Take care of transfer, especially if patient is for caesarean section, unstable or sedated or has altered level of consciousness



**Intraoperative**

1. Perform regular anaesthesia machine checking as per protocol and also check other essential equipment
  2. Identify the patient, check consent, verify the procedure, and confirm fasting status
  3. Review recent investigation reports and anaesthetic plan
  4. Communicate with the patient clearly and in a reassuring manner
  5. Establish pre induction monitors and free flowing intravenous line
  6. WHO checklist - Sign in, time out and sign out
  7. Manage A-B-C; Airway-Breathing-Circulation, under supervision or independently
  8. Structured and evidence- based approach to difficult airway management
  9. Properly position patient, protecting eyes, superficial nerves, plexus, pressure points
  10. Prevent physical injuries
  11. Communicate with team members
  12. Watch for and prevent medication errors
  13. Managing blood and blood products, blood transfusion being a potential source of AE
  14. Document meticulously including complications and outcome
- Be alert, vigilant, communicate, discuss, act appropriately and on time



**Postoperative care**

Select the postoperative area to be shifted depending on patient's needs

Ensure patient's safety and stability with,

- a) clear handover to the concerned staff: a critical step.
- b) monitoring the patient frequently, if there is a potential for instability.
- c) providing pain relief and watching for potential complications

**5. International Patient Safety Goals (IPSG) : do your part carefully**

IPSG represents the broad guidelines for patients admitted to hospital. Anaesthesia related safety measures and recommendations should comply with these goals. They are 1. Identify patient correctly, 2. Improve effective communication, 3. Improve safety of high alert medications, 4. Ensure correct site and procedure, 5. Reduce risk of health care associated infections and 6. Reduce patient harm resulting from falls.

**6. Prevent medication errors**

From the time drug is delivered to operation theatre from the pharmacy till it is injected into patient, at every stage there is a risk of error due to,.

- 1. Look alike and sound alike (LASA) medications
- 2. Wrong drug, wrong dose, wrong route, wrong concentration, wrong volume
- 3. Poor communication
- 4. Negligence/physical exhaustion/ work (volume) pressure
- 5. Lack of knowledge

When you are using the same drugs almost daily, there can be a tendency to ignore certain rules and commit errors subconsciously. They include a)not using drug labels b) failure to mention the drug concentration c) carrying medication syringes in pockets d) depending on others to prepare medications and e) Failure to hand over the details of the medication administered/ loaded to the next care giver.

Some of the important measures to prevent medication errors: 1) identification of drugs and expiry date before loading 2) loading just before administration and proper labeling including concentration 3) loading the drug yourself 4) use of color coding 5) confirming with another person while loading high risk drugs and 6) use of pre-filled syringes and bar coding.

**7. Soft skills : realize the importance, cultivate and use**

As far as patient safety is concerned, communication and teamwork with clarity and decisiveness plays a vital role. This is more important when managing a complex procedure, sick patient, managing perioperative complications and handing over after the surgery(see chapter 6).

8. There are protocols, good clinical practices and standards of care for patient management

They are aimed at ensuring basic minimum safety at all the times. Protocols and guidelines are recommendations regarding specific drugs, techniques, monitors, sequences, or other components of patient care for different clinical settings or anaesthetic techniques. They are usually developed and published by accreditation bodies and professional societies- national and international. Ex; Protocol for anaesthetic management of an emergency caesarean section, protocol for preoperative assessment, guidelines for fasting in a child undergoing elective procedures and guidelines for management of difficult airway. Modifications of the guidelines can be done within a department or a hospital to suit the local population and needs.

Good clinical practices and standards of care are evidence-based recommendations which the practitioner or a professional must adhere to be reasonably safe.

**Examples of clinical consequences related to compromised safety (iatrogenic complications)**

1. Loss of tooth/ teeth in a patient who did not have any loose teeth.
2. Eye injury due to inadequate protection
3. Pressure sores during prolonged surgery
4. Nerve palsy or brachial plexus injury due to excessive stretching and improper positioning
5. Electrocautery induced burns
6. Airway fires
7. Delayed recovery
8. Prolonged hospitalization
9. Air embolism in a susceptible child following failure to remove air from the intravenous line

**Quality of care**

Quality of care is both subjective and objective reflection of the way the care is delivered. Not all aspects of quality are measurable objectively. It is reflective of the medical care, both at the individual and institutional levels. Quality in medical care was defined by Institute of Medicine(IM), USA, as “the degree to which health services for the individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”. Thus, quality is not a static endpoint, and it is applicable both at individual and population levels. IM defined quality as having six domains, namely effectiveness, equitable, timely, efficient, safe, and patient centered. This can be summarized as “how, why, where, when, to whom

and by whom” of professional care.

Medical professionals are expected to deliver a high-quality care to their patients, irrespective of any confounding factors. It is by no means easy, especially in specialties like anaesthesia and critical care. In delivery of such services, anaesthesiologist is frequently stressed by time, incomplete information, multiple options, inadequate evidence, lack of appropriate equipment and assistance. It is during residency that the foundation for delivery of quality care starts. Quality of care and safety are closely associated with knowledge, commitment, skills, observations, situational awareness, lifelong learning and soft skills (table 2).

Table 2 : Actions indicative of quality of care among residents,

Preoperative phase	Intraoperative phase	Postoperative phase
Assessment of and interaction with patients Not missing out important clinical findings Getting complete workup done before the surgery Identification of potential sources of danger Proper and comprehensive documentation and communication to the faculty	Adhering to established standards of care Stable and appropriate venous access Continuous monitoring Interaction with the team members Keen and continuous clinical observation proper documentation	Safe transfer to recovery Handing over appropriately Monitoring during recovery Anticipation, preparation, and management of complications Calling for help at any phase of care

**Recommendations by WHO-WFSA (2018)**

World Federation of Societies of Anesthesiologists (WFSA ), which represents anaesthesiologists from more than 150 member countries is also the representative body to liaise with World Health organization(WHO). The **Safe Surgery Saves Lives** initiative of WHO in 2008 is a milestone in patient safety. It led to introduction of surgical safety checklist. WFSA recommendations for safe anaesthesia practice were updated in 2018 and approved by WHO. They are evidence based and covers wide range of clinical settings.

**Other international anaesthesia related safety-oriented organizations**

American Society of Anesthesiologists (ASA), has made significant contributions to patient safety in the form of risk stratification (ASA grading) and periodic development and revision of guidelines for different clinical situations such as airway management, monitoring, and several other anaesthesia related patient management aspects. Anesthesia Patient Safety foundation (APSF) and Anesthesia Quality Institute (AQI) in

2008 were founded by ASA to promote patient safety and quality of anaesthesia care. APSF aims to improve patient safety during anaesthesia by way of a) safety research and education, b) patient safety programs and campaigns and c) national and international exchange of information and ideas.

Indian Society of Anaesthesiologists (ISA) has published several recommendations related to anaesthesia related patient safety. Various airway societies like Society of Airway Management (SAM), Difficult Airway Society (DAS-UK), All India Difficult Airway Association (AIDAA), Canadian Airway Focus Group (CAFG) work in the specific domain of airway management to improve safety and quality through guidelines, research, training etc. Evidence based recommendations have been recently introduced safe patient management during the COVID 19 pandemic.

### Perioperative patient safety goals ( APSF recommendations 2021)

1. Culture of safety
2. Teamwork
3. Clinical deterioration
4. Non-operating room anesthesia
5. Perioperative brain health
6. Opioid related harm
7. Medication Safety
8. Infectious diseases
9. Clinician safety
10. Airway management

### 8. Conclusion

Patient safety and quality of care are the primary twin goals of safe anaesthetic care. Breach of safety and poor quality of care have potential to cause immense harm to the patients as well as to the professional image and reputation of the anaesthesiologist. They are not impossible goals and residents would do well to spend considerable time and energy in assimilating a safety culture.

---

**Prof. (Dr) Raveendra Ubaradka S.**

**with inputs from Prof. Manjunath Prabhu and Prof. Sriganesh Kamath**

---

- Doing your best is not enough if your best is not the right thing for the patient.
- A technique should be chosen to fulfill the needs of the patient, not that of the anaesthesiologist/trainee

Chapter 13

# Ethics in Anaesthesiology

## Improves inner strength

### Preamble

Medical ethics is a set of rules or principles accepted by the professional bodies based on the best interests of the patient in particular and community in general. Ethics is ought to be followed by every practitioner of medicine. Ethics is different from law. However, unethical practices are punishable like unlawful activities. But defining what is unethical is more difficult than defining what is unlawful.

Anaesthesia residency is incomplete without inclusion of and emphasis on morality and ethics. These two attributes are so important and crucial that they must become part of your personality. *True success is achieved only when your moral standards are high and professional service provided is of high ethical standards.*

“The cataclysmic transformation of the practice of medicine has reflected the rate of change in both its own scientific foundation and the nature of the society it serves. Therefore, we as physicians are ever more frequently confronted with complex ethical dilemmas that impact both our professional and personal lives”. This opinion of the authors of an article on ethics, published in 1997 reflects aptly about the ethics in our work. We encounter ethical issues both as basic medical professionals as well as anaesthesiologists. They can be related to patient, procedure, surgeon, colleagues, administrators, and can involve clinical, sociocultural and religious factors.

Ethics and morality are closely interrelated and are expected at three levels, personal, professional and societal. Ethics is based on values and reasoning, while morality involves adhering to individual beliefs or principles. Ethics is not just related to patient safety or right or wrong about any individual anaesthetic technique or choice of drug or plan. It is about trying to do the right and the best at all the times. Importance of ethics is apparent at all levels of working: in interactions with the patient, surgeons, colleagues and seniors. Sometimes it is just about being truthful to yourself. Unethical practices or actions may not always be noticed and may not cause any harm to the patient, but it certainly erodes the inner values of the person and can be reflected in his/her work, can affect the system in which the person is working and at some stage impact the patient safety. They can also adversely affect the reputation of the individual, department, hospital/institution and can tarnish the image of the profession itself.

### Ethics and morality from residents' perspective

It is strongly recommended that you go through the available national and

international guidelines related to ethics carefully and completely in the first one month of your residency itself. Consider it as important as anything else in your training. When you are ethical you are sure to be morally right as well. On the other hand, when you indulge in unethical behaviour, it includes immoral acts also. Thus, all your actions should be ethical, moral and lawful. Lastly, remember that ethics encompasses your clinical, academic, research and personal domains of work.

### Ethics in clinical work

**1. Patient management :** First, it involves your interaction with and management of patients, both what you should do and should not do. It starts with the consent and the information you share with the patient. Second, the clinical management wherein you need to consciously respect and ensure patients autonomy, individuality, dignity, beliefs, and privacy, in addition to the clinical goal of safety. Third, your ethical responsibility continues till you safely and properly handover the patient to the next caregiver. When you care about the quality of care, instead of anaesthetizing patients in a routine and casual manner, you would be automatically ethical.

Admitting your mistakes and wrongdoings is both ethical and moral. Hiding the information, wrong information, willfully ignoring the warning signs, disrespecting patient in any way, are some of the examples of unethical, hence unacceptable behaviours.

**2. Academics and ethics:** Here, you should seriously and constantly introspect about your own ethical values. In academic domain, you have plenty of opportunities to be unethical without appearing to be so. Ethics is related to the originality of your answers, preparation and presentations, honest presentation of facts during case discussions, disclosure, and admission of mistakes, writing or facing examination with your own preparation and knowledge rather than copying or taking the help of others against the rules, etc.

**3. Personal ethics :** Being ethical to yourself is the final goal. It is the icing on the cake. Of course, you can realize that *when you are ethical to yourself, you cannot be unethical to others*. One specific aspect of personal ethics highlighted in guidelines and unique to professionals is to be a life -long learner. It includes both acquiring knowledge and clinical skills. It also includes unlearning ! The word unlearning is important in the medical profession where yesterday's rights can be today's "not acceptables" and today's controversy could be tomorrow's gold standard.

**4. Ethics in research :** When you do a dissertation, let ethics be your one of the guiding principles. It includes choosing a topic based on your own thinking after going through literature and discussion with guide, following proper methodology, being ethical in choosing the patient or drug or equipment or in the

way study is conducted and data is analyzed. There is enough scope for being less than ethical at every stage. Particular attention should be given to avoid anything even remotely unethical. This is the main purpose of the need for ethical clearance. Same principles and guidelines hold good for the non-dissertation publication also.

- 5. Ethics in interpersonal relationship :** As a resident you interact with surgical colleagues, nursing and technical staff and other personnel in your team during your patient management. In all these interactions you have an ethical responsibility to be truthful, maintain confidentiality and share relevant information as required for patient management. Working against the patient's interest, breaching the trust that has been placed on you and working against interest of the institution are few ways in which ethics can be breached.

**Some examples of unethical practices and ethical dilemmas related to anaesthesia residents**

**Preoperative Phase**

1. Not obtaining consent
2. Non-disclosure of risks to the patient
3. \*Consent: content, language, patients' understanding and ability to take informed decisions, differently abled patients and unaccompanied trauma patient
4. \*Choice of technique: what is preferred by the patient may not be the best choice according to you or your faculty

*\*Represent ethical dilemma rather than unethical practices*

**Intraoperative Phase**

1. Being indifferent to patients' wishes and dignity during transfer to the theatre, positioning and exposure for application of monitors, surgical/anaesthetic procedures
2. Choosing a technique as per surgeon's advice for non- medical reasons
3. Blood or blood product transfusion simply because it has been arranged
4. Non arrangement of blood when there is a clear anticipation of significant blood loss during surgery
5. Starting the procedure without relevant investigations report being available
6. Performing a procedure which you are not familiar with or not authorized to do
7. Selecting a particular technique, type of anaesthetic, drug purely for the sake of "study" even when safer alternatives are available
8. Not being with patient continuously and not being vigilant

9. Failure to document properly, concealing information regarding failure, errors, complications
10. Failure to recognize life threatening complications/events and failure to call for help

**Postoperative phase**

1. Not handing over a patient properly as you are in a hurry to go
2. Leaving your patient in an unstable condition
3. Transfusing blood without checking the details of the blood

**Other examples**

1. Transferring a patient at risk of hypoxia without oxygen
2. Delay in starting a lifesaving treatment waiting for consent or for bill payment
3. Not responding to calls, especially emergency related
4. Physical relationship of any kind in workplace
5. Imposing personal beliefs and faith on others in the workplace
6. Failure to respect the privacy, dignity and self-respect of colleagues and team members.

**Key values in ethical practice**

1. Autonomy: Patients' right to determine their own healthcare
2. Justice: Distributing benefits and burdens of care across society
3. Beneficence: Doing good for the patient
4. Nonmalfeasance: Causing no harm to the patient

**Conclusion**

Each one of us is finally answerable to our own inner conscience. Concealing your wrong doings, active or passive, from public scrutiny may not be difficult. However, such acts are clearly unethical. Being ethical means being truly right. When you combine ethics and knowledge with professionalism also you become moving towards excellence. You will then become an asset to your institution, family and society and role model to your juniors and colleagues. *You will reach heights you never imagined.*

---

**Prof. (Dr) Raveendra Ubaradka S. & Prof. Sriganesh Kamath**

---

Think positive, be positive, speak positive & stay positive

## Chapter 14

# Research

### Publish or perish

#### Preamble

Residents are rarely attracted towards research. Preparing residents for research is an integral part of residency. It is mandatory to learn the basics of medical research, conduct at least one study and write a dissertation. What you learn now will benefit you lifelong. Remember that the safest drugs, sensitive and versatile monitors, specific and purpose made equipment, guidelines and protocols that ensure patient safety are all results of research. Basics and methodologies of research are discussed in this chapter.

#### 1. Importance of research

Importance of research in modern medical practice is almost self-explanatory (Fig. 1). Research is the foundation for evidence- based anaesthesia (EBA). Any treatment modality or drug or clinical decision that is not backed by evidence and solid data is not routinely accepted. EBA always takes precedence over any experience-based anaesthesia (ExBA). Experience based teaching or practice without evidence can be legally untenable. Hence, finally, a combination of EBA and ExBA provides the best

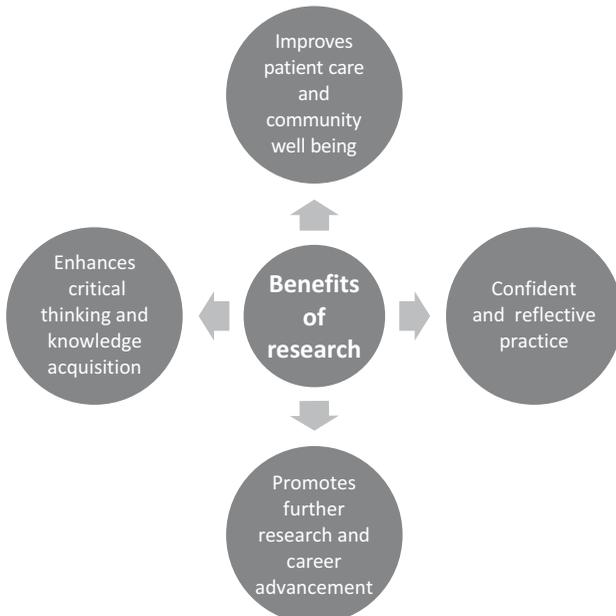


Figure 1 : Benefits of conducting the research

care to the patient.

## 2. Steps in conducting research

Scientific research is a planned, structured, and ethical procedure where established scientific methodology is followed meticulously.

1. Identify the area of interest and select the topic
2. Collect, evaluate and analyze existing information
3. Frame research questions : Aim and objectives
4. Set a relevant study design
5. Define study subjects/parameters: sample size, sampling technique, inclusion, and exclusion criteria
6. Finalize tools for data collection
7. Conducting the study
8. Collecting the data and analysis
9. Writing the study
10. Publication

### 2.1 Conceptualization of Research idea

This is the first step and has profound influence on further progress and outcome of research. Spend enough time, think, discuss with senior residents, faculty and your guide and go through literature. This helps you to conceptualize the idea with clarity.

### 2.2 Framing the research question

One of the keys for success of any research projects is an appropriately set research question which drives the subsequent process. Keep the following points in your mind,

1. What is the ultimate end point of study (Aim) ?
2. What are the objectives which are to be achieved to reach this end point?
3. Are the objectives specific? Can they be scientifically measured? Are they relevant ?
4. Are the objectives achievable within the time frame(feasibility)?

### 2.3 Selecting study design

The study design is purely based on the aim and objectives of the study (Table 1).

### 2.4 Defining the study subjects

Calculation of appropriate sample size is a very important aspect of the research. We need to recruit adequate number of study subjects to reach to a scientific decision. The sample size for any study has to be scientifically calculated through mathematical formulas or softwares.

Sample size is usually determined by the primary objective of the study. Thorough review of literature and small- scale pilot studies will also help us in determining the sample size. Please remember, sample size has to be calculated at the beginning of the study. Always consult a statistician before you decide on the number of subjects to be included in the study. Both large and small sample sizes have advantages and disadvantages (Table 2).

Decision 1	Am I observing the event or intervening in its progress	If observing the event	Observational study
		Intervening	Interventional or experimental study
Decision 2	If observing the event	Am I observing only one group of subjects with a specific health outcome or exposure	Descriptive study
		I am comparing the groups of individuals with or even or exposure	Analytical study
Decision 3	Observing only one group of subjects with a specific health outcome or exposure	I am observing the study subjects only once during study period and collect all the information related to exposure and outcome	Cross sectional study
		I am following the study subject over a period of time to look for the outcome	Longitudinal study
Decision 4	I am comparing the groups of individuals with or without exposure	I am comparing the group of subjects with the disease (cases) and group without disease (Control) and collect the data retrospectively	Case control study (Start with disease and go back in time to check exposures)
		I am comparing a group of subjects with exposure and without exposure, follow them prospectively to look for the health outcomes	Cohort study (start with exposure and end with disease/outcome)
Decision 5	Intervention	I am doing randomization to allocate the treatment / Intervention	Randomized control trial
		I am not assigning the study subjects to the treatment / intervention through randomization	Non randomized trials

Table 1 Selecting the study design

Table 2	Advantages	Disadvantages
	Large sample size	
	<ul style="list-style-type: none"> <li>Estimated characteristics of study group approaches that of population</li> <li>Provide better estimates</li> <li>More confidence level</li> <li>Smaller test errors</li> </ul>	<ul style="list-style-type: none"> <li>Expensive</li> <li>Loss of time</li> <li>Waste of manpower</li> <li>More support facilities</li> <li>Ethical issues</li> </ul>
	Small sample size	
	<ul style="list-style-type: none"> <li>Less expensive</li> <li>Less time consuming</li> <li>Man power and support facilities requirement are less</li> </ul>	<ul style="list-style-type: none"> <li>Unable to detect clinically important results</li> <li>Efforts may go waste</li> <li>Test errors will be more</li> </ul>

### 2.5 Sampling technique

We conduct studies on a sample of subjects and generalize the results to the population. For this to be effective sample size should be selected in a scientific manner. There are a series of probabilistic and non-probabilistic sampling techniques to achieve it.

Probability sampling techniques	Non probability sampling techniques:
Equal chance for everyone in the population to be a part of the study	Study subjects are selected based on a particular intention or convenience
Simple random sampling. E.g.: lottery method	Convenience sampling: subjects are selected based on the convenience of the researcher
Systematic random sampling: picking every Nth person in the population (like 5 <sup>th</sup> , 10 <sup>th</sup> 20 <sup>th</sup> etc)	Purposive sampling: Sampling based on the purpose of the study. E.g.: Antenatal women, children with hemoglobinopathies etc.
Stratified random sampling: Dividing the study population into several groups of similar character (strata) and selecting the required number of study subjects from each strata randomly	Snowball sampling: Study subjects are selected one after the other. Where the first person will help in finding out the second and second will help in finding third so on. E.g.: Selecting subjects with substance abuse, first enroll one candidate with substance abuse and collect information about others in his group, then reach out to them and collect information about their contacts.

### 2.6 Data collection

Developing the questionnaires and validating them are herculean tasks. Often the questionnaire or scales developed elsewhere may be used if it is modified to suit the local context. Utilizing the existing knowledge and research intelligently and appropriately is recommended. Blind adoption of someone else's work can be disastrous. Data collection depends on the nature of the study, sample size and feasibility. As far as possible it should be specific, reasonably elaborate, and relevant to the study objectives. It should neither be too extensive nor too short.

### 2.7 Data analysis and interpretation

This is a limiting factor in any research. There are many statistical softwares available; SPSS, SAS, STATA, Open Epi, Epi Info are some examples. Describing the results in a precise and uncomplicated manner is a skill you must learn by dedication and hard

work. Data should include tables and graphs. Make it as a habit to sit with statistician until you understand the "nitty-gritty" of the statistical analysis.

## 2.8 Publication

A research without publication is a waste of time and resources. This can be overcome by conceiving publication ideas at the early stages of research conceptualization. Scientific publications carry a lot of weightage for not only scientific advancement but professional and academic enrichment of the researcher. With new journals starting regularly and appearing on the public domain, you must carefully choose the journal. Seeking guidance from the faculty with good research experience is absolutely essential in this regard

## 3. Clinical Research

Clinical research is a domain which is carried out on human subjects (both healthy and sick). Ultimate objective is to provide a safe, effective and affordable medical care to maximum number patients. It is a highly structured form of research which demands precise study protocol and meticulous research conduct. Clinical research also focuses on improving the quality of care and patient outcomes.

As far as anaesthesia is concerned the research areas can be related to preoperative assessment, premedication, optimization, contribution of comorbidity towards choice of techniques and outcome, perioperative phase (process, drugs, techniques, and devices) and postoperative phases. Other areas can include validation of hypothesis, guidelines, controversies, outcomes (short and long term) including effect on cognitive function, mechanisms of anaesthesia and pain. Pharmacogenetics and effect of anaesthetics at cellular level are other interesting areas of research.

**Advantages and scope:** Evidence based clinical findings are accepted as gold standard and are of immense clinical and medicolegal values. Also, clinical research is often directly linked to patient care. Clinical research encourages you to think, analyze and think differently, increasing your observational powers. In the process of research, you may find answers to existing unresolved clinical issues, or you may come up with fresh questions. Your observations or solutions can be the stimulus for further research or can be a path breaking finding as well. Anaesthesiology has no dearth of issues where research is the need of the hour.

**Disadvantages and limitations :** Clinical research is time consuming and resource intensive. Scope for unethical practices or ethical dilemmas can prop up during the process. When comparing drugs or equipment, patients can be subjected to unintended harm even when you take precautions and adhere to established guidelines. Overall, it requires meticulous planning, literature review, execution, extensive study on your part and guidance from the faculty to bring out the best

research abilities in you. Lastly, some of the clinical trails can not be carried out in humans without establishing their safety with animal studies.

#### 4. Basic statistics : Not a choice, but a minimum requirement for residents.

Often you develop a sort of aversion or “allergy” for biostatistics believing that only clinical work and theory knowledge are really worth the effort. You fail to realize the importance of learning the basics of statistics which will be useful throughout their professional life. Also, it is perceived that statistics means numbers, complicated formulae, annotations, theorem, graphs, figures etc. The fact is that, as doctors we may not need not know in depth about these, but it is essential to understand the interpretation of the numbers and values which come out of these formulae.

As residents, you need to know,

1. Type of data you are dealing with; qualitative or quantitative.
2. Summarizing data: Is it in terms of percentages, mean (average), median (the middle value) or mode (most frequent observation). The last three measures are known as measures of central tendency.
3. If it is a mean, how are the other variables dispersed around the mean? This is understood by the term standard deviation and mean deviation which together are known as measures of dispersion.
4. Check whether there is a need to apply any test of significance. These are the tests applied to check whether there is association between variables (chi square test), difference in mean values between two or more groups, (unpaired t test, paired t test and ANOVA), correlation between two variables (Pearson's or Spearman's correlation) etc. These tests will give the 'p' value which is a measure of statistical significance.
5. Sometimes, we may need to apply much advanced statistical tests like regression, survival analysis, ROC curve, factor analysis, Cohen's kappa, reliability analysis etc.

#### 5. Conclusion

Learning research methodology opens new avenues for you in your future career. It is only through high quality research; we get answers for many unresolved questions and evidence for different aspects of clinical care.

---

**Prof. Praveen Kulkarni**

---

If you do not know what you are doing and how well you are doing it, you have no right to be doing it at all.

*Prof. Sir Bruce, National Health Service, Medical Director*

## Chapter 15

# Facing Examination

## Prepare and perform

### Preamble

Residents' opinions and fears regarding examination vary. Often, it is seen as a hurdle between them and the freedom to practice the profession. Facing the exam for some can be more stressful than managing a complex patient undergoing a major procedure! Exam fear grips the candidates months before the scheduled time along with doubts, rumours, anxiety, and apprehension. This chapter helps you to face the exam better, with a positive approach.

### How to manage exam preparation, overcome phobia and anxiety?

1. Remember that exam preparation starts the day you join the specialty. It is an "ordeal" which you must go through. But you can make it manageable by optimally utilizing the stress-free period of the training (initial 2 and 1/2 years). What you learn during this period will be absorbed, assimilated, and retained better resulting in a "knowledge pool". The knowledge that is required for exam should come from this. Larger the "pool", easier for you to go through examination.
2. Make your learning and process of training systematic, organize your work and studies. Always try to connect your academic and clinical learning and experiences. This automatically results in comprehensive understanding of the patient management. Do read only standard textbooks and journals. Standard books initially appear exhaustive and extensive. But that is how you should study during residency. You should not be "intimidated" by the size or new terminologies. Rest assured, once you start reading, you will get a hang of the subject and learn to assimilate the most important points in each topic. Let the main source of all your knowledge be the latest editions of standard textbooks.
3. From the beginning, keep collecting old question papers of different universities and institutions. At regular intervals, check what questions have been asked from the topics which you have studied. Also, look at the way the questions have been framed. Next, consider how much you know the answers. During your regular as well as special classes, participate in discussion. Maintain your learning/study material from the beginning of your course in a systematic manner so that you can retrieve the required information.
4. Change your method of study 6 months before exams. You can study alone or do combined studies, depending on your preference. Also, make it a point to regularly have informal discussion with your batchmates and seniors. Lastly, teaching juniors and discussion with faculty whom you feel comfortable with, will further enhance

your knowledge and boost confidence.

### Learn to write a good theory paper

The theory paper must reflect the knowledge assimilated during your residency in a crisp, clear and attractive manner. Few general tips are listed in the box below (for the final examination).

- Eat moderately and avoid alcohol and excessive coffee or tea on the previous night
- Take rest and sleep well
- Avoid studying into the last minute, just try to recollect or simply relax
- Check stationary
- Carry medications if you are on and you might need
- Arrive early and maintain a calm attitude

### Once you are in the examination hall,

The time just before you begin your exams could be used to recollect your knowledge. This is the time you must remain calm and confident.

- First five minutes is for letting your pulse rate settle down. Exams are a test of knowledge accumulated over a long period. Prior hard work makes writing an exam a pleasure!
- Make sure it is the correct question paper and then go through it completely
- Calculate the time to each question based on the marks allotted. Budgeting time wisely helps.
- The first page must give the impression of a neat and confident individual. No additional marks will be given for any display of tribute to Gods, Goddesses, or parents!
- Be legible. If you cannot devote time for a neat and easily readable paper, then obviously your examiner will not try to understand what is written. Remember, the examiner may be correcting sixty papers that day. His patience will certainly not be at its best!
- Random pattern of answering without correct numbering confuses the examiner and makes his job difficult. Answering the questions in an orderly, organized, and planned manner gives a good impression. However, if you do wish to write the best answers first, do number them correctly.
- Leave ample space between two answers. It is not a bad idea to use a fresh sheet for a new answer. The wandering mind will need space and a chance to add and improve answers during the allotted time frame.
- Do not expect to know perfect answers for all questions. Examiners also

understand that some questions can be tough.

- Move on. Getting stuck on hard ones wastes time, builds frustration, and blocks free flow of recall. You may return to it if time permits.
- It makes less sense to fill up four pages for a short note and only a half-page for a long essay. The baseline is to get 50% for each answer. Do not assume that one 70% will compensate for another 30%.
- Get to the point immediately. Avoid frills and gimmicks to fill in this space. This will be easily recognised and penalized. It makes for a better reading if you write in points instead of paragraphs of flowery, sweet nothings.
- Classifications, headings, sub-headings, flow charts, algorithms, labelled diagrams, underlines, colourings and highlighting help draw the examiner's attention to crux of matter.
- Clinical essays may be best answered sequentially using a format of definition, description, significance, aetiology, pathophysiology, clinical features, pre anaesthetic evaluation, investigation, treatment modality, anaesthetic management, perioperative complications and their management followed by post-operative issues and pain management. Enumerate points specific to the question.
- Polish. Little things matter! Spellings, neatness, grammar and handwriting need attention. Worst of academic writing is opaque phrases full off meaningless jargon. Be confident of what you have answered and spare time for a quick review to finish.
- Attempt every question. Put in some relevant points if time is running out. They will earn you marks.
- Running out of time? List what you want to convey in points. Let examiner know what you planned to write. Ignore what others are doing. Focus on your own pace and work. Stay for the whole exam. Walking away half an hour early may rob you of a few gems of knowledge that could have fetched you more marks, had you jotted it down in the paper.

### **Practical exams- put your best foot forward**

- Be calm. Be systematic. Think positively. Talk positively. Use breathing and visualization techniques to feel positive. Envision a positive result.
- Make sure you are presentable, looking neat, and confident. Your apron should have been kept ready and your roll number prominently displayed. Accessories required should accompany you.
- Practice what you are likely to speak once you are allotted your cases and are aware of the system you would be examining. ( RS, CVS, etc. )
- Be courteous with your patient and ask his/her permission to proceed with history taking and physical examination. It helps to earn your patient's good will.

- You would be familiar with the pattern of exams i.e., longcases, short cases, viva voce, with respect to equipment, instruments, X Rays, drugs, ECG, capnography, ABGs, etc. You should have prepared well for each of these individual components of the practicals.
- Long cases generally are allotted system-wise, i.e., respiratory, cardiovascular, cerebrovascular, hepatic, renal, and endocrine. Airway and obesity may be standalone cases, or a part of the major systems just mentioned. Similarly, for Obstetrics, paediatrics, orthopaedics, and burns cases. Be prepared for long or short cases pertaining to all the above, in various combinations and permutations as deemed by your examiners.
- History taking must include positive and negative history as they are equally important for you to reach the proper diagnosis. Chronological arrangement of history and clinical presentation will take you in a step wise, organized manner towards your provisional and differential diagnoses.
- Your answers should be loud, clear, and complete; don't wait for prompting from the examiners as this cuts marks. Look at all four examiners when you talk.
- List the required investigations and their reference range in your answer paper for a quick reference during discretion. As far as possible, do not read out from your answer sheet.
- Examiners often provide clues. You need to be alert and pick them up for good answers. On the other hand, you may want to give them clues on the topics you may be good at. Remember, no examiner comes with the intention to harm you. It is not difficult to pass your practicals if you have been consistent during your class discussions or table discussions as a postgraduate student.
- You may disagree on a point, with your examiner, but do not argue or appear rude. You may end up creating a negative opinion about yourself. If you are unsure of an answer, convey it to your examiners and allow them to move on.
- Be prepared with a favourite drug or equipment. Sometimes the examiners may ask you to pick up something of your choice and talk about it. But remember, when you choose something of your choice, you are expected to know almost everything related to the drug or equipment you selected.
- You may be familiar with capnography, ECG, ABG charts, and Xrays which are routinely kept during exams. An occasional examiner may write a fresh ABG for you to comment on or show an ECG or an X Ray on a smart phone and ask you to comment on it. It helps to be well versed with the basics of these investigations so that you are comfortable answering them. Remember, once you pass out you are expected to be familiar with all the above, because your knowledge will guide your safe practice as a consultant.

- Most colleges or universities conduct pedagogy as a part of the practical exams. The topic will be given the previous day, or a few hours earlier. Pedagogy assesses your teaching skills. Prepare for your topic to be able to talk about it for about 10 minutes. Present your topic in a clear and crisp way.
- If you are given an equipment during viva, go straight on to talking about it instead of pretending to examine it in detail, wasting time.

Examination is the occasion wherein all the cumulative good will you have developed during your past 3 years of interactions with staff, will come in handy. With good interpersonal skills, and cordial relationships with your internal staff, not necessarily with only the senior staff, may bail you out of trouble. At times when your performance is suboptimal, the external examiners might want to hear from your teachers about your overall performance in the past years. If you have been shirking responsibility and have proved unsafe for your patients, the reviews you get may go against you. It pays to give your best in each day's performance as a resident. External examiners usually believe the internal examiners in these instances, keeping in view, the general patient safety, and future employability of the student; and the important fact that an anaesthesiologist is born the day he passes his exams. He/she gets the licence to practice independently. No examiner would want to be responsible in passing a student who is unsafe to his patients.

### Conclusion

Examination is the culmination of your three years of hard work, sleepless nights, stressful anaesthetic management, tense moments in OT and class, so on and so forth. Put all the resources at your disposal, your cognitive abilities, knowledge, and intelligence sharply focused like a laser and prepare and face examination. Surely, success will be yours. The so-called proverbial luck will smile on those who have worked hard. As Spock says, "Trust yourself, you know more than you think you do." All the best for your exams!

---

**Prof. (Dr) Nalini Kotekar**

---

"Doing the best at this some moment puts you in a best place for the next moment"

*Oprah Winfrey*

Wake-Up Call: 'Commitment Will Always Beat Out Talent'

Chapter 16

# Towards Excellence

## Bring out the best in you

### Preamble

Survival is the lowest level of professional existence. Hence, your goal should be to achieve excellence. Excellence is not a single objective nor a static point. As Aristotle famously said, “we are what we repeatedly do. Excellence, then, is not an act, but a habit”. It is a state in which you, by training, professional abilities, social responsibility, and inherent and cultivated personality traits, can give the best care to your patients and the community. Excellence represents something which is of highest quality at any given point of time.

In the previous chapters tips for survival were discussed. Excellence is the progress of the same habits and characters with additional attributes. Excellence is simply not equivalent to having great skills nor having extraordinary knowledge of the subject. An apparently average resident can also excel. Excellence is not achieved overnight or within few months. During residency you sow the seeds of excellence.

Habits you inculcate, values you imbibe and exhibit and practices you cultivate during the residency are going to be there for ever in your life. More positive and constructive they are, higher the quality of your professional and personal life.

Excellence in anaesthesia shares several qualities of excellence as a human in general. Change your attitude from “survival in anaesthesia” to “excel in anaesthesia”. Road to excellence can be construed as a 3 steps ladder: Skills and knowledge, professionalism, and excellence. (Figure 16.1).



Figure 16.1: The journey from “survival to excellence”

### Professionalism

Developing a professional behaviour boots your confidence and performance and gets you respect and love from others. Your patient care also improves and stress level decreases. Further, you will be able to analyse complicated clinical scenarios

confidently and scientifically. In addition to personal growth, you start influencing those around you to perform better.

### Professionalism, from residents' perspective

1. Punctuality & taking responsibility
2. Preparing a plan for every anaesthetic management
3. Maintaining calm and composed attitude, especially in stressful situation
4. Use of scientific terminologies in patient related communications
5. Following the rules and regulations in letter and spirit
6. Understanding your limitations
7. Calling for help
8. Valuing other's opinions
9. Honest and truthful documentation
10. Performance beyond the minimum requirements and standards
11. Preferring discussion over argument
12. Responding, not reacting to a situation & courteous behaviour with all

### Excellence

As a professional, you excel when you go beyond the minimum call of duties, balance the professional life with personal and social spheres, demonstrate leadership qualities, especially during critical periods of training.

### Excellence, from Residents' perspective

1. Always ahead of time, works well beyond working hours when required
2. Helps other residents or faculty whenever required
3. Shows leadership qualities: honesty, integrity, ability
4. Polite, genuine, compassionate, honest, and hard working
5. Volunteers for additional responsibilities as and when required
6. Does not claim for credit to everything or every time
7. Demonstrates empathy, and always keeps patients' interests above self
8. Shows signs of maturity and wisdom in day-to-day interactions
9. Sensitive to others' problem and can understand the from their point of view
10. Shows the attitude of lifelong learning
11. Constantly reviews his/her performance and takes corrective measures
12. Interested in welfare of co residents and juniors as well
13. Meticulous documentation of patient management
14. Committed to the larger picture of respect, welfare and upliftment of the profession

Being a doctor, your work should not be mechanical and only rule based. There is a significant difference between the professionals dealing with non-living things and those who treat fellow human beings. This should be understood and reflected in your

behaviour and work. Change your outlook, consider residency as the beginning of your journey towards excellence. Then your whole experience changes for the better.

Prepare a vision document for your goals in life, that is excellence in profession and personal life. Of course, excellence only in any one of them with the other one going haywire is no excellence at all. In addition to the tips and other advice described elsewhere in this book, following some more principles will make your journey easier.

1. Remember that every day you spend in training is unique and non-recurring. It will never come back. Do not waste your time and energy on things which do not matter, or which can create a cycle of negativity.
2. Planning for the day in the morning, implementing the same in your work and reviewing the day's performance and experiences at night is a good way to organize.
3. Develop your own method of studying and organizing the information, materials, academic resources and follow them meticulously.
4. Documentation: A key word in profession. It includes patient records, work diary and logbook. Convert the work diary into a storehouse of information, experiences, and observations of your own. I am sure, you would have enough materials to publish a book by the end of three years. No one has ever written such a book and if any of the readers of this book gets inspired to do so it would be wonderful.
5. Attend and participate in academic forums and meetings other than your mandatory classes. When you do something without compulsion, your ability to listen and remember is much more. Any additional knowledge gained can come in handy at unexpected times.
6. Excellence is a dynamic concept. Competence is a prerequisite for excellence, but not sufficient. Beyond knowledge and skills, the behaviour and attitudes determine the pursuit of aiming higher and progressing in the journey towards achieving excellence.

### **Unprofessional behaviour**

While discussing about professionalism it is very important to know what is clearly considered as unprofessional. Many of them could be unethical and immoral also. avoid them consciously. Like excellence, seeds of unprofessional behaviour are also sown during residency and if that happens, you will find yourself gradually in wrong company and progressively slip into ignobility and disrepute. A list of unprofessional behavior<sup>3</sup> is shown in the box below. Unless you consciously and continuously watch yourself, you can be unwittingly on the wrong side of professional ethics even without your knowledge.

### Examples of unprofessional behaviour

1. Abuse of authority, bullying, harassment
2. Bias and discrimination based on personal, cultural, religious, and economic reasons
3. Sexual harassment
4. Arrogance and abusive nature
5. Dishonesty and lying, copying in examinations
6. Disregard to protocols, rules, and regulations
7. Disregard to patients needs and requirements
8. Fraud
9. Frequent conflicts with co-residents, surgical colleagues, and other staff
10. Distractions during work with the mobile, social media, unwanted chatting, etc

### Conclusion

Excellence can be acquired by anyone who aspires and works for it. It represents overall progress and performance both personally and professionally. Beneficiaries of your excellence include your patients, teachers, society, community, your institution and the mankind at large. Every resident must read David Chestnut's article included in the references to understand the importance of professionalism and excellence.

---

**Prof. (Dr) Raveendra Ubaradka S.**

---

Make excellence your stated goal and don't settle for anything less. Personal attributes, clinical skills and soft skills, knowledge and sociocultural behavior are the domains you need to consider carefully and assess yourself on what you need to correct/change/improve in each domain.

Once you make a vision document for excellence, assiduously work for that undeterred by any temporary setbacks. Once you start working for excellence with a laser-like focus, you will be surprised how you attract and internalize multiple virtues like honesty, integrity, sincerity, compassion, altruism, empathy etc, even without any extra effort. That is the power of your commitment to excellence.

Once you are on the path of excellence, you start enjoying every day of your residency. Your patients will receive truly high-level care, you need less supervision and finally you will just walk through the examination. Well, that also will be the beginning of an extraordinary professional career further ahead.

Successful people do what unsuccessful people are not willing to do. Don't wish it were easier, wish you were better.

*Jim Rohn*

Chapter 17

## Beyond Residency Opportunities galore

### Preamble

Obtaining MD/DNB is undoubtedly a phenomenal achievement. Once qualified, you often feel competent to anaesthetize any patient. However, in present day competitive life with explosion of knowledge and rapid advances in the specialty, there is still a lot left to achieve/learn after MD/DNB.

### Options after MD / DNB

You will be “bombarded” with umpteen options, and often start receiving calls from prospective employers. That is the problem too! If you don't have a clear plan for your future especially for the initial few years after the MD/DNB, there is every chance that 10years later you will be nowhere and still searching for your options.

### Factors to consider while deciding about future course after MD/DNB

1. **Attitude, aptitude, and interest:** They should be matching with what you want to specialize further! If you want to consider paediatric anaesthesia as your future, then you must be comfortable in dealing with young children, have lots of patience to deal with parents, crying child, manage the venous access, etc. This is just one example. Introspect what special attributes you must possess to take up a particular specialization in anaesthesia.
2. **Stress management abilities:** Areas like critical care, cardiac anaesthesia are probably more stressful due to the inherent nature of the specialty, high risk patients, teamwork, prolonged hours of duty etc. These could lead to rapid burn out and lead to frustrations as years pass on. However, if you have a strong passion for any of them, then it is for you to choose the same. When you learn and subsequently practice something which you enjoy doing, stress and burn out become less important and manageable.
3. **Personal considerations ;** likely workplace in future, specialty of spouse, financial commitment and health issues should be considered. This aspect is no less important than others. When you stay for more than a few years in a place as a professional, you imbibe the local culture and become a part of that place. You can bring in many positive changes in the medical practice or even in the society.
4. **Long term vision:** Probably the most important. Visualize what you would like to be in 10, 20 and 30 years from now. Split the long-term goals into short term plans of 4 to 5 years. Do not hesitate to set higher goals if you are prepared to work for the same. You can assume that on an average you will have 3 decades of active

professional life.

Choose an option you feel suits you best (fig. 17.1). Earlier you take this important decision and work accordingly, more likely you will achieve something substantial and significant at a relatively younger age or early in profession.

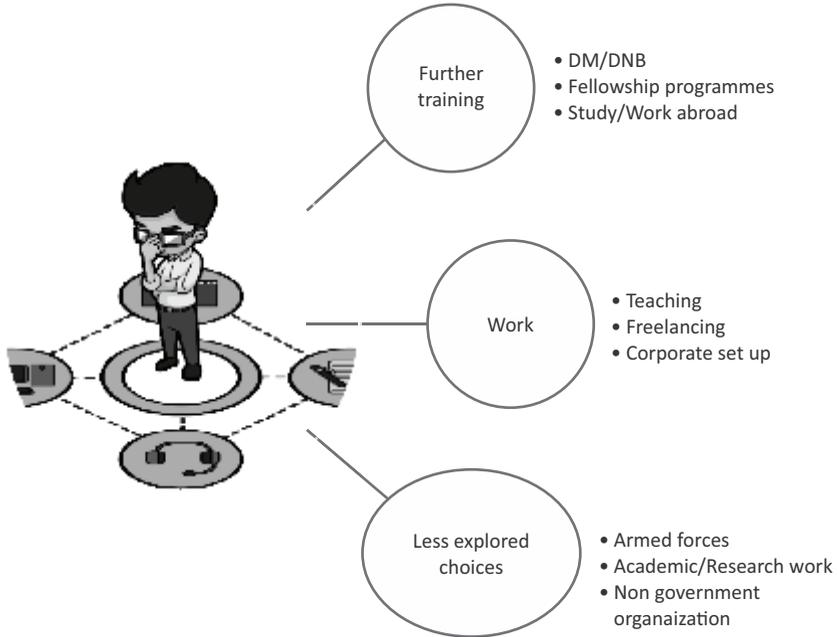


Figure 17.1 options after Anaesthesia Residency

### Option 1

**Further training :** One-year fellowship or 3year DM/DNB/FNB (Fellow of National Board). Fellowships of one year are available in regional anaesthesia, pain and palliative care, paediatric anaesthesia and cardiac and neuroanaesthesia. 3year DM or DNB are available in critical care, cardiac and neuroanaesthesia. These options keep increasing, with more and more subspecialties being created . If you join critical care, especially 3-year course, it almost certain that you will be changing into an altogether different specialty. This would be a good option considering the changing scenario and future trends, if you have serious interest and endurance to withstand the physical and emotional stress.

### Option 2

**Academic career :** Join an academic set-up as senior resident in a teaching institution with several subsequent options 1) progress in academic field with a long term plan in

which you can choose few areas of anaesthesia to master, with or without fellowship 2) undergo further training in specialized area after a year or so, as fellowship or 3 year course after which pursue the same subspecialty or return to academic 3) continue in academics without fellowships, but strengthen your weak areas and focus on teaching and research. If you have an aptitude for teaching, academic career is something worth pursuing. Every profession needs grate teachers.

### Option 3

**Private practice** : Start freelancing, something unique to our country. If you plan to enter this domain, remember that it is a different game altogether which requires very strong commitment, lots of patience with significant limitations on your personal freedom. You can start this after a stint as senior resident or one-year fellowship, and it will add to your competence and professional capabilities.

### Options 4

**Corporate hospitals** : Enter the “corporate world” as a junior consultant or whatever designation applicable, again, either directly after MD or after fellowship. Here usually you will be working in a well-equipped and disciplined set up, but not without stress of its own. It is good to discuss with at least two senior colleagues who are working in similar set ups about the plan.

### Option 5

**Study/work abroad** : Plan for fellowship exams in UK or other western countries. If going abroad is your option, begin early, and try to incorporate the appropriate additional curriculum into your regular studies for MD or at least commit to prepare and clear examinations like FRCA with your full might immediately after MD. The advantage would be that once your fellowship from Royal College, UK, is completed, you would be more confident and will be welcomed all over the world with huge incentives and perks.

### Option 6

There are few “less explored” options also. You can consider them if it suits you. They include a) joining armed forces and working in battlefields and conflict zones rendering anaesthesia services, b) working with international nongovernmental organizations like “ Doctors without Borders” c) specializing in “nascent” areas like ambulatory anaesthesia, bariatric anaesthesia, maxillofacial anaesthesia, sedation, high altitude anaesthesia etc and getting involved in the development of the subspecialty, d) change over to emergency medicine, f) disaster management and g) pursuing a career in research related fields.

### Conclusion

At present, for a knowledgeable and qualified resident with a good aptitude, the

problem is that of plenty rather than scarcity of opportunities. It is up to you to develop and transform yourself into an “employable” personality, by qualification, specialization, professionalism, excellence and commitment. Go out, conquer the world.

**Good Luck**

---

**Prof. (Dr) Raveendra Ubaradka S.**

---

A good curriculum vitae is an important introduction about yourself when you qualify and apply for a job and even for further studies. If you have worked hard and sincerely during residency, you will have enough achievements to include. A good dissertation topic which is worth publishing, one or two additional publications, few conference presentations, successful completion of ACLS, PALS and other short duration training courses if any, participation in department activities, participation in social activities etc are some of the achievements which add value to your CV. Good reference letters from your teachers carry a lot of weightage.

In corporate jobs and especially in opportunities abroad, your personal qualities and references matter a lot. You need to cultivate sincerity, commitment, loyalty, communication and team spirit during residency itself, so that they become part of your personality trait.

Academic career needs extraordinary commitment to be able to achieve excellence and thereby create a legacy of your own in the long run. Remember that life never stops teaching you and you never should stop learning. There is a dearth of high quality research in India and the current and future generations of residents have the responsibility to fill in this void.

Follow your heart. Not everything ought to have some meaning. Listen to only those who you know and trust. In the vain attempt to please everyone, you will end up being no one and getting nowhere. Do not be carried away in the donkey's world; you can have your own. Whether you want to ride the donkey, make it work or sell it - you decide. It is your donkey, your world.

"To be continuously successful one has to believe in the concept of consistent reinvention. To reinvent yourself take risk in trying something completely new in the way you think, work & live so that life remains exciting, fulfilling & remains fresh."

## Chapter 18

## Learning Resources Should be authentic and reliable

### Preamble

Use of appropriate learning resources is one of the keys to success during residency. Thanks to internet and medical education websites, plenty of information, not necessarily knowledge, is available at the click of mouse. Unfortunately, their authenticity cannot be always confirmed. If you have a habit of obtaining information or answers to the questions from these open sources, then it can be only a temporary, "easy-to-fix" kind of solution without being useful in a way it should be. It's just another short cut approach to an otherwise hard task of acquiring long lasting true knowledge.

Other short cuts which residents' resort to are, using seniors' notes, notes from other colleges, handbooks, and guides. Further, when the textbooks are referred to, the preferred ones are small (in size and shallow in content) and apparently easy to read. They are more like handbooks. These comments are not to ridicule those sources, but to highlight the situation and to stress the fact that they are not enough for a resident. Result is a vicious cycle of progressive reduction of knowledge (its width and depth) with each transfer from one senior to junior.

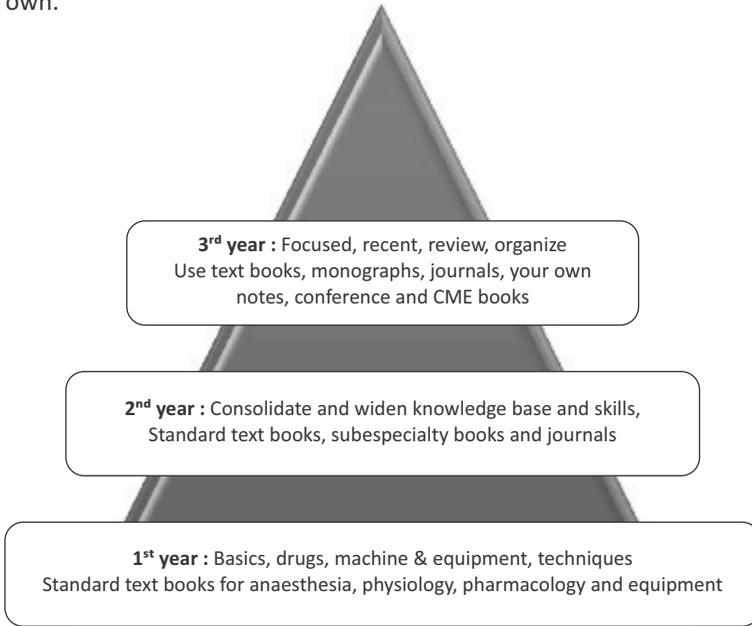
Assume that the required knowledge level is 100%. If you read standard textbooks, you might be able to acquire about 70% of what is required (100%), at the best. Out of that you might be able to share and teach others a maximum of 70% (which becomes about 40% of the maximum possible knowledge). Thus, it progressively goes down, unless the learner at every level makes his/her own efforts to learn.

Alternately, when you study from small handbooks or notes imagine the starting level of knowledge! That itself will be 60% instead of 100%. I hope residents appreciate this example with the seriousness it deserves. One of the sacred responsibilities for having been selected for specialization is that you must acquire the required knowledge, improve and refine it with your own experience and thoughts and finally you should pass it on to the next generation.

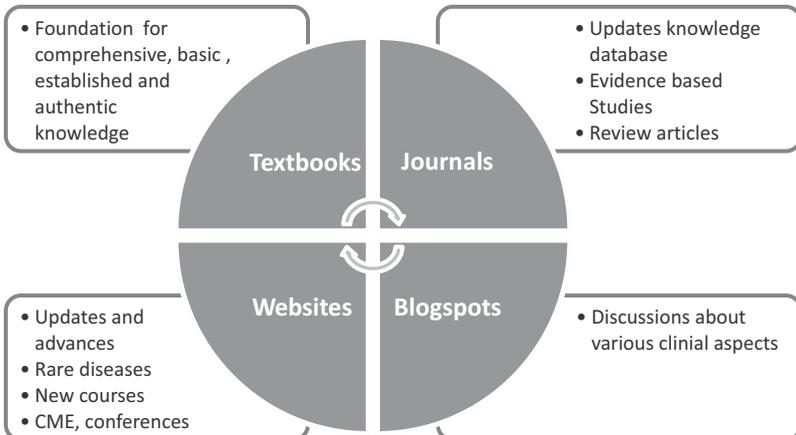
### Learning resources at different phases of residency

First year should be dedicated to learn "something of everything" to acquire a comprehensive knowledge of the basics of anaesthesia, anaesthetic and emergency drugs, anaesthesia machine, equipment and techniques like regional techniques and general anaesthesia. Second year is the time to consolidate and build up on the knowledge and skills acquired in first year. It is the time to escalate to subspecialty

textbooks and gain in depth knowledge about various branches such as cardiac anaesthesia, neuroanaesthesia, obstetric and paediatric anaesthesia, pain medicine, critical care and so on. A third-year resident should start revising and updating the knowledge base by referring to latest journals and recent advances. By the time you go for the examination, you must have a knowledge which should have some originality of your own.



### Various learning resources



### Guidelines for use of resources

1. You must begin with learning the basic principles and “scientific foundations” (this is also the title of one of the anaesthesia books ) of anaesthesia, then progressing to clinical topics with applied knowledge of other subjects, recent advances, equipment, monitoring and controversial areas where there is no clarity or consensus.
2. Use only authentic resources, authenticity recommended and suggested by your teachers, seniors and standard like textbooks. Use a combination of resources and change the pattern of resources as you gain more knowledge.
3. By using multiple resources, you should be able to develop your own clear concept and knowledge about any topic. Also, regarding controversial topics, you will be able to understand the different perspectives from different sources.
4. Resources are the universally accepted standard anaesthesia textbooks, subspecialty textbooks, textbooks for different aspects of anaesthesia, handbooks, manuals, journals, annual reviews, abstracts of conference presentations, CME books, pocket guides, websites of various anaesthesia professional bodies, training websites, online tutorials etc.
5. Others include the learning materials available in the department, regular classes, discussions, and handouts prepared in the class.

### Textbooks

#### 1. **Miller's Anesthesia**

Popularly considered as the "Bible of Anaesthesia". It is the most authentic & authoritative textbook in anaesthesiology. It has got the worldwide acceptance & is one of the most referred books. The book is revised every 5 years and latest is 9<sup>th</sup> edition. It may look difficult initially, but it is worth the effort. Use it from the beginning so that within a month or two you become familiar with the book. Ensure that you have covered all the chapters, by the time you complete the second phase (24months) of your training.

#### 2. **Wylie & Churchill Davidson's - A Practice of Anesthesia**

This book is an " old friend to many anesthetists across the globe". It provides all the information relevant to the residents during their training period & also the consultants to use after training. Provides both the basic science & the modern anaesthetic practice up to date in a comprehensive manner. Currently 7th edition is the latest one.

#### 3. **Clinical Anesthesia by Paul G Barash and Bruce F. Cullen**

In its 8th edition, purchase of this book gives access to image bank and to podcasts.

#### 4. **Morgan & Mikhail's Clinical Anesthesiology**:This book is clinically oriented,

concise & easy to read with key points given & ends with the case discussion.

### Books for subspecialties

Subspecialty	Title	Latest Edition
Cardiac anaesthesia	Kaplan's Cardiac anaesthesia	Seventh
Thoracic anaesthesia	Thoracic Anaesthesia by Joel Kaplan	Third
Neuroanaesthesia	Cottrell and Patel's Neuroanaesthesia	Sixth
Regional anaesthesia	Hadzic's textbook of Regional Anaesthesia and acute pain management	Second
Pain management	Acute Pain Management by Pamela E Macintyre and Stephan A Schug	Fifth
Pain management	Bonica's Management of Pain	Fifth
Obstetric anaesthesia	Chestnut's Obstetric Anaesthesia Principles and Practice	Sixth
Pediatric Anaesthesia	Gregory's Pediatric Anaesthesia Smith's Anaesthesia for Infants and Children	Sixth Ninth
Anaesthesia Equipment	Understanding Anaesthesia Equipment (Dorsch and Dorsch) Ward's Anaesthetic Equipment	Fifth Sixth
Anaesthetic Pharmacology	Stoelting's Pharmacology and Physiology in Anesthetic Practice	Fifth
Airway Management	The Airway Manual  Airway Management (Rashid M Khan) Benumof and Hagberg's Airway Management (text book)	Latest 2022 (under publication) Seventh Fourth
ICU	Textbook of Critical Care (Shoemaker) Civetta, Taylor & Kirby's Critical Care Medicine Irwin and Rippe's Intensive Care Medicine	Fifth Fifth Eighth
Emergency medicine	Tintinalli's Emergency Medicine'	Ninth
Complications and Management	Complications in Anaesthesia (Lee Fleisher) Complications in Anaesthesia (John Atlee)	Third Second

*\*There may be slight changes in the editions and titles*

## Journals

1. ***Acta Anaesthesiologica Scandinavica*** - It is the official publication of the Scandinavian Society of Anaesthesiology and Intensive Care Medicine. It has an international reputation for publishing high quality academic and clinical material attracting global readership.
2. ***Airway***: is the official journal of All India Difficult Airway Association (AIDAA). It is first of its kind in the world catering to topics related exclusively to airway management and research related to airway. It is published quarterly and is the official journal of All India Difficult Airway Association (AIDAA).
3. ***Anaesthesia*** : 70-year-old, official journal of Association of Anaesthetists of Great Britain and Ireland with an international scope and comprehensive coverage. It publishes original, peer-reviewed articles on all aspects of general and regional anaesthesia, intensive care and pain therapy including research on equipment. Published monthly.
4. ***Anesthesia & Analgesia (A&A)*** : It is considered as global standard in anaesthesia. Started in 1922, (A&A) is the first anesthesia journal. It is published monthly and covers "anesthesia, pain management and perioperative management". It is the official journal of International Anesthesia Research Society (IARS). Infographics are both interesting and informative. *Anesth. Analg.* is the standard abbreviation.
5. ***Anesthesiology*** : Official journal of American Society of Anesthesiologists and was founded in 1940, to promote “ scientific discovery and knowledge in perioperative, critical care and pain medicine to advance patient care”. It has the highest impact factor among the various journals related to anaesthesia. It's every issue offers the readers attractive features of visual and video abstracts, podcasts, infographics and interviews with the authors. Reading select articles from this journal credits CME points to the readers (unverified).
6. ***Anesthesiology Clinics*** : Formerly called Anesthesiology Clinics of North America, this popular and reputed journal presents “procedurally focused articles that update you on the latest trends in patient management, keep you abreast of the newest advances, and provide a sound basis for choosing treatment options”.
7. ***ASA Refresher Courses in Anesthesiology*** - It is the largest selling annual publication in the field. Peer-reviewed lectures on topics of current clinical interest are selected from regional and national ASA Refresher Courses and are individually bound and printed as separate booklets.
8. ***British Journal of Anaesthesia (BJA)*** : it is one of the highly rated journals publishing original articles dealing with all the branches of anaesthesia. Founded in 1923, BJA is a published monthly and is the official journal of Royal

College of Anaesthetists, College of Anaesthesiologists of Ireland and Hong Kong College of Anaesthesiologists. It covers Anaesthesia, perioperative medicine, Pain and Intensive Care. BJA Education, sister journal of BJA was started in 2001 and since 2015 it is known as BJA Education for “improving patient care by supporting continuing professional development in anaesthesia, critical care medicine, pain and perioperative medicine”.

9. **Canadian Journal of Anesthesia (CJA)** - An international peer reviewed journal giving readers access to basic and high-profile clinical research and latest advances in anesthesia. Its mission statement is “Excellence in research and knowledge translation in anesthesia, pain, perioperative medicine and critical care”. Published monthly, started in 1954 and is owned by Canadian Anesthesiologists' Society.
10. **European Journal of Anaesthesiology (EJA)** - publishes original work of high scientific quality amongst which preference is given to experimental work & clinical observation in human beings.
11. **Indian Journal of Anaesthesia (IJA)** Peer reviewed, open access, official scientific journal of Indian Society of Anaesthesiologists and is published monthly.
12. **International Journal of Obstetric Anaesthesia** It is the only journal dedicated exclusively to obstetric anaesthesia and covers three main aspects, namely anaesthesia care for operative delivery and the perioperative period, pain relief in labour and care of the critically ill obstetric patients.
13. **Journal of Anaesthesiology** Clinical Pharmacology (JACP) This is a quarterly peer-reviewed open access international journal published by the Research Society of Anaesthesiology Clinical Pharmacology. This is another Indian journal with international repute for publishing standard articles.
14. **Journal of critical care** -This is the official publication of the World Federation of Societies of Intensive and Critical Care Medicine (WFSICCM) and the Society for Complex Acute Illness (SCAI). It is dedicated to publishing new and updated information which can be incorporated into clinical practice.
15. **Paediatric Anesthesia** - A dedicated journal of pediatric anesthesia, it focuses on science and clinical practice of paediatric anesthesia, pain management and peri-operative medicine.
16. **Survey of Anesthesiology** - An authoritative source of information on advances in the science and practice of anesthesiology as reported throughout the world literature. It brings forth bimonthly issue containing several condensed articles covering a wide variety of topics related to anesthesia.
17. **The Journal of Pain** - It is a dedicated pain journal covering all aspects of pain,

including clinical and basic research, patient care, education, and health policy.

### **Journals as learning resources**

Journals, when utilized optimally and regularly, help you to understand different aspects of academics: the progress, history, studies, anecdotes, debates, from past through present to future. Unfortunately, majority of residents go through the journals only for review articles selected for the classes or journal clubs and for dissertation references.

### **How to use journals?**

1. Your first encounter could be when you need to search for articles for your dissertation topic selection. Know all names of important journals related to anaesthesia in the first couple of months and add more to the list as you move on. It is important to know the exact spelling of the journal title and short form.
2. Whenever you present a topic, after your reading from the textbooks, go through the journals for a) historical articles, especially if the topic is related to any landmark discovery b) its status and controversies c) related review articles, directly or indirectly and d) recent advances. Include at least 2 references published in journals within the last 2 years for your presentation.
3. "Scan" through the standard journals at least once in a fortnight, preferably weekly once, to a) familiarize with the pattern of contents b) know the type and varieties of topics being covered c) know new hypothesis, developments in the field d) get the evidence-based answers to the existing clinical problems dilemmas and controversies e) new guidelines f) interesting case reports etc.
4. It is good to go through the review articles regularly. It is worth collecting and organizing them regularly so that it becomes a quick and authentic reference for the exams. 4<sup>th</sup> Question paper in MD final exam is on recent advances and most of the topics related to this can be automatically covered by reading review articles regularly.
5. Learn how to scientifically analyse a journal article, to know the reputation of each journal based on impact factor. As a resident, you can publish case reports, letter to editor or clinical studies.
6. In addition to anaesthesia journals per se, try to go through the important medical journals like Lancet and British Medical Journal (BMJ) which also publish important articles related to anaesthesia or related topics often.

### **Websites as sources**

Websites include those of professional and scientific bodies and those run by individuals or group of anaesthesiologists.

1. Anesthesia Patient Safety Foundation ([www.apsf.org](http://www.apsf.org))

2. American Society of Anaesthesiologists ([asahq.org](http://asahq.org))
3. Anaesthesia ([anaesthesia-database.blogspot.com](http://anaesthesia-database.blogspot.com))
4. Anaesthesia UK ([frca.co.uk](http://frca.co.uk))
5. New York school of regional anaesthesia ([nysora.com](http://nysora.com))
6. British journal of Anaesthesia ([bja.oxfordjournals.org](http://bja.oxfordjournals.org))
7. Australian & New Zealand college of Anaesthetists ([anzca.edu.au](http://anzca.edu.au))
8. Orphan Anesthesia – Information regarding rare anomalies, syndromes etc. [www.orphananesthesia.edu](http://www.orphananesthesia.edu). It is a project of German Society of Anesthesiology and Intensive Care Medicine.

## Conclusion

There is no dearth of learning resources. Problem is with the authenticity, specificity, reliability, appropriateness, and utility. You, as resident, must recognize the importance of this soft power called knowledge, acquire it, and make use of it appropriately to the benefit of all stakeholders. You should build a “usable knowledge pool” only by organizing and integrating the information acquired from different sources.

---

**Dr. Vyshnavi S. & Prof. (Dr) Raveendra Ubaradka S.**

---

### Podcasts and Infographics

**Podcasts** have become an increasingly popular way of learning in the digital era. Podcast is a series of digital audio files on any topic. Many of the reputed journals produce podcasts with each issue the details of which can be accessed from the respective journal sites. In addition, there are a large number of podcasts related to anaesthesia and you can listen to them on the go. Some of the podcasts which might be useful during residency are Depth of anesthesia, ASRA news (from Society of regional anesthesia), The Etherist, Anaesthesia Success, etc. They cover clinical, non-clinical and abstract topics as well.

**Infographic** is yet another effective learning tool. Pictures can often convey the message which hundreds of words may fail to convey. Info graphs are pictorial and graphic (may be a combination) representation with brief verbal description related to a specific topic. Anesthesia and Analgesia and Anaesthesia journals regularly publish infographics. Also, infographics can be developed by anyone, and can even be presented for conferences.

When used regularly, both podcasts and infographics can help you to enrich your knowledge and become a better professional and also help you to perform better in the examination.

Do not lower your goals to the level of your abilities. Instead, raise your abilities to the height of your goals

*Swamy Vivekananda*

## Chapter 19

# Training Methodologies

## Preamble

Objective of residency is to train you as an anaesthesiologist with competence, knowledge, and professionalism. Specialization can be described as “learning more about less”. This chapter describes different training methodologies, the details and implementation of which may differ among institutions.

## Training modalities

1. Subject seminars
2. Didactic faculty lectures
3. Case presentations and discussions
4. Interdepartmental classes and integrated teaching programs
5. Workshops and continuing medical education programs
6. Simulation
7. Clinical society meetings
8. Hands-on in the theatre: observation, under supervision and independent
9. Other innovative methods like focused symposia, small group discussion etc.

### A. Academic components of training

Aim of academics is to enable the learner to internalize the knowledge, improve on it with his/her intellectual and cognitive abilities, share and apply the knowledge to the benefit of patients.

#### 1. Subject Seminars

Topic is allotted in advance and you are expected to study and present it as PowerPoint (PPT). For each topic, one faculty will be allotted as moderator whose guidance and suggestions should be sought at every stage of preparation to make the best out of it. Guidance is needed both for the content and presentation part of the seminar. Duration of seminar is about 1h including discussion but can extend beyond.

Preparation begins with collection of materials for the presentation. The content should include basics, clinical aspects and recent advances. It should be evidence based as much as possible. Controversies, if any, should be included. You should go through at least two related and recent journal articles or studies. Preparation should be completed at least a week before the scheduled date so that there is time for discussion with moderator and subsequent improvement. Presentation should be neat, clear, and comprehensive. Duration of presentation should be not more than 45 min in a one-hour class.

Contents of your presentation can be complemented and enriched with figures, photos, descriptive words, formulae, videos, graphs, and schematic diagrams for emphasis and to prevent monotony. Similarly, clinical reports, X Ray or other images can be included in PPT. Preparation of PPT and presentation is an art which can be learnt and mastered. Few tips for better power point presentation are,

1. Sober background and use of common fonts
2. text colour contrast to the background colour
3. Limited sentences with short meaningful words
4. Multiple colours to be avoided
5. Minimal animation
6. Checking the power point at least 2 times before your presentation and get it approved by the moderator

## 2. Didactic faculty lecture

Some important topics are taught as faculty lectures. Residents should make use of this to enhance their knowledge. They should come prepared for the class and note down the key points, ask questions and review what they have learnt in the class. You should also learn both the presentation style and its contents.

## 3. Case presentation

Case presentation is complementary to clinical management of patients. For every case discussion there is a presenter and a moderator. Usually, case discussion starts in the 2<sup>nd</sup> year of residency. Presenting a case in the classroom helps you to learn more about the clinical management and its complexities. It is also an opportunity for learning from others knowledge and sharing of experiences. In addition, you come to know about the “good and bad” of your own presentation.

Case selected for presentation can be a patient from a recent surgical list, or some interesting case or rarely a hypothetical case. Repeated case presentations help you to overcome fears related to presentation, communication, discussion and examination. Proper documentation on a regular basis goes a long way helps you to improve the presentation as you will be able to do it based on real rather than hypothetical values and findings.

## 4. Interdepartmental classes (IDC)

IDC provide good opportunities for sharing of knowledge and understanding from others' perspective. Usually, topics chosen are of importance to both specialties. At least one faculty from the other specialty will be present. Examples : case of thyroid, common between anaesthesia, surgery and medicine or a case of stridor, common between anaesthesia and ENT. IDC can also be on common topics such as airway

management (with ENT, ICU, emergency medicine etc.), antibiotics or vasoactive drugs (with ICU, cardiologist). Use these opportunities to expand and refine your knowledge of other specialties and perspectives of other specialists related to patient management. It is one of the principles of life as well, to learn to view from another person's perspective. An indirect benefit of IDC is preparing yourself to play the role of perioperative physician better in future. As you move up in the professional ladder, developing a broader perspective becomes a necessity.

### 5. Webinars and virtual meetings

This is the way academic activities are being conducted during this pandemic. It offers the advantage of learning from the comfort of your home. Make best use of them and make notes from each lecture you listen to.

### 6. Workshops, continuing medical education (CME) programs and conferences

Theory related workshops include primarily research methodology and biostatistics. Make use of them to the best possible extent and learn the fundamentals. CME programs are conducted regularly in several institutions. Some examples are RACE and APGAP.

### 7. Journal Club (JC)

Historically, Sir Willam Osler organized a journal club in McGill University as early as in 1875. The primary purpose of JCs is to develop critical appraisal skills in residents and promote evidence-based medicine. Benefits of JC are listed in the table below.

1. Literature search
2. Critical evaluation of scientific literature
3. Statistical analysis
4. Promotes scientific temperament and evidence-based medicine
5. Motivation for and improvement in research abilities including dissertation (hypothesis, methodology, discussion, referencing, manuscript etc.)
6. Helps in clinical decision making
7. enables differentiation between bad, good and best articles and studies
8. Improves communication skills and analytical power
9. Stimulates lifelong learning
10. Promotes excellence

As a professional you are expected to regularly go through current and past literature and make inferences which finally should lead to better patient care. This should stimulate you to make your own contribution in future. Towards this goal, Journal clubs are conducted regularly as a part of residency training.

In JC also you have a presenter and a moderator. Topics are selected based on moderator's advice. It should be interesting, important academically or clinically or both, recent and should be from a standard journal. There should be a mix of different kinds of publications, review articles, original studies, case reports and experimental studies. It should contribute to the existing knowledge with additional information or by addressing any controversies or by providing different perspectives to the audience.

## **8. Critical incident discussion and Mortality meeting**

You will be witness to critical incidents at least a few times in your 3 years residency. You may or may not be directly involved. Critical incidents are clinical incidents, preventable or not, which has or could have resulted in an adverse outcome. Discussion of these incidents hugely benefits you if you are a keen learner. You can understand how things can go wrong, how mistakes can happen, how they can be prevented, etc. You can participate in the discussion and listen to scholarly discussion and arguments, constructive criticism among the faculty, etc., altogether taking your learning experience to a different level. Going through available literature related to similar or related critical incidents before the meeting will further increase the benefits of such discussions.

### **B. Clinical training**

This is by far the final purpose of anaesthesia residency. How well you can manage the patients in different clinical situations is what finally matters. As it has been repeatedly stressed, without theory knowledge your clinical training is grossly incomplete. Clinical training is dynamic, complex, often challenging, potentially stressful and comes with risk of occupational hazards. Teamwork is always a key word in anesthesiologist's professional work. Crisis management is another important aspect of clinical training, in addition to routine management.

#### **1. Observation**

If you are a keen observer, you are lucky. If not, learn to be one. Observation precedes hands on learning. Observation stimulates your thought processes. It is a good practice for you to make a note of what you have observed and learnt. Observation should include both the skills and the process. Process involves assessment, transfer, positioning, monitoring, induction or regional techniques, aseptic precautions, communication, and management in the entire perioperative period.

#### **2. Patient management under supervision**

This is the first step of hand-on training process. Extent of supervision is progressively reduced as you progress, subject to your performance. This demands from you a constantly receptive attitude, willingness to work hard, even beyond the expected

working hours, to take rebuke and punishment in the right perspective and focus only on learning.

Please remember that it is not as a matter of right that you learn on a patient. Rather, it is a privilege that the patient has granted. You must be thankful and courteous to the patient. Once you accept the responsibility of managing a patient, It is mandatory for you to be with the patient during the entire perioperative period. It is not acceptable to perform a spinal on patient and go in search of a “chance” to intubate another and then for another “chance” to place an arterial line. That is clearly unethical. Hands-on training doesn't imply simply learning to do a particular technique. It is the overall learning the patient management in the most scientific and ethical manner. Acquire and practice the attitude of gratitude rather than “ it's my right” attitude, that you got an opportunity to learn something.

### **3. Independent patient management**

This is what every resident dreams about. You may have opportunity to start managing the patient independently either early or late in the first six- month period depending on the policy, patient numbers, number of residents and your own efforts and behavior. It always begins with simple and straight forward 'cases” undergoing relatively simple procedure. But always treat every patient management with the same seriousness that he or she deserves.

### **4. Hands-on training programs and workshops**

There are several skills in anaesthesia which are critical and lifesaving. Classical examples are cricothyrotomy and surgical tracheostomy. These cannot be learnt in any real-life situation during residency or even after that. However, we encounter patients for whom timely cricothyrotomy or tracheostomy could be lifesaving. You are expected to perfectly perform something which you have never done. Truly paradoxical. Only solution to acquire hands-on experience in such techniques is by practice on mannequins and simulators.

### **5. Simulation**

This is a new-age learning and training modality where in the learning technical and non-technical skills takes place without any harm to patient and violation of ethical issues. Simulation is useful for both training and assessment. Few institutions have advanced simulators which offer enormous scope for learning. Your postings in simulation center should be fully utilized. Teamwork and communication can be improved with simulation. You can repeat skills and make errors and learn from them. Take simulation-based training seriously, you will benefit a lot as a resident.

### **6. Innovative and novel teaching and training methodologies**

Any training process starts losing its value when it stagnates. Innovation and

implementation are the antidotes for stagnation. Each academic department can develop its own innovative teaching techniques. These can be small group discussions, postgraduate symposia, theme-based discussion, themes like “Drugs for the week” or “Equipment for the week”, to mention a few.

### Conclusion

Training methodologies have evolved and diversified, have been scrutinized and refined, over the last several decades. Each method has its own benefits and flaws and should be considered complementary to other. Resident should try to get the best from each of them to synthesize and internalize their own unique knowledge and apply the same in clinical management.

Remember that you are adult learners and already have been qualified as medical professionals. Hence, your study should be self-directed, and you should use your experience, intellect and cognitive abilities to complement your present learning. Most important of all, please realize that the knowledge you assimilate and skills you acquire are for the real-life application to benefit patients.

---

**Prof. (Dr) Raveenra Ubaradka S.**

---

In the last couple of decades there have been tremendous advancements in academics in anaesthesia in India. Indian College of Anaesthesiologists ([anaesthesiacollege.in](http://anaesthesiacollege.in)) complements ISA in anaesthesia academics and research.

APGAP, RACE, Ganga Anaesthesia Refresher Course (GARC) are some of the popular and high-quality academic events the residents and faculty alike look forward to. APGAP is organized by Manipal University at Kasturba Medical College Manipal and PN Thota Oration is the highlight of the event. Similarly, Ramachandra Anaesthesia Continuing Education (RACE) is organized by Sri Ramachandra Medical College, Chennai (SRMC) annually, usually in Feb- March. Ganga Anaesthesia Update, usually in May -June every year has consistently raised the benchmark of academic programs which covers all aspects of anaesthesia profession.

Lastly, there are equally important online regular academic events conducted by ISA national and state branches and individual institutions.

Student, you do not study to pass the test, you study to prepare for the day when you are the only thing between a patient and the grave.

*Mark Reid*

# Dissertation, Conferences, Audits, Never Events

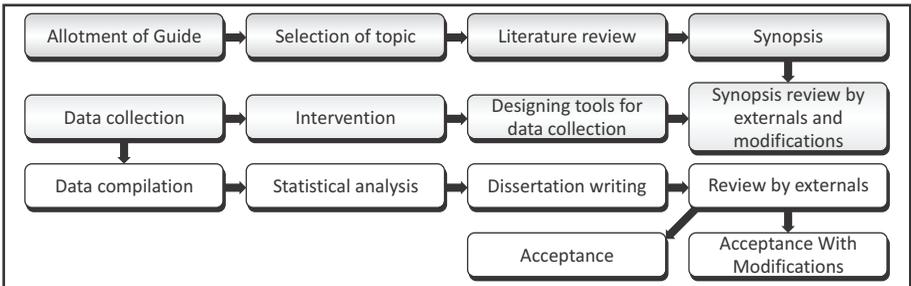
## Preamble

In adult learning, as it is in residency training, everything cannot be taught. They have to be learnt on your own or from seniors. But individual abilities to acquire such knowledge and capabilities are highly variable. This chapter covers four such important, but not formal, topics.

### Dissertation : How to make the best of it?

Main objective of dissertation is to develop research aptitude. Make it a masterpiece. At the outset, decide to adhere to the deadlines set by the authorities. To ensure this, set your own deadlines one month prior to the official ones so that you never have to rush. Begin with the understanding of basics of research and medical statistics. Start collecting references from the beginning and organize them systematically. Make the best use of research methodology training sessions organized by the medical education department.

## Process of dissertation



## Selection of appropriate topic

Mostly, topics are decided by the guides and students through mutual consultation and discussion. A common practice followed across the institutions is that the guide advises the student to search the literature and shortlist few topics of his/her interest. These topics are subjected to further detailed deliberations across other faculty members and head of the department to arrive at a consensus after taking opinion of the student. In many cases, a pilot study involving a small number of subjects is performed to refine the methodology. Thus, selection of topic is an intellectual and collaborative effort of student, guide, and departmental faculty. Once the topic is finalized, ethical committee approval followed by registration with the Clinical Trial Registry of India (CTRI) are the next mandatory steps before study starts. Institutional ethical committee usually invites external members during the synopsis presentation.

Ethical issues are given due consideration and candidate must ensure that ethical guidelines are fully complied with. Table 20.1 lists the qualities of a good dissertation. Also, acronym FINER, can be used to remember the overall guidelines to selection of topic.

1. **F- Feasible** : It refers your ability to complete the dissertation within the set time frame. To be able to achieve timely completion you need a right combination of availability of patients/drug/study material, equipment, consumable, materials, manpower, money and support and guidance.
2. **I-Interesting& Important**: Topic should be clinically or academically important and should have the potential to benefit the patient or community at large. At the same time it should help you in improving your clinical skills and knowledge about clinically important issues.
3. **N-Novel** : There should be something new in the topic you choose. Novelty deals with the newer ways of approaching old problems through innovative solutions.
4. **E-Ethical** : Anything you do for research should not cause any harm to the study participant. Autonomy and confidentiality of the participant must be ensured.
5. **R - Relevant& Recent** - The topic you choose for your dissertation should be relevant to the current context. It should be based on the felt need of patients, society, and your discipline.

**Table 20.1 Other qualities of a good dissertation topic**

- |   |
|---|
| <ol style="list-style-type: none"> <li>1. Should have a solid factual ground to be chosen as a topic for research</li> <li>2. It could be a study, survey, review etc with or without intervention or techniques. The latter, if needed will increase the value of the dissertation, at the same time increasing the responsibilities on the resident and the entire team</li> <li>3. Study or topic can be <i>in vivo</i> or <i>in vitro</i></li> <li>4. Procedure, or intervention, if any is involved, should have proven safety and without a significantly better alternative.</li> <li>5. If a drug is involved preliminary research should have established its safety</li> <li>6. Cost factors should be considered.</li> <li>7. Adequate literature should be available</li> <li>8. Facilities for the intervention/monitor/experiment/ drugs should be locally available</li> </ol> |
|---|

### Literature review

After you select the topic, there is a need to develop in-depth understanding about that topic. To ensure this, you need to perform a thorough review of literature. Following are the tips for literature review.

Search the published literature from all the standard search engines like google scholar, PUBMED, SCOPUS, SCOPED, DOAJ etc. Filter all the manuscripts related to your topic and select the most relevant one for you. Also, it is difficult to read the entire paper, read the abstract carefully and if you feel the study is relevant, then attempt for complete reading. While reading the articles, try to synthesize their findings in the matrix given below. This is known as literature matrix.

Sl No	Title of the study	What was done? (Objectives)	How was it done? (Methodology)	What was found? (Results)	What is not done?	How can it be improved?

Preserve the articles you have searched, either as soft or hard copy. Keep updating the list as soon as you get new papers.

### Synopsis

Synopsis is a brief resume of intended work. The synopsis will have the following components.

Title	<ul style="list-style-type: none"> <li>• Meaningful, short, and simple. Avoid technical jargons.</li> <li>• If any drug related trial/intervention is involved, clearly mention them</li> <li>• Mention the design in the title.</li> <li>• Expand the acronyms in the title. Remember, normally you cannot change the title of your study once it is registered.</li> </ul>
Need for the study	<p>Mention</p> <ul style="list-style-type: none"> <li>• Reason for the study and how it will add to existing literature.</li> <li>• How your study is different from other studies on the same topic and the potential implications of your study</li> </ul>
Literature review	<ul style="list-style-type: none"> <li>• Describe what is already known about your research topic and the key results of relevant studies.</li> <li>• Strictly avoid any copy and paste and also reproducing without appropriate consent. This seriously erodes your integrity and professional standing in the long run.</li> </ul>
Aim and Objectives	<ul style="list-style-type: none"> <li>• Aim: What you want to achieve at the end of the study. By and large it is the title of your study. Usually there is one aim for your dissertation.</li> </ul>

	<ul style="list-style-type: none"> <li>• Objective: The steps you undertake to achieve the aim. Objectives must be SMART- Specific, Measurable, Achievable, Relevant, Time bound.</li> <li>• Do not keep too many objectives; one primary and two secondary objectives are recommended for a good study.</li> </ul>
Material and Methods	<ul style="list-style-type: none"> <li>• Includes study design, sample size, sampling techniques, inclusion and exclusion criteria, method of data collection, place of the study, duration, and statistical analysis.</li> <li>• In drug related studies, mention description of the drug in detail, dosage, and route of administration, known adverse events, method of allocation across the groups, method of randomization and follow up details.</li> </ul>
Ethical issues	Should include ethical issues involved, method of taking informed consent, potential benefits and harms to the study participants and the details of Institutional ethics committee clearance.
Outcomes	Need to describe the outcomes of your study
References	List the references in Vancouver style. Cite all the references as superscripts in the body of your synopsis

### Conducting the study

Prepare an informed consent form and questionnaire/schedule for the data collection. It should include two parts. Part A: All socio-demographic characteristics of participants (name, age, gender, education, occupation, marital status, socio economic status etc) and Part B: Specific details like, pain scores, adverse effects, vital events related to the treatment, anthropometric parameters etc.

For studies involving drug intervention: a) Randomised control trial (RCT): Generate random numbers through computer or random number tables and allocate into study and control groups, and b) non-randomized study (measuring certain parameters before and after a particular drug being administered or no randomization is followed for allocation of subjects into study and control groups): Decide on what procedure you will use to allocate the subjects into different groups. Conduct your study with drug intervention, clinical observations, procedures, techniques, etc. using the schedule you have prepared. Do regular follow up, record all the observations meticulously. Preserve all the forms properly and enter the data using appropriate software. Consult statistician on methods of data entry into master-chart.

### Statistical analysis

Take the guidance of a biostatistician for this purpose. Remember that the data analysis will be purely based on the objectives of the study. You need to guide the statistician what are the outcomes of the study and what are your expectations. Once

you get the tables or graphs, for the statistician, sit with him/her and understand correct interpretation.

Learning biostatistics and learning the operation of software by yourselves is the best way to handle these things. Represent your results as tables and graphs as necessary. If you have applied any test of significance like chi square test, student t test, ANOVA etc, understand clearly, why they are applied and interpret the p value correctly. If the p value is not statistically significant, do not bother much, clinical significance is more important than statistical significance.

### Tips for writing dissertation

#### Part 1

<b>Introduction, review of literature, aim and objectives, material, and methods.</b>	
Introduction	1. Introduce the topic of your study in detail and mention why this study was conducted, 2. How will this study add to the existing pool of knowledge 3. Implications of this study, 4. How your study is different from other similar studies
Review of literature	<p>Divide this into different segments based on the objectives of the study.</p> <ul style="list-style-type: none"> <li>• First section will be usually the elaborate description about the disease, drugs with their mechanism of action, route of administration, adverse events etc.</li> <li>• Second section onwards, studies related to each of your objectives are described. Mention the key findings of other studies pertaining to each of these objectives. Each study you are going to quote under this section can be mentioned as a separate paragraph.</li> <li>• Avoid copy paste of results from other studies, this will amount to plagiarism. Try to paraphrase the statements. If quoting verbatim is felt necessary, then mention the author or study name and put the quoted portion within apostrophe.</li> </ul>
Aim and objectives	This section will be same as that of your synopsis. In case you were not able to fulfil any of the objectives or modified them in the process of your study, make a mention of it here.
Methodology	The flow of this section is same as that of synopsis. Do not forget to frame your sentences in past tense. (In synopsis your statements will be in future tense).If there is any deviation from the methodology described in the synopsis, that has to be mentioned here.

Part 2

**Results, discussion, conclusion, recommendation, summary and references.**

<p>Results</p>	<p>This is the heart of your dissertation.</p> <ul style="list-style-type: none"> <li>• Always start this section with tables/figures on basic demographic characteristics of the study subjects, like age, gender distribution of study subjects, followed by the tables/figures on the specific objectives.</li> <li>• Divide this section into different segments based on objectives of the study. There is no need to provide the table and figures to the same variable, either is enough. Judiciously use graphs/figures. Too many graphs are not required.</li> <li>• Ensure that the tables and figures are self-explanatory. Do not merge too many variables in the same table. Give proper titles to tables and figures. Don't forget to number them serially. Below each of the tables and figures, describe the inference out of them in words. This description should be clear and crisp.</li> <li>• In the tables, where statistical tests are applied and p value is mentioned, clearly describe its interpretation below the table. Ensure that all the objectives are addressed in the results section.</li> </ul> <p>Do not jump to debate on the results, (why a particular result is different from other studies). Reserve it for discussion section.</p>
<p>Discussion</p>	<p>It is a time-consuming step. Discuss important/key results. Discuss why your finding is similar to or different from rest of the studies in the literature. Provide correct interpretation of the findings and cite references.</p> <p>Arrange the content of discussion in logical manner and you can provide comparative tables for key findings with other similar studies. But it is not mandatory.</p>
<p>Conclusion</p>	<p>It is the ultimate findings based purely on the results of the study. Do not repeat all the components of results. Do not mention something which you have not found in your study Remember, THIS IS NOT THE SUMMARY</p>
<p>Recommendations</p>	<p>Should be purely based on the conclusions of your study. They should be practical, realistic, feasible and implementable. Two to three recommendations are enough.</p>
<p>Limitations</p>	<p>Optional. Limitations should not be directly related to primary objective of the study and avoid mentioning vague limitations.</p>
<p>Summary</p>	<p>Summarize the whole dissertation into a short description with inclusion of basic points about need for the study, objectives, brief</p>

	methodology, key results, conclusion, and recommendations. It should give clear idea about what was done, how was it done and what was observed and what next. Do not give elaborate summary.
References	All the references should be cited in the text. References are cited in sequential manner. Only reference numbers are cited in the text, not the authors names. References should be in Vancouver style. More than 50% of the references should be recent ones (Last 5 to 8 years) and more than 3 continuous references to the same paragraph is avoided. Ex: References like xxxxxxxxxxxxxxxxxxxxxxx <sup>1,2,3,4,5,6,7,8</sup> or yyyyyyyyyyyyyyyyyyyyyyy <sup>1-10</sup> should be avoided.

**Conferences – Great learning experience**

Attending conferences and presenting papers is a part of residency. It is in your own interest that you make the best of it rather than “somehow manage” the situations “as and when they come” without any preparation. Benefits of attending the conference are listed in Table 20.2.

**Table 20.2 Benefits of attending the conferences**

1. Acquiring knowledge and learning in a different environment
2. Exposure to a variety of topics and speakers; different styles and experiences
3. Meet, listen to, and learn from, experts from different fields of speciality
4. Learn, appreciate, and admire the developments taking place in our speciality not only through the lectures or symposia, but also through trade exhibitions where you will have an opportunity to look at the latest developments.
5. Meet / make friends, fellow residents to exchange experiences, share ideas and have fun and socialization.

Usually, you start attending the conferences in the 2nd year of the residency. This is the time when you are expected to have a basic understanding of the subject, free of exam worries and in a fully receptive state of mind to assimilate new ideas and knowledge. Conferences can be state level, zonal level, and national level. Probably you will get to attend at least 2 conferences in the entire training period, one national and one smaller one. Following are some suggestions to derive maximum benefits from conferences.

1. Planning and preparation are the key words. You may be either presenting a paper or participating as a delegate or both. If you get an opportunity to present a paper, make the best of it, irrespective of whether it is a poster or a podium presentation. Go through the presentation many times with your guide or co resident and ensure

that there is zero error and that you have achieved the best possible format and knowledge for presentation.

2. When you are participating just as a delegate with no stress of preparing for a presentation, focus all your energy on learning as much as possible from the conference.
  - a) Go through the theme of the conference and scientific program critically.
  - b) Choose the lectures or panel discussions, based on the topics and speakers and your interests. Include lectures on different aspects of anaesthesia like basic sciences, clinical sciences, subspecialty, equipment, research aspects and rare topics which either you have not heard of so far or about which you don't know much. Choose a mix of well-known and "not so well known" speakers.
  - c) Plan to attend at least 5 to 6 hours of academic programs everyday and spend a couple of hours in the exhibition stalls looking at different equipment.
  - d) As far as possible, do not spend the academic time in just relaxing.
  - e) During the lecture or discussion take notes and ask questions. Listen to the contents, observe the presentation style, body language of the speakers, language etc and learn from them. It is just a few years away before you can become the one who is going to deliver the lecture in the same or similar stage.
  - f) If you feel that the lecture, topic, or speaker is extraordinary try to meet the speaker later and discuss.
  - g) For workshops, prepare very well and participate with your full energy and enthusiasm.
  - h) Do not miss the oration. There is a lot to learn from oration, other than the subject content. Oration is always delivered by an expert on invitation based on the contributions to the profession.
  - i) Note down any information which might be useful for your future: details of courses, fellowships, training centres etc.
  - j) All the information you collect should be organized and stored properly in a retrievable way.
3. Keep the plans for sightseeing and tourism for the days before and after conferences, with permission from authorities.
4. Once you return from conference, recollect and share the experience. Preferably, make a presentation in the department.

## Clinical Audit and self-audit

### Effective assessment tools

Clinical audit is a quality improvement process that seeks to improve patient care and outcomes through systematic review of care and implementation of change. Aspects of the structure, process and outcomes of care are selected and systematically evaluated against explicit criteria. Where indicated changes are implemented at an individual, team or system level and further monitoring is used to confirm improvement in healthcare delivery.

Self-audit is audit of your own clinical work. It is an excellent way of understanding and knowing your own work. As a resident you can audit your own work and make it a part of self-assessment. You can use it for your own improvement and share the knowledge with others. The information you gather through self-audit can be a motivation for further research. Sometimes you will be startled with the findings.

#### Suggested topics for self audit during residency

1. Techniques of airway management used by you and complications you encountered – over a specified period.
2. Use of SGAD - success, failures and complications in your experience.
3. Incidence and types of complications during induction of anaesthesia
4. Analysis of extubation in a series of cases done by you
5. Satisfaction among your own patients regarding perioperative care
6. Failures and complications of regional anaesthesia in your experience
7. Audit of near misses and negligence in your experience

You can even publish your audit findings as a original work.

#### Never Events (NE) in Anaesthesia – ensure that you never have one

Never events are “serious, largely preventable, patient safety incidents that should not occur if relevant preventive measures have been put in place”. It is important for the residents to be aware of this terminology, which denotes an extremely serious act of omission or commission leading to or potentially leading to irreversible damage to patients. The adage “to err is human” is not an excuse when these events happen. These are the incidents which no one should encounter even once in their entire professional career. The psychological consequences of such an event, should it occur, could be disastrous personally and professionally.

NE are listed after the analysis of literature and extensive review and is updated regularly. They can be related to surgery, medications, process, techniques etc. Many

of these events could be directly or indirectly related to anaestheologist either by doing something wrong or by not doing what should have been done. The example of the former is administering a wrong medications and the example for the latter is not recognizing an oesophageal intubation. Both are preventable and when happens, can severely compromise patient safety.

Some of the Never Events listed in literature include 1) Nasogastric or orogastric tube misplacement, 2) Erroneous IV administration of strong potassium solution (can cause immediate cardiac arrest), 3) Drugs administered by wrong route, 4) Overdose of insulin being administered due to abbreviation error or incorrect device, 5) Erroneous IV administration of high strength of midazolam and 6) Transfusion of ABO/Rh incompatible blood or blood components.

### Prevention of never events : role of residents

1. Be alert to the possibility of never events
2. Identify patient, procedure, and plan before surgery: WHO safety check list should be meticulously followed.
3. Load the drug, dilute and label clearly all the drugs yourself. High alert medications should be kept separately. Colour coded labels and bar coding when feasible add additional layer of safety.
4. Never use drugs without labels or drugs whose concentration you are not aware of. Learn the correct way of performing any techniques. When in doubt always consult others
5. Oesophageal intubation should be detected early, and the tube should be removed immediately. Absence of capnography waveforms is the most dependable sign, in clinical practice. Ultrasound can also be used for real time monitoring of intubation and to confirm ventilation. Fall in saturation is a late sign and auscultation may not be a reliable sign.
6. Exercise extreme caution with blood transfusion. Any doubts about the reliability of the details or at the earliest sign of incompatibility, blood or component should be returned to the blood bank.
7. Meticulous, real-time documentation is very important.

**Prof. (Dr) Raveendra Ubaradka S. & Dr. Vyshnavi S.**

WATCH : Watch your Words, watch your Actions, watch your Thoughts,  
watch your Character and watch your Heart

*Sri Sathya Sai Baba*

## Chapter 21

# Medicolegal Issues

## Be legally correct as well

### Preamble

Word “medicolegal” usually does not elicit much interest among doctors. Anaesthesia residents are no exceptions. But it is important to realize that anaesthesiologist's professional work is often subjected to legal scrutiny on several occasions for various reasons. Actions or lack of them, can become legally wrong, or controversial, even if they are done with good intention and based on sound clinical judgement. Similarly, when you face clinical dilemmas and controversies in the absence of clear-cut evidence-based solutions, they can be associated with medicolegal implications. Hence, a basic knowledge of medicolegal aspects applied to anaesthesia practice is essential for residents.

Medicolegal suits against anaesthesiologists are increasing, often for apparently frivolous reasons. Most of them baseless and are on assumption of negligence or even with ulterior motives. Further, anaesthesiologists could become both the victims of violence by patient relatives or public and be accused of negligence even when he or she has tried their best to save the patient. Lastly, anaesthesiologist could be sued for the faults of surgical colleagues as they are part of the same team. But unfortunately, it is also a fact that burden to prove non-negligent is on yourself and can take years of legal battle and expenses at least in India. Sometimes, legal suits can simply ruin your professional career even when you are sure of your innocence. Difference between case against the anaesthesiologists and other doctors is anaesthesiologists have minimal rapport with the patient and relatives, so in case of mishap the factor of faith may not come to the rescue of anaesthesiologists. Best protection against medicolegal problems are offered by knowledge of medicolegal implications, good knowledge, skills, communication and documentation.

### Laws available against medical negligence

- 1. Civil Law :** Every individual has rights and to protect the rights there are legal remedies. According to law of torts doctors shall be responsible for his negligence Act. According to Sec. 70 of the Indian Contract Act, there is a contract (oral, written or implied) between a doctor and a patient, and both parties are bound by it.
- 2. Criminal Law :** To protect the community, the Government has the right to punish wrong doer, through various agencies. Criminal laws and police are usually not involved in doctor – patient relationship unless there is a gross rashness or negligence resulting in either in death or serious injury.

- 3. Consumer Protection Act 2019 :** CPA bill was passed in 1986 and amended in 2019. Medical profession comes under CPA 2019 for the following reasons.
- Service means service of any description which is made available to potential users and includes - **but not limited to** - (Medical profession comes under this).
  - But does not include rendering of services – free of charge or under the contract personal service.
  - S/C judgment in IMA V/S V.P. Shanta case defined relationship between patient and medical professionals as contractual in nature.
  - This act defines deficiency – Any act of negligence or omission or commission performed by a person in pursuance of a contract or otherwise in relation to any service which causes loss or injury to the consumer.
  - CPA 2019 dictates that matters relate into proceedings in respect of medical negligence, resulting grievous injury or death should not be referred to mediation cell.
  - The definition of consumer also includes services of offline or online transactions through electronic means or by teleshopping etc.

### Implications for residents

To build a strong medicolegal foundation for your professional life, develop habit of attention to details, use of proper terminologies, good writing skills and communication skills and if possible basic legal knowledge. Following are some of the issues useful for residents to know about.

- 1. Informed consent :** The anaesthesiologist's duty to the patient arises the moment he/she undertakes the responsibility to provide anaesthesia to him or her. The relationship is usually created through performance of pre-anaesthetic check-up. It may be created without an actual face to face meeting between the anaesthesiologist and patient party in implied way through surgeon.

#### Risk explanation / information

- Explain the potential risks of anaesthesia to the patient, especially the commonly occurring one and enumerate such risks in the consent.
- Risks having probability of 10% or more must be specifically spelt out to the patient and duly recorded in the consent.
- Answer any specific question raised by the patients about risks and record the same in the consent. Risk involving loss of vision, hearing, mental function, loss of function of limbs, and organs must be specified even though the risk may be rare.
- Better take – High risk consent / Post-operative Ventilatory Support Consent

- 2. Monitoring the vitals :** Constant vigilance and monitoring vitals during

anaesthesia is the primary duty of the anaesthesiologist. Delegation of duty to inexperienced anaesthesiologist or person is not permissible in law. It is also the responsibility of the anaesthesiologist to check the equipment to ensure proper working including gas connections. In *Kalavati Vs Himachal Pradesh HC 1988*, two patients died when they were administered N<sub>2</sub>O instead of O<sub>2</sub>, as a result of pipeline connections unknowingly interchanged by ward boy during cleaning of the OT and State Government was held vicariously liable. Monitoring of inspired oxygen concentration (FIO<sub>2</sub>) would have prevented delivery of hypoxic mixture to the patient could have prevented. Also, a strong system would have prevented or detected wrong pipeline connections.

- 2. Accidents during intubation :** Misplacement of the endotracheal tube (ETT) by itself cannot constitute negligence, but failure to detect and recognise that the tube is misplaced before hypoxic damage occurs is negligence on the part of the anaesthetic. Hence the importance of use of EtCO<sub>2</sub> and use of ultrasound to confirm intubation and ventilation cannot be overemphasized. Also, always remember, “when in doubt, take out the ETT and reinsert”. Desaturation is a late sign.
- 3. Accidents in regional anaesthesia :** It is obligatory on the part of the anaesthesiologist to ensure that the block carried out is safe, effective and useful. Avoidance of local anaesthetic toxicity and nerve damage are the most dangerous complications.
- 4. Brain damage :** Failure of oxygen delivery to the brain for 6-8 minutes may result in cerebral hypoxia that not only stops the brain machinery, but also wrecks the same. The result of cerebral hypoxia is profound, viz., impairment of intellect, permanent disability and at worst death. In one of the cases the anaesthesiologist was held negligent for causing brain damage to a patient due to faulty method of induction of anaesthesia. Some of the causes of hypoxic damage during anaesthesia are mismanagement of the airway, equipment failure, thromboembolism, anaphylaxis, perioperative cardiac arrest, medication errors, massive blood loss, etc.

#### **Few examples of litigations involving anaesthesiologist**

**Anaesthetist was liable even if services were not hired directly by the patient** – In case *Mumbai Grahak Panchayat versus Rashmi B.Fadnavis, 1996*, it was held that the anaesthesiologist who participates in the process of delivery of medical services to the beneficiary is as much liable as the main surgeon if the anaesthesiologist's negligence is established even if his services have not been hired directly by the patient.

**Administration of anaesthesia without infrastructure :** In one case it was alleged that death was due to complications of anaesthesia. The State commission held that the

anaesthesiologist was negligent on account of the hospital undertaking major surgery without having the basic facilities to perform such a surgery; and the operation was elective. There was negligence of the doctors in not giving proper medical attention after the complications developed and for delay of 1.5 hours in deciding to transfer the patient to a higher centre with necessary facilities.

**Fasting and anaesthesia** : Operation for hernia was done immediately on the same day when patient got admitted and without adequate fasting. Death occurred due to aspiration and court held medical negligence and awarded compensation of Rs.1,75,000/-.

**Transfer of the patient** : Patient must ideally be shifted in well-equipped ambulance and anaesthesiologist should accompany the patient till the hand over to the tertiary care.

Case : Mr. Sakil Mohammed Vakil Khan Vs Dr Miss Perin Irani – SCDRC, Maharashtra 1999. Court held that the anaesthesiologist did not monitor intra operatively and did not accompany in the ambulance which she was professionally, morally and ethically responsible to do to ensure that no further damages done. A compensation of Rs. 4,10,000/- was ordered to be recovered from Anaesthesiologist.

### Risk management strategies

- 1. Improve doctor patient relationship** : For anaesthesiologists, it is very important to talk to the patient/parents and relative about all the aspects of anaesthesia. Communication should be clear, specific, include important points and able to clear the doubts of patients/relatives. This is the first step for a good anaesthesiologist – patient relation.
- 2. Adhere to standard care** : Anything which is short of or deviation from standard care is very difficult to prove in case of mishap. Hence, adhere to standard of care in all the aspect like, infrastructure, communication, investigations, and monitoring etc. in anaesthesia. Any deviation or exception made must be documented with justification.
- 3. Maintain good records** : Court cannot rely on the memory of the parties to evaluate the evidence. Moreover, court has no way to ascertain as to what happened within the four walls of the operation theatre. It has therefore to depend upon the records of the case maintained by the anaesthesiologist and the hospital. All the records start from preoperative visit to intra – operative and post-surgery recovery. Documentation should be in clear, understandable format with date, time, and event relationship, records should be maintained in duplicate if possible. Any corrections made must be duly attested with signature immediately. Once you have regular habit of documentation in all the patients, that itself is a powerful defence for your integrity and competence.

4. **Respond properly when there is a critical incident** : Do not run away from the situation, be calm and face it. Call for help immediately and assign roles and start attending the ABCs. In case of medico legal action, what is more important is how you have handled the crisis and its documentation, which require sound mind. Inform the patient's attendant about the complications, slowly build up the scene and give some time to get prepared for the possible mishap and then inform the bad outcome, shift to the ICU where more people are involved for comment.

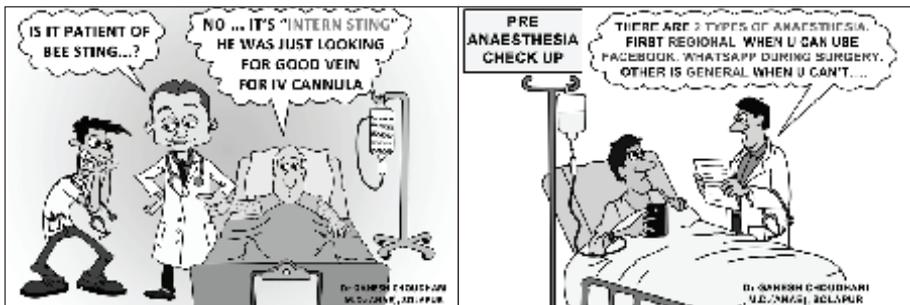
In many cases, the success of a suit depends primarily on the stature and believability of the expert witness. There have been number of cases where courts have dismissed the complains when complaint has not produced expert witness to substantiate his claim.

5. **Understand your limitations** : As residents you should clearly know what your privileges, responsibilities and limits are. You can be clinically right but legally not. Your intentions may be good, but methods and outcomes may not be expected or even adverse. Always involve your faculty and take their directions and guidance whenever you have any doubts about a technique, drug, procedure, decision, process or management. Dealing with the patients or other consultants or any critical decisions are always best left to them.

### Conclusion

Finally, the best defence against medicolegal problems and negligence cases is to maintain high degree of integrity with professionalism. In medicolegal context, they can be summarized as a) application of knowledge and skill with patient safety at the centre of all actions, b) genuine, clear and specific communication, c) following standards of care, d) being a good team member and willing to call for help in crisis and e) documentation as your routine habit.

Dr. Shivakumar Kambar



Chapter 22

# Occupational Hazards & Residency

## During Pandemic

### Maximize efforts to minimize risks

#### Preamble

Professional work of anesthesiologists is associated with several hazards; physical, psychological and emotional. Causes and consequences can vary in severity, presentation, and preventability. They can be accidental, unintentional, self-inflicted or caused by others. As residents you must be aware of the occupational risks and make constant efforts to minimize them. Your safety and well-being are as important as that of the patients.

#### 1. Types of occupational hazards

Occupational hazards are classified under five categories by the World Federation of Society of Anaesthesiologists (WFSA) and Brazilian Society of Anaesthesiology, as physical, chemical, biological, anaesthesia practices and ergonomic risks and labour standards.

Physical	Noise, light, heat, radiation, injuries, and repetitive strain
Chemical	Anaesthetic agents, latex, drug and substance abuse
Biological	Bacteria, virus, prions, and fungus
Anaesthesia practice related	Physical and psychological stress, substance abuse
Ergonomics and others	Workload, working pattern, academic pressure, peer pressure, responsibility, violence

There are plenty of sources of noise apart from human interactions. They include monitors, alarms, drills, cautery, ancillary electric equipment to name a few. Regular exposure to high decibel sounds, chronic acoustic trauma can cause irritability, inability to concentrate, poor communication, reduced productivity, and partial hearing loss.

Poor lighting is not uncommon, especially during laparoscopic procedures and non-operating room procedures. It can lead to visual disturbances, medical errors, physical injuries such as tripping, falling and fatigue. Bright light is also a cause of discomfort and might precipitate migraine or other types of headaches.

Modern operating theatres are usually cold with a temperature of less than 20 degrees most often. This is uncomfortable for most anesthesiologists and can reduce

the work efficiency. Rarely, a normal or higher temperature inside the theatre or nonoperating room location can also produce unfavorable working condition.

Electromagnetic fields are all around in anesthesiologists' working environment. Invisible as they are, long term exposure can have both immediate and long-term effects such as exhaustion, blurred vision, eye discomfort, headache, and hearing defects. Prolonged and regular exposure also increases the risk of cancer and leukemia. Radiation can be ionizing and nonionizing. If proper care is not taken, a resident is at high risk of exposure to radiation while working in orthopedics, neurointerventional procedure, radiological investigations and several diagnostic non-operating room procedures. Laser is the most common nonionizing radiation. Since radiation is an invisible phenomenon and lacks specific short term adverse effects, the risk is often ignored. Radiation effect is usually very small on single exposure, however repeated exposures may have a cumulative potentially adverse health effects. One must regularly monitor the radiation exposure using a Thermoluminescent Dosemeter (TLD batch) and ensure that the annual radiation exposure is limited to 15mSv per year.

#### Steps to minimize radiation hazards

1. Maintain safe distance of > 90cm from source of radiation. When possible, stay in control room.
2. Wear personal protective equipment such as lead apron and thyroid shield.
3. Wear the dosimeter and monitor the exposure levels at regular intervals.
4. Beware of implanted cardiac devices or other metal objectives when you enter the MRI area. Remember not to carry your mobile inside!
5. During laser surgery, especially eye and airway procedures: a) Laser resistant endotracheal tubes, saline soaked gauzes(if feasible), minimal FiO<sub>2</sub> and avoidance of volatile anaesthetics, for patient and b) lase protective goggles for yourself.

#### Chemical hazards

Important in this category are exposure to waste gases from the anaesthesia machine. Effect of expired inhalation agents on the operation theatre personnel has been a subject of study for decades. Potential effects are listed in the box

#### Effects of expired inhalation agents

- Headache, nausea, drowsiness and fatigue
- Hepatotoxicity, nephrotoxicity, genotoxicity, pulmonary toxicity, chromosome aberrations, carcinogenesis
- Increase in spontaneous miscarriages and congenital anomalies due to effect

on reproductive system

- Nitrous oxide may lead to teratogenicity
- Exposure to anesthetic gases may lead to psychophysiological effects and distortions in the cognitive and motor function
- Greenhouse effect which may lead to global warming

Causes of waste gas exposure are use of high flows, lack of or malfunctioning scavenging systems, inadequate mask fit resulting in leak and use of uncuffed tubes. Preventive measures include effective scavenging system, low fresh gas flows, replacement of nitrous oxide with air, use of regional techniques and total intravenous anaesthesia.

Latex allergy is not uncommon and can lead to contact dermatitis, allergic reactions and rarely anaphylaxis. It may be immediate hypersensitivity reaction ( Type I) to latex which is IgE mediated response and may lead to urticaria fatigue, vomiting, bronchospasm and anaphylactic shock. A delayed response may occur due to chemicals in latex and is Type IV reaction. It usually presents several hours after exposure as rash, vesicles, and blisters. The management is prevention of exposure and treatment of reactions (antihistaminic, bronchodilators and steroids). Latex free items are usually available, and they should be used.

### Biological risks

Work related risk of contracting infection is significant. Pathogens can enter the body through various routes, inhalational, blood and skin (damaged or breached, not intact skin). Source can be patient's blood, saliva, amniotic fluids, or other body secretions. Needle prick during insertion of peripheral venous cannula and resheathing of the needle ( not recommended) are the common mechanisms of needle prick injury. Techniques such as laryngoscopy, endotracheal intubation, central venous cannulation, bronchoscopy etc. can facilitate the transmission of infection. A coughing patient or patient in sepsis is a potent source of infection. Latter can contain multidrug resistant bacteria.

1. Hepatitis B, C
2. Corona Virus
3. Human Immunodeficiency virus (HIV)
4. Tuberculosis : through droplets directly from the patient

As residents, you must be familiar with the universal precautions against needle stick injury and guidelines for prevention of infection transmission. Immunization and booster doses at regular intervals provide high degree of protection against hepatitis B. In case of needle stick injury, the site of exposure should be thoroughly washed with

soap and water, inform local health committee and take post exposure prophylaxis as per intuitional protocol.

The incidence of tuberculosis is increasing in medical professionals. It is important to develop strategies to prevent disease transmission like increased awareness, use of appropriate protective clothing and personal respirators; limiting the number of personnel in contact with the patient and where possible delaying procedure/surgery until a patient is non-infectious. Anaesthetists should undergo a tuberculin test and take 6–12 months of chemoprophylaxis, if needed after high risk exposure.

### **Covid 19 pandemic: Impact on residents and residency**

Martin Luther King Jr. said, “The ultimate measure of a man is not where he stands in moments of comfort, but where he stands at times of challenge and controversy.” COVID 19, the most recent disastrous pandemic has proved it right.

In December 2019, the city of Wuhan in Hubei province of China reported a pneumonia outbreak. By January 7, 2020 the WHO identified a novel corona virus (The infectivity of SARS-CoV 2 is much more and has overwhelmed all healthcare systems across the globe and has exhausted the healthcare workers. The virus is transmitted primarily through respiratory droplets, direct contact, and aerosols. Healthcare professionals in direct care of patients are at increased risk of contracting the virus and many residents and fellow doctors have got infected and some have lost their lives while battling this pandemic.

#### **Impact on residency program**

Though there is no clear data, certainly covid 19 pandemic has significantly affected residency. The schedules of postings of gone haywire, elective surgeries cancelled and all resources including manpower were mobilized for management of Covid 19 patients. They can be summarized as follows.

1. Clinical rotations cannot be implemented
2. Cancellation of cases lead to loss of opportunities as overall number of “cases” is drastically reduced
3. Diversion of both faculty and residents for Covid related responsibilities
4. Reduced time for teaching or cancellation of classes and other academic training programs
5. Reduced communication and interaction between the faculty and residents
6. Efficiency of teamwork may be reduced
7. Patient assessment may be incomplete, reporting to staff is difficult or not possible, all leading to reduced or lack of guidance by the faculty
8. Conferences, workshops, and other group activities affected.

9. Classroom teaching changed to online activities
10. System failure or weakening due to all round effect on the day-to-day work

### Impact on residents

It varies from disappointment to disaster. Impact depended on duration of residency already completed, reorganization of the training programs by the department and institution, need for participation in management of COVID patients, mental toughness, and attitude. Overall, certainly the residents lost lots of opportunities to observe and perform technical skills and anaesthetic management of variety of procedures, both elective and emergency. Also, they missed much of bedside (in the OT) teaching as well. Most of the routine clinical work was affected and this also affected the ongoing research work/ thesis. This was an additional stress to them and forced them to either change their topic or reduce the number of participants for thesis completion. Most of the institutes also extended the time for thesis submission. This was one of the important stressors for them and residents needed to learn regarding the same. Overall, there was a major detrimental effect on research and academics due to pandemic and the long-term effects are yet to be seen. COVID has impacted the research capabilities and many residents have not been able to complete their thesis.

Now after COVID has settled the routine work has started. However, it is still not the time to be complacent and the same degree of precautions and alertness is needed at all levels including the residents so that they are not caught unawares like previous occasions. It is of immense importance to educate, train and protect themselves to carry out duties safely amidst the disease outbreak. During these times of uncertainties, it is very easy for our residents to have cognitive bias, dysfunctional group dynamics and organisational pressure. Moreover, the residents have encountered many challenges at clinical, physical, psychological as well as emotional front.

Another challenge faced by all professionals especially residents is that the evidence regarding the management of COVID-19 is changing very fast and one needs to be updated with the knowledge for best management of patients. Hence, there is a need to ensure that roles are assigned to faculty and residents to summarise the latest national and international guidelines for all colleagues to benefit all the patients. Residents need to grasp this complex information and draw unique insights, which enable them to take the right decisions and demonstrate the ability to view the situation from different perspectives. Timely decision making during COVID became the distinguishing feature between containment and unrestrained spread of the virus.

Also due to this adversity new models of health care delivery like telemedicine have been initiated and their role in healthcare is bound to increase. So, residents need to

be well appraised with the upcoming technological changes that are bound to happen and ensure that the human touch of the health care delivery is maintained. More importantly the academics had taken a big hit initially during the pandemic and subsequently teaching was started in virtual mode. It was initially difficult but eventually the educating and sharing knowledge through virtual mode has become popular and acceptable among the residents. Residents need to take care of themselves during this pandemic as there is high risk of contracting the infection themselves. One must ensure a nutritious diet, precautions of social distancing, wear face masks and hand hygiene and spend some time of the day doing physical exercises in the appropriate personal protective equipment, have an active stress-free lifestyle to ensure healthy body that can help them cope up with adversity. Also, they must learn to wear personal protective equipment's (PPE) for long duration, keep themselves hydrated and be ready to help their colleagues in case of need whenever required and be punctual during shifts. ( Fig. 1)

The pandemic has seen an increase in incidences of mental breakdown, anxiety, and stress among residents. There have been multiple reasons for this, and one must ensure that none of the residents feel alone. Regular meditation and spirituality should be practised by residents to energise them both mentally and physically and lead a healthy lifestyle.



Fig 1: COVID warrior donned in PPE Operation theatre

Lead with transparency and honesty

Communicate strategically by incorporating learning and collective purpose

Integrate recovery periods and tools for releasing fear

Establish a routine to Create order

Prepare a long-term plan to deal with the waves of the crisis

Figure 2 : Traits which can potentially help residents overcome challenges ahead

During times of unprecedented crisis, embracing adaptive capacity in evidence-based strategies can help to establish long-standing resilience in the face of COVID-19. ( Fig 2)

Dr. Nishkarsh Gupta, Dr. Anju Gupta & Prof. (Dr) Raveendra Ubaradka S.



Chapter 23

# Golden Rules of Anaesthesia

## Guiding principles

### Preamble

When principles are understood, learning becomes more meaningful, effective and whatever learnt is retained better. Principles imply a set of fundamental facts and rules which are applicable across a wide range of patient population and clinical situations. Principles described below are specifically applicable for residents. (Figure18.1) Purpose is to motivate and help you to internalize the good practices so that these become part of your personality.



**Figure18.1: Golden rules of Anaesthesia**  
 For ABCDE expansion, please see point 5 below

## The Golden Rules

### 1. Never anaesthetize a stranger.

Always assess the patient before you anaesthetize or perform any intervention. Next, confirm the identity of the patient again before the process of anaesthesia begins. World Health Organization (WHO) surgical safety check list with sign in,

time out and sign out components should be meticulously followed in letter and spirit. Anaesthetizing a wrong patient, if ever happens, is unpardonable.

**2. Explain risk, establish rapport, and document the findings of assessment and discussion. Take informed written consent.**

These measures represent a safe, high quality anaesthetic service and can lead to a cordial and comfortable environment with mutual trust and cooperation. It will also be of immense medicolegal value.

**3. Fast the patient adequately for any elective procedure. Assume every patient posted for emergency procedure as “full stomach” and manage accordingly.**

Normally, fasting reduces the risk of aspiration of gastric contents, one of the dreaded complications related to anaesthesia. However, the resident should remember that, even after fasting as per the guidelines, there are certain groups of patients in whom complete gastric emptying is unlikely (Table 18.1). Ultrasound assessment of preoperative gastric volume is helpful.

**Table 18.1**

- Parturients
- Opioids
- Obese patients
- Moderate to severe pain
- Gastrointestinal pathologies: gastroparesis, intestinal obstruction, gastro oesophageal reflux disorders
- Renal failure
- Diabetic patients with autonomic neuropathy
- Critical illnesses, Ex: Sepsis

**4. Optimize the co morbid conditions before surgery.**

Control or optimization of associated medical conditions or risk factors helps to reduce anaesthesia related risks. Examples are cessation of smoking, controlling blood pressure, blood sugar, weight reduction and reversing bronchospasm.

**5. Safe anaesthesia is safe management of ABCDE. That is Airway (and analgesia, amnesia, prevention of awareness and aspiration prevention), Breathing (ventilation + Brain+/- bleeding management), Circulation (Hemodynamics, rhythm, pressure, volume) and Drugs (safe dose, route, volume, avoiding medication related errors, defibrillation) and environment (logistics, help, skill).**

It doesn't mean that we manage airway in every patient (like those who receive only regional anaesthesia). But preparations for management of airway should be

ready for every patient, should the need arise due to any reasons.

**6. Always prepare a written plan with alternate options, about technique, drugs, equipment etc. and anticipated complications.**

Practicing this simple exercise daily helps you to internalize good values related to safe anaesthesia practice. Do it for your own benefit, with your complete involvement. Compare your plan with the actual management after the procedure, you will learn lot of lessons.

**7. Checking equipment and preparing medications before the procedures.**

Checking the equipment and medications can be life saving and also improve the quality of care when properly used. On the other hand, equipment can also be source of adverse events when not available, malfunctional or improperly used. Always load the drug yourself confirming the drug and immediately label the name and concentration. Syringe swap is not uncommon as once loaded, most of the drugs look alike.

**8. Tipping operating table is always safer. Know the functions of the table.**

It is important to be able to change the position of the patient as required for the anaesthetic management or surgical requirement. One of the advantages of a tipping table is the ability to lower the head end of the patient when there risk of regurgitation. This is one of the measures to prevent pulmonary aspiration.

**9. Keep working suction always ready before induction**

This safety measure and should be a part of every induction protocol, both in elective and emergency procedures. It helps to quickly suck out of the regurgitated gastric contents, foreign body, blood or secretions. In emergency procedures with high risk of aspiration, an additional standby suction apparatus is recommended.

**10. Be prepared thoroughly in anticipated difficult airway. Priority is maintaining oxygenation throughout airway management.**

Often your focus during airway management is on succeeding in intubation, at the cost of everything else. Intubation is life saving only in very few conditions whereas oxygenation is continuously required and can be maintained by other strategies as well. Repeated intubation attempts, especially without appropriate ventilation in between and without apneic oxygenation increases risk of hypoxia. Even in patients with apparently normal airway, you should be prepared for a remote possibility of unanticipated difficult airway.

**11. Rule out contraindications before any regional anaesthesia .**

Patient refusal, abnormal coagulation profile due to disease or drugs and local infections are universally recognized as absolute contraindications for regional

anaesthesia, especially central neuraxial blockade. Any exception to the above rule, should be the decision of experts and must be documented.

### **12. Proper documentation of the entire perioperative course**

Documentation is one the most important responsibilities of a resident. It should be clear, lucid, neat, real time and complete in all respects. Both the objective and subjective information should be documented. Documentation has multiple beneficial effects, clinical, academic, and medicolegal. It is also a valid proof of your work and will help you in career progress.

### **13. Monitor carefully during the entire perioperative period and hand over safely to the appropriate staff in recovery area.**

A mandatory requirement of anaesthetic management, irrespective of type and duration, is monitoring of the patient. Established minimum standards should be followed and additional monitoring should be adopted as required subject to availability. Monitored values should be documented continuously, frequency determined according to monitored parameter and clinical condition.

*Do not treat only the numbers on the monitor.* They make sense only when you consider them in relation to patient's condition at a given moment and also overall preoperative condition, baseline values and management goals during anaesthesia. Example, a blood pressure of 86/40 mmHg could be 1) normal in a newborn 2) induced for hypotensive anaesthesia in a maxillofacial surgery 3) normal response to propofol and harmless in a healthy adult and hence without the need for correction and 4) severe hypotension in a patient with ischemic heart disease or due to significant bleeding. How you manage differs in each of these situations.

### **14. When in doubt, call for help. Similarly, when you suspect any serious complications, 2 most important steps: Call for help and 100% oxygen administration.**

**Help and 100% oxygen** are always key words in anaesthesia. Not calling for help is a negligence and can result in adverse outcome. No resident or even specialist is expected to be able to manage every patient on his or her own at all the times. Your colleague, friend or senior could be a savior for you, and you could be the savior for others in times of such crisis.

### **15. As a resident understand your limitations, discuss the plan and details as required, with your staff.**

All throughout the training, residents should consciously and clearly understand their limitations and privileges. Always make it a point to discuss and get guidance from your seniors and faculty. It helps in your all-round progress as a true

professional with competence and integrity.

**16. Earn the trust of your teachers, colleagues, and others around you, with sincerity, integrity and hard work.**

Nothing can replace the core human values. Medical profession, especially anaesthesia, needs values to be inculcated and internalized in full measure in your personality. Earning the trust of your teachers and winning the confidence of fellow residents is the biggest reward a resident can ask for.

**17. Maintain/develop good communication skills**

Anaesthesia training is not only about theory and technical skills. Communication skills helps to achieve excellence, along with skills and knowledge. It is a part of building a great future for yourself. However, remember that excellent communication alone cannot substitute for the lack of knowledge, skills and good human qualities. Each has its own place.

---

**Prof. (Dr) Raveenra Ubaradka S.**

---

**Six modes of error detection**

1. Standard check : Errors detected during routine check or monitoring of environment.
2. Outcome signs : In this the errors are detected by the effect of action on the patient .
3. Suspicion from knowledge
4. Interpellation : Detected by others
5. Alarms : Important source of detection of errors
6. Chance

Rivers do not drink their own water; trees do not eat their own fruits; the sun does not shine on itself and the flowers do not spread the fragrance for themselves. We are all born to help each other. No matter how difficult it is....Life is good when you are happy; but much better when others are happy because of you.

*Pope Francis*

Chapter 24

## Experts Advice Invaluable

### My advice to Residents / Fellows in Anesthesia

This is the golden period of your life, whatever you learn during this formative period of professional life, will stay with you forever. If you have a solid foundation professionally it will take you a long way. I joined my anesthetic training at AIIMS and during those 3 years I did not go to a cinema hall and hardly had timeout with my old friends! This hard work and the firm knowledge base got me through not only my MD exam but also through MNAMS and later FRCA (London). You later reap what you sow!

Besides theoretical knowledge (which is a must) you need to put in hard work at this stage of your career. More the experience, better you will get at your job. Besides that, it will carry a good impression on your seniors and colleagues which will help you in future job / training prospects. Hard work kills none, lack of work certainly does! After U.K, I worked in Denmark for 3 years and I was given preferential treatment over the local Anaesthesiologists as I was always ready to work even when I was not on call!

Academics and research go hand in hand. Get involved in some research project at every stage of your career, present and publish or perish! Besides being an ego kick it will give you a distinct advantage over your contemporaries with similar qualifications and experience but none or lesser number of publications. Don't hesitate and take the plunge! It is always difficult the first time but gets better and easier with experience!

Be sincere and honest with yourself, your patients and colleagues. People should trust you and have faith in you. If you have botched up, own up! If you are knowledgeable, hardworking and honest, the surgeons also will trust you and respect you. Anaesthesia being a dependent speciality its importance because then they will leave major decision making to you. You earn respect, can't demand it!

Learn to take well thought after risks in life! After weighing pros and cons you will have to take the plunge if you want to succeed, but never burn your bridges! Always keep good relations with your previous seniors and colleagues! Also, early on choose your super speciality like cardiac, neuro, paediatric, obstetric Anaesthesia, pain management or critical care and try to excel in it. Truly sky is the limit if you do all these!

All the best!

**Dr. Yatin Mehta**, MBBS, MD, DNB, MNAMS, PGCCMH, CEPC, IDRA

## How anaesthesia residency can change the life of the resident - my thoughts

The anaesthesia resident meanders through the unique, dynamic and complex environment of the operating room as well as areas outside it, trying to manage the patient, surgeon, interventionist, equipment and personal interactions. This process needs more than guidance, instruction and training. It should be a process that leads to a fundamental change. A change in knowledge, beliefs, behaviours and attitudes. An ability to develop higher order thinking skills. A strong understanding of pathophysiology and manifestations of the disease and their implications in anaesthetic management, and, very importantly the manual dexterity to perform procedures is a given in any program. While picking up such nuances, they need to acquire the ability to think quickly, rationally and methodically. They also need to figure out how to cope, handle and manage pressure and stress. Stress during and after residency can be overwhelming and program coordinators should provide them with the tools to manage it when it rears its ugly head. This can be attained when the resident starts loving and enjoying the subject and becomes proud of what is being and is to be done.

To me an ideal program should be able to inculcate the passion for the subject, speciality and the work. Anaesthesiology is often wrongly referred to as a dependent discipline and residents at times get bogged down by this. Postgraduate students need to be imparted with the concept that they are a very key component in the well being of the patient. They are an important stakeholder in the patient's journey from being sick and scared to being healthy and happy. They are the physicians to provide pain control when a trauma victim writhes in agony or a labouring mother screams. Complex, comprehensive surgical and interventional procedures have developed hand in hand with the rapid strides in anaesthetic care. Residents need to not just be taught to learn anaesthetic management but they should be made to understand their major role in a patient's well being. They have to recognize their responsibility in making the treatment safe as well as comfortable. They have to believe from the very beginning that they are perioperative physicians and their care neither begins nor does it end in the Operating room. They are crucial to the current buzzwords of healthcare - quality and safety. Pride, passion and professionalism provides excellence. A responsible teacher makes a trainee responsible by providing appropriate responsibility at appropriate levels. This sows the seeds of leadership and stewardship. These values are essential to make the resident understand that they are not mere facilitators of surgical care but are responsible for good quality patient care. They need the requisite spark and fillip to get them out of the confines of the Operating Room and enjoy their time under the sun as role models and leaders in safe

and quality patient care. These do not appear in texts of anaesthesia and not many seminars or webinars are held highlighting the same. They are possibly difficult to impart without the teacher leading by example. A well-formed mentor mentee relationship also helps in developing a love for the speciality. It is our role and responsibility to help residents understand, care about and act on core ethical values. We can be the *Magister Ludi* for their character education.

**Dr. Saikat Sengupta** MD, DNB, PGDMLS, FICA.

---

## Residency in Anaesthesia - my perspective.

Anaesthesia residency has changed enormously over the last 30 years. I did my MD during 1990-93 from KMC Mangalore. We used to work both in the Govt. Hospital (GH) and private Hospitals giving us an opportunity to experience both. In the GH, we had to come to OT at 8.00, check machine, load drugs, dilute them and label. One who comes first and sets a table will get to anaesthetize the first patient. Our monitor was hand-on-pulse (HOP). We were with patient all throughout the surgery with HOP and eyes on the operative field. There used to be regular teaching by seniors and faculty inside OT while we were with patient. But in the private Hospital the trolley was set by technicians, drugs loaded by them and we had ECG & pulse oximeter. The confidence gained in GH helped a lot in private practice to manage any case alone with minimum available facilities.

Now anaesthesia profession has changed for the better with so many changes. All teaching hospitals are equipped with state of the art work stations, monitors etc. Often, when the resident's eyes are on monitors, their hands are on mobile. The patient's condition is assessed by machine and monitored, but to touch with patient. However, the situation is not same in all the teaching institutions. Everyone may not get the same opportunities during training period due to differences in available facilities. Big hospitals will be having some of these, but small hospitals will have only bare minimum monitors. Also, they may have only Basic versions of Boyle's Machine and a Pulse Oximeter. When the newly qualified resident goes for "private practice", he/she may find it difficult to adapt to the "scale downed" facilities.

What a resident should learn now is not just anaesthetizing a patient in an ideal atmosphere with support around, but to manage a case singlehanded in minimum facilities. Monitors may fail, but not our experience and knowledge. Our hands should always be on patient's pulse and eyes on operating field. Look at both patient and surgeon before starting an emergency. It will tell a lot. If surgeon doesn't look very comfortable, especially obstetrician, it means there is something wrong.

Learn from everyone, even the OT Technicians, OT sister, MNOs etc. They have been in

OT for years and have seen many surgeons, anaesthesiologists and patients. They will tell you how the others were doing and the result. Take all clues from them and use your judgement. Have good communications and relation with everyone around you from sweeper to head of the department. Respect all. Learn from every one.

Do not restrict to anaesthesia alone or only one technique. Learn different techniques from different persons. How I give a spinal or epidural or caudal or a nerve block or giving GA will be different from others. Learn from every one and adopt the best suited for you and your patient in the given condition. Learn Pain and palliative Care and Critical Care. They are added advantages for you. In a small place or hospital, you can practice all and will be liked by all. Learn non technical skills and develop your personality. You must learn how to conduct a case, keep good relation with all, keep OT team happy, your family happy. Available at any time, but should take sufficient rest at available time. Use your free time for your hobbies and they will be your stress relievers. Manage your money like a professional, do-good financial planning for future and plan alternative sources of income, in case you are not successful in your private practice or unable to do your profession for any reason. Attend classes from leaders and experts both in anaesthesia and others. Success will be yours if you have passion for these.

**Dr. Venkatagiri K. M.**, M.D., President, ISA National

---

## Some thoughts for PG students who join the Residency training in Anaesthesia

Most post-graduate students join the Department of Anaesthesiology with trepidation, not sure they have got themselves into. The Anaesthesia rotation during MBBS is most often used for leave, marriage, etc, and the anaesthesia questions for the examination are “optioned out”. With a few exceptions, most land up with Anaesthesia more by compulsion than by choice. The good news is that you have entered into speciality that is patient-centric, modern, evidence based, intellectually and technically challenging, and emotionally satisfying. If someone had advised you to take anaesthesia because it was a “light” branch, this is absolutely the wrong reason. OTs can be long and a test of endurance, but challenging cases and nail-biting events more than make up for it. The ICU is grueling, but the satisfaction of saving lives overcomes all the sleep deprivation. Seeing patients recover without pain and with a smile on their face makes the daily schedule of preoperative visits, OT management, pain management, and postoperative intensive care worthwhile.

Residency is a unique period, and in many ways, a turning point in your life, and it comes with opportunities and challenges. Opportunities to train to become a specialist

perioperative physician, make new friendships, forge new bonds and value your financial independence. Challenges include living and working in a new social, cultural and professional environment far away from home, dealing with colleagues and seniors with different and at times difficult personalities, and balancing work, study, and family life. You have to work and study at the same time, be a student and also take responsibility for your actions and their impact on patient outcomes. You may face many brickbats and receive few or no bouquets. In some ways, it is a battle for survival, but one which you will look back on with satisfaction and a sense of accomplishment. Success is almost certainly guaranteed if one sticks to the basics - be sincere, hardworking, and above all, honest. Be honest to admit mistakes; mistakes (yours or others) are an opportunity to learn and to improve. Pick up the good points you see in your seniors and colleagues, as well as unlearn some avoidable practices that you may observe. Remember that the patient is at the centre of our universe. Despite the stress and the burden of work, patients and their families must be treated with respect and humanity. Arrogant and abusive behaviour is an absolute, non-negotiable crime. Similarly, treat all those working with you - doctors, nurses, technicians, Class four workers with respect and courtesy. Anaesthesiology lays great emphasis on patient safety. Do not forget that your safety is also of paramount importance; unless you are safe and healthy, you cannot look after the health and safety of others. Make sure you take appropriate precautions at work and do look after your physical, mental, and spiritual health. You must learn to make the most of your limited free time, whether to rest, exercise, study, or party. If the batch of residents works together, and co-operates in terms of on-call exchanges, covering for illness and holidays, many of the work-related stresses can go away. Share your troubles and problems with a friend, colleague, or senior in the department. Find a mentor who can guide you in your career.

Apart from the theoretical knowledge and procedural skills, you must imbibe a work culture of professionalism and empathy that will not just make you a competent perioperative physician but a good doctor. Your residency lasts three years, but it is an education that will last you a lifetime.

**Dr. J.V. Divatia**, MD, FCCM, FICCM

---

## **Postgraduation is challenging but enjoyable!**

You have arrived at the next crossroads of your career - Postgraduation. Congratulations on becoming a doctor and successfully getting past the first major milestone in your career. Let us be honest. The next 2 or 3 years are going to be the toughest years to crack. You will be busy as you have never been before. You will be assuming more and more responsibilities in your chosen field. Time is precious and you will have to make the most of every minute. Anaesthesiologists are often referred

to as Perioperative Physicians. While the surgeon is busy with his/her chosen field, our job as Anaesthesiologists is to ensure that not only is the perioperative experience safe for the patient, but also 'pleasant'. To this end, one needs to acquire the knowledge and skills needed to perform one's duties efficiently.

It would be a good idea to divide your professional training into several segments with goals to be achieved during each segment. While these segments should follow a logical sequence, they could well be changed to suit your style of learning. The first month is best spent trying to crack the pharmacology of special anaesthetic and paranaesthetic medications that you will be using to create the anaesthetised state. The majority of these drugs are not covered in any detail during our Pharmacology days. It would be mandatory for one to acquire a working knowledge of anaesthetic pharmacology during the 1st month of your postgraduation. "A drug a day" – and you will be done with this hurdle. The first 3 to 6 months should be devoted to acquiring the basic skills of airway management and central neuraxial blocks. One should also understand the importance of the statement "For some must watch while some must sleep". The philosophy behind patient monitoring and honest documentation needs to be internalised in the first 6 months. Having mastered basic knowledge and skills during the first 6 months, one can now train one's sights on to the Postgraduate Dissertation. All of us pledged to dedicate our loves to caring for patients but where did "Research" come from? Research does not come naturally to most of us. However, it is a necessary part of postgraduation. One needs to be lucky to get a sincere teacher who will guide your dissertation. Frequent meetings with the Medical Statistician along with your Guide will help you overcome this part of your training. Remember, neither your Guide nor you are interested in making any "earth-shattering scientific discovery". All you need to learn is planning a scientific study, meticulous collection of data, reviewing relevant literature all along so that one does not repeat mistakes already made by our predecessors, and writing up the results and conclusion of your study in simple, scientific language. "Simple" you retort! But don't despair if things don't go smooth all through. Life always gets better if one applies one's mind to it.

You will soon shed the title of First Year Postgraduate. That means you get promoted to 2nd and later 3rd year of postgraduation. The 2nd year is when you have started understanding what anaesthesiology is all about. You are probably doing more reading "around the difficult clinical cases" that you are doing. Don't lose this opportunity. You have an eager 1st year who wants to learn and you are ideally placed to teach him or her. Co-opt one of your consultants posted with you every day and decide the previous evening what you would like to discuss. You do the hard work. You do the teaching without pushing patient care to the back burner. Two things are sure to happen. The first, you will wonder whatever happened to those much-touted "hours of boredom" in the operating room! The second and more importantly, you will

realise how well you have understood (or incompletely understood) what you are teaching. It is a “win-win situation” for all concerned. Once you have experienced the joy of understanding the why and what of anaesthesia, there will be no looking back. Teaching and learning are both addictive, and the margins get blurred as you progress. I often say that “a good postgraduate makes his/her teacher more knowledgeable by asking questions; a good teacher no doubt acts as a catalyst by providing the stimulus to read”.

The first 2 years have now whizzed by creating a strong foundation on which you will build not only the 3rd year of your postgraduation but also the rest of your career. With your dissertation now shedding its ogre avatar and starting to look like an angel, you now need to concentrate on driving home the advantage carefully gained in the first 2 years. Strike while the iron is hot! Your last lap has just been flagged off. You have earned the title of “Final year postgraduate”, and with that, you start assuming greater responsibilities at work. Taking supervised decisions that turn out to be right most of the time is that high octane that you are looking for to fuel this last lap. Put your head to the grindstone, be honest and run the race along with your batchmates. There needs to be a subtle camaraderie that unites all of you. Joint study often helps in understanding that you are all on the same page. It removes hidden fears. Competition is good but in the end, all that matters is that you do not let yourself, your teachers or your alma mater down.

The final exam is just another day in your life. Face it with courage. You are going to face a tougher exam probably every single day of your life. You are not expected to know everything. Believe me, none of the examiners ever knew everything (and I surely speak for myself)! Get a good night's sleep, dress professionally for the occasion (but remember, it is not your wedding day), be honest with your answers, present your concepts clearly, never cross swords with your examiner. They did not become old overnight!

All the best. Enjoy the next 2 to 3 years of postgraduation. The message that Raveendra and Nalini have paraphrased in the Anaesthesia Residency Handbook is by and large the same. It will be a good read not only for the 'Resident' as the title promises but also for many anaesthesiologists who are early into their careers as practitioners or teachers of Anaesthesiology. I wish Raveendra and Nalini a successful launch to the Anaesthesia Residency Handbook!

**Prof. Ramkumar V., MD**

---

## Surgeon's Perspective of Anaesthesia Residency Training

**A good teacher can inspire hope, ignite the imagination,  
and in still a love of learning.**

**- Brad Henry**

Being a paediatric surgeon I have utmost respect for a competent and confident Anaesthesiologist. The calm in the theatre with only the sound of the beeps on the monitor knowing that my baby is safe in the hands the doctor at the headend kept me concentrating only on my work, doing the best for my tiny patients. This synchrony of a surgeon with an anaesthesiologist comes from mutual understanding as well as mutual trust, based on maintaining highest standards of competence both academically and clinically and working to provide the best care for the patient. My job as a surgeon does not end with the surgical correction, but I, also have to encourage my patients and their parents, and give them tools to improve their recovery till they are at their best to go home. As a surgeon I am personally involved with my patients from the day they are brought to my outpatient, till they are safely discharged from the hospital. The safe surgery is incomplete without safe anaesthesia and this book highlights the connection between the surgeon and anaesthesiologist, with the patient, as a continuum

Of all the milestones and achievements in medicine , conquering pain can be considered one of the few that has potentially affected every human being in the world. There was a foregone era when it was thought that young children neither respond to , nor remember painful experiences to the same degree as adults which has been superseded by human newborn research in which failure to provide anaesthesia or analgesia for newborn circumcision resulted in immediate physiological changes as well as long term behavioural changes. Pain relief in the neonates and children has evolved from antiquated not required to multimodal analgesia , regional blocks, spinal and epidural anaesthesia .I have been a part of this evolution and major improvements in the understanding of the physiology and pharmacology of anaesthesia resulting in better outcomes and survival .

The wide experiences of anaesthesiologists in different parts of the world researching , reading , implementing protocols and again going back and checking their findings has been instrumental in the present day scenario of safe surgery and safe anaesthesia. Dr Raveendra is amongst those august few who continue to learn and teach and this book is the essence of all the hard work , experience and constant upgradation .

The perioperative care, communication, safety protocols and evidence based recommendations are as important as the practice of correct anaesthesia techniques,

pharmacology of drugs, equipment, physics and last but not the least anatomy. There is in-depth coverage of each topic with key points being highlighted. Vast experience of the authors both clinically and in teaching, in conducting interactive workshops have added a personal touch to the textbook, making it extremely useful to the novice reader as well as the practicing anaesthesiologist .

The young anaesthesiologist bursting with information, brimming with confidence should also have the emotional quotient specially with children, where, in the span of a few minutes, sharing a smile, an understanding look, the way you stand, have to be intuitive to connect to a child to establish trust for them to accompany you without apprehension into the operation theatre. With Dr. Raveendra, I have admired him in his work and his commitment to providing the best care to his patients .

I congratulate Prof Raveendra and Prof Nalini on a very well written book, which will be useful not only to the doctors working in Anaesthesiology, but also those working in the emergency rooms and surgical specialities and intensive care areas. The ever broadening horizons of anaesthesia, integrated with rapidly advanced research, have been dealt with a fresh perspective and vital information have been handled in a crisp and lucid manner.

I hope this manual remains in the pockets of every trainee and helps for quicker and confident decisions to save the patients.

**Prof. (Dr) Srinivas M.,** MCh (Paed Surg), Dean, ESIC Medical College, Hyderabad.

## A message to anaesthesia residents

My very dear anaesthesia resident,

Greetings from Dr J Balavenkat, who wore the shoes that you are wearing now 33 years ago. I welcome you wholeheartedly into the fascinating world of Anaesthesia. I congratulate you for choosing to be an Anaesthesiologist.

I consider every Anaesthesiologist as a special child of God, because God chose you to be an Angel and bestowed on you the Knowledge, Skill and Wisdom to prevent death and alleviate Pain. I want each one of you to create a legacy and lead a legendary life. If this has to happen you need to plan every day appropriately which would enable you to accomplish this task from the day one of your Residency. You need to evolve holistically and to do that you need to take a few steps.

Step 1 Tell yourself every morning, i shall dedicate this day in enriching myself and become better than yesterday.

This involves reading a new topic, learning a new skill and observing an act of your

senior. Imbibe them into you and make them dissolve inside you forever.

Step 2 Tell yourself every morning, that you are going to give the best to your patient who is suffering and who is under your care, because you need to remember every patient aids you to become a better professional and is contributing to your growth.

Step 3: Resolve every morning that the specified number of hours that you are supposed to be in the hospital is completely dedicated to learning without any other agenda

Step 4: To accomplish your task with ease, you need to mentally play before you physically play. For example if you need to give General Anaesthesia to a patient tomorrow and you have seen the patient today, construct your Anaesthesia plan mentally today and you would enjoy as you will sail through the case next day with ease.

Step 5: It is extremely important to practise evidence based medicine and you need to graduate yourself constantly by reading new Guidelines and Journals.

Step 6 : You are branded by your attitude and acts. To be branded as the BEST, you need the following ingredients: Punctuality, Honesty, Integrity, Humility, Calmdemeanour, Good Interpersonal Relationship, Positive and Communicate with confidence.

Step 7: Strong mind in a strong body. Do spend time in keeping your brain happy by indulging in hobbies you like the most and ensure physical endurance by yoga and sports

Step 8: Take Responsibilities in organising events and play leadership roles, these will enable you to grow in the most appropriate path

Step 9: Learn to manage your finances, financial stability will allow you to work with ease and will give you a lot of inner peace, which would allow you to concentrate with utmost focus at your work

Step 10: Be extremely respectful to your Parents and Teachers always, their blessings are of utmost importance to your growth

When you go to bed every day, kindly ask yourself if you followed these ten steps. Your Journey should be a " CRUSADE AGAINST MEDIOCRITY". I wish that each one of you become a POWER TO RECKON and AN ICON.

**You can write to me anytime : drbalavenkat@gmail.com**

**Ever interested in your progress,**

**Dr. J. Balavenkatasubramanian, MD, DA**

## Books to Read

Dear Residents, reading is a great habit. Books are your all-weather friends. They help to widen your horizons of knowledge and perspectives. Make you more confident. Here is a list of books, non-academic ones, which you can go through and will surely find enlightening and informative.

1. The Power of Habit, Charles Duhigg
2. Most and More, Mahatria Ra
3. Fistful of Kindness, Om Swamy
4. Happiness trail, Ramesh Venkateshwaran
5. The Checklist Manifesto, Atul Gawande
6. Think Like an Anaesthetist, Murali Thondebavi
7. Wake Up Call from the anaesthesiologist, Dr Vasanthi Vidyasagan
8. Learning from experience, Dr Vasanthi Vidyasagan
9. Establishing, Managing, and Protecting Your Online Reputation, Kevin Pho and Susan Gay
10. The Happy Brain, Dean Burnett
11. The Magic, Rhonda Byrne
12. Do it now, Napoleon Hill
13. The power of Positive Thinking, Normal Vincent Peale
14. Anesthesia : A Fascinating Tale, Dr Jitendra Belani
15. Laughing Doses by Dr Ganesh Chaudhary

## Anaesthesia residency 3 decades ago

Residents of 2022 or future might be curious to know how the anaesthesia training could have been 3 decades ago. I share here some of my own memories of residency way back in early 90s in a Govt set up. Hallmarks of a govt setup then were plenty of clinical materials in the form of patients, minimum facilities in the theatre but dedicated teachers.

Anaesthesia was limited in terms of number techniques, drugs, equipment and monitors. By today's standards, you might feel that it was rather primitive. But that itself was a transition from a still poor setup to a more advanced one, such as introduction of thiopentone, or more common availability of Boyle's machine. Common man's knowledge about anaesthesia at that time was only by way of words like ether, chloroform, etc. and making a person unconscious. Patients were hardly aware that there is a separate anaesthesia doctor who is also trained similar to surgical colleagues.

Techniques were limited to GA and spinal. GA was with mask ventilation for short cases or endotracheal intubation for longer duration, which however, rarely exceeded 3-4 hours. Era of ether induction was just coming to an end, at least in places where I was trained. But it continued to be used for a while as a maintenance agent and was subsequently replaced by halothane. Mask ventilation was the initial technique any trainee would be trained with and making the resident to hold mask for even an hour or more was not uncommon, more so when it is a junior. But that helped me in future to ventilate even difficult airway patients. There were no supraglottic airway devices, only endotracheal tube and it was "red rubber tube" with a high-pressure low volume cuff. Washing in running water was the routine way of disinfection. Drugs used during GA were atropine, morphine or pethidine or pentazocine, thiopentone or ketamine for analgesia, ephedrine for hypotension, pancuronium was the only muscle relaxant, later vecuronium being added. Scoline was more routinely being used than now.

Regional anaesthesia was limited to subarachnoid block (SAB). Steel needles for spinal were the only ones available and 20G was most commonly used. Needles were all meant to be reused after autoclaving. Epidural was introduced in our institution when I was in 3rd year. Even now I struggle with epidural as I did very few in residency. OT assistants like Rajasab, Tinwale or Ahmed were providing such good positioning of patients for SAB that they could tell with precision whether your needle was in proper place even before CSF started coming out. Fond remembrances of those unsung heroes.

Hand on pulse and clinical observation, manual ventilation with a Bain's circuit (without circle system) was commonplace. We got pulse oximeter towards the end of 1992. BP monitoring was with a normal sphygmomanometer. Venous access was with steel hypodermic needle, sterilized only by autoclaving. Later, "scalp vein" sets replaced the needles. Present day canula was available only in the last part of our residency. Wylie's textbook of anaesthesia, 2nd addition was very popular. Boyle's Mark 2 and Boyle Basic were the only anaesthesia machines. I had used ether bottle, trylene bottle and Goldman vaporizer during residency. When nitrous oxide supply was not there intermittently, we used to use ether in air for GA with EMO (Ebstein, Macintosh, Oxford) apparatus.

All our apparently primitive anaesthetic techniques, drugs, monitors etc were more than compensated by the amount of "clinical materials", a very congenial environment for learning in the department with perfect harmony between the teachers and residents, residents among themselves, with the surgical residents and with OT staff. We had complete freedom to manage the patients. There was hardly any conflict or confrontation with other departments. I hardly remember any bad memory in my 3 years course and KMC Hubli department of anaesthesia was the second home with a motherly HOD and a host of learned and caring staff, who, more than anything else, were great human beings.

Lessons learnt during my residency: what you learn during residency remains with you for lifelong compared to whatever you acquire subsequently. Institution you were trained is the best place for you. Image you create with your work, knowledge and behaviour will influence your future progress in profession and life.

Chapter 25

## Self - assessment tool

### Know where you stand

Examination conducted by the university or National Board at the end of residency decides your eligibility to receive MD or DNB qualification. On the other hand, regular self- assessment (SA) of your training and knowledge will help to know where you stand in terms of your clinical abilities as well as academic knowledge. SA also helps to identify your own deficiencies and strengths so that you can build a strong foundation for the future career. Using the self-assessment tool proposed here, for the first time in any residency training program in anaesthesia, you can achieve these objectives.

Also, when you document your own performance and track regularly, it is a great exercise in self improvement and will reflect positively on your personality.

#### How to use the self- assessment format below?

1. Assess yourself under the headings of theory, clinical knowledge, skills, and others.
2. Fill in the final columns with the number 1-10, depending on your own overall assessment under each section.
3. Decide on the follow up needed in the next phase, write them down in 5 actionable points.
4. Performance in each assessment should reflect the improvement in the previous ones.
5. Do it meticulously at the end of each phase, it will be a formative assessment.

#### Interpretation of the scores

<5: You need significant improvement, consult/discuss with faculty and seniors, draw a detailed plan for improvement.

5-7: Look for specific areas requiring follow-up action to improve yourself.

>7: Very impressive, you are on the right track, keep aiming for excellence.

Follow-up of your performance through assessment 1 to 4 will help you to face to examination with confidence and knowledge. Of course, you must initiate corrective measures after every assessment as required.

**Assessment 1 - On completion of first 6 months**

Date : \_\_\_\_\_

Objective is to ensure that you are adjusted well to the working environment, understood the basic safety rules, familiar with basic techniques, drugs, and overall patient management. Also, make sure that the dissertation synopsis is completed, and actual work started. Also, identify any issues where you are able to cope up, understand the theory or practical management. If any, this is the right time to correct.

**Technical skills**

	Skill	Yes/No	Remarks/Score
1	Peripheral IV access; selection of cannula, site, preparation, asepsis, insertion and setting up infusion. Should be able to cannulate most of the adults except those who have difficult veins or children.		
2	Mask ventilation : a) ability to achieve a good mask seal in majority of patients before and after muscle relaxation, ventilate without gastric distension, b) identification of patients with difficult mask ventilation (DMV) and prepare plan for such patients with guidance of seniors or staff c) oral and nasal airway insertion and d) ability to identify and correct inadequate mask ventilation		
3	Endotracheal intubation: <ol style="list-style-type: none"> <li>1. Preoperatively recognize difficult intubation</li> <li>2. Knowledge of types of endotracheal tubes (ETT), selection (routine and specialized), size, checking and preparing.</li> <li>3. Plan for oxygenation during airway management</li> <li>4. Laryngoscope, suction, bougie – preparation</li> <li>5. Normal intubation sequence with induction and relaxation</li> <li>6. methods to reduce stress response</li> <li>7. Ability to perform easy intubations (Cormack Lehane grade 1 and 2) confidently</li> <li>8. Recognition of difficult intubation and appropriate actions</li> <li>9. Knows when and how to use a bougie, apply cricoid pressure</li> <li>10. Rapid sequence intubation: role and techniques</li> <li>11. Communicate clearly with assistant</li> <li>12. Call for help early in difficulty</li> </ol>		

4	Supraglottic airway device (SGAD) usage a) Knowledge about the role and limitations of SGAD in airway management and available device. b) Ability to manage airway with SGAD		
5	Spinal Anaesthesia a) Applied anatomy and physiology relevant to subarachnoid block b) Indications, contraindications, drugs and complications of spinal anaesthesia d) Preparation, positioning and techniques e) Performance of subarachnoid block in lateral and sitting position and aseptic precautions f) Patient management under spinal anaesthesia		

**My Statistics** (independently performed skills, with or without supervision including both successful and failed also)

Supraglottic airway insertion	Endotracheal intubation	Spinal anaesthesia	Others

Important complications (serious ones, related to airway, breathing, circulation, drugs)

**Others essential knowledge**

Parameter	Score	Remark
1. Consent, medicolegal issues 2. Interpretation of investigations 3. Positioning, basic monitoring 4. Machine checking and routine anaesthetic equipment 5. Broad principles of general anaesthesia and techniques 6. Asepsis, Principles, and techniques of central neuraxial blockade 7. Familiarity with the working environment and department 8. Ability to participate and understand the teaching programs 9. Comfort level with your work 10. Problems faced: conflicts, failures, frustrations, anger 11. Grasp of the local language (for residents from other states) 12. Dissertation: synopsis preparation and submission, ethical committee clearance		

**Overall score (1-10)**

Theory	Clinical knowledge	Skills & Patient management	Communication and teamwork	Others

Summary of your self assessment - 1 and targets for next assessment

**Assessment 2 - At the end of one year**

Date : \_\_\_\_\_

**Objective:** By now you are expected to have good knowledge of applied anatomy, physiology, pharmacology, basics of anaesthesia along with practical knowledge. Clinically, you should be able to manage ASA 1 and 2 patients undergoing routine procedures, with normal airway, including older children.

**1. Theory:** Good knowledge of following by now makes your further learning easier and cohesive.

- a. Non-operating room anaesthesia, dental, pediatric, neuroanaesthesia and ICU.
- b. Consolidation of medical knowledge.
- c. Hypothesis, principles, guidelines, protocols, and recommendations related to anaesthesia.
- d. Knowledge of drugs, pain management and advanced resuscitation.

**2. Clinical knowledge and experience**

- a. Management of high-risk patients
- b. Sedation in various clinical situations
- c. Initiation and interpretation of all invasive and noninvasive monitoring
- d. Life saving techniques like defibrillation, cardioversion
- e. Patient transfer

**3. Clinical skills**

No.	Skill	Score	Remarks
1	<b>Airway Management</b> 1. Pediatric and ICU airway management 2. Management of difficult airway 3. Video laryngoscopy 4. Extubation 5. Knowledge of surgical airway		
2	<b>Epidural anaesthesia and analgesia</b> 1. Indications, contraindications, and complications 2. Drugs used 3. Preparation, positions and techniques 4. Catheter insertion, its benefits and maintenance 5. Ability to perform lumbar epidural in both sitting and lateral positions 6. Ability to perform with assistance thoracic/caudal epidural 7. Preoperative counselling about the procedure 8. Soft skills during procedure		

<p>3</p>	<p><b>Nerve blocks</b></p> <ol style="list-style-type: none"> <li>1. Pharmacology of local anaesthetics and adjuvants. Local Anaesthetic systemic toxicity (LAST)</li> <li>2. Applied anatomy of peripheral nervous system.</li> <li>3. Indications, contraindications and complications.</li> <li>4. Sonoanatomy, basic principles of peripheral nerve stimulator and ultrasound machine</li> <li>5. Blocks given by various techniques- landmark, nerve stimulator guided and ultrasound guided methods.</li> <li>6. Ability to perform simple blocks independently.</li> <li>7. Recognizing block failure and complications.</li> <li>8. Sedation during RA and conversion to GA.</li> </ol>		
<p>4</p>	<p><b>Vascular Access ; basic principles, indications, contraindications</b></p> <ul style="list-style-type: none"> <li>• Ability to perform with or without assistance/ supervision</li> <li>• Subclavian and internal jugular cannulation</li> <li>• Radial artery cannulation</li> <li>• Connecting to transducer and setting up the monitor including calibration</li> <li>• Interpretation of waveforms</li> <li>• Complications</li> </ul>		

**Miscellaneous**

	Parameters	Score	Remarks
1.	Progression of dissertation work		
2.	Department presentations: performance and feedback		
3.	Communication and management skills		
4.	Participation in academics and nonacademic activities		
5.	Basic research methodology – knowledge		
6.	Teaching skills		

**Assess yourself on a scale of 1-10**

Theory	Clinical knowledge	Skills & Patient management	Communication and teamwork	Others

**Important complications**

Summary of self assessment - 2 and targets for next assessment

**Assessment 3 : At the end of 2nd year**

Date : \_\_\_\_\_

**1. Theory**

1. In depth knowledge of subspecialties: cardiothoracic, neuro, pediatric, obstetric, plastic, anaesthesia outside operating room etc.
2. Biomedical research, paper presentation (completed or ongoing)
3. Basics of statistics and journal interpretation
4. Knowledge of progress in the field, different areas which are not included in regular teaching programs
5. Consolidation and revision of basic anaesthesia knowledge, what you acquired in two years

**2. Clinical skills**

Knowledge	Skill	Attitude(affective)
1. Anaesthetic implications of ASA III and IV patients Score _____	1. Management of ASA I and II patients. Score _____	1. Communication skills Score _____
2. Basic principles and anaesthetic management of major surgeries- pheochromocytoma, scoliosis correction, cerebral aneurysm etc. Score _____	2. Anticipation and preparedness for major surgeries, ASA III and IV patients and emergency surgeries. Score _____	2. Teamworking Score _____
3. Patient blood management including massive transfusion protocols, resuscitation techniques in emergency scenarios Score _____	3. Independent performance of spinal, epidural (thoracic and caudal) anaesthesia and nerve blocks Score _____	3. Interprofessional relationship Score _____
4. Management of perioperative life-threatening emergencies including perioperative cardiac arrest Score _____	4. Lumbar epidural analgesia for labour. Score _____	4. Presentation Skills Score _____
	5. Assisting and preparing for advanced airway management (fiberoptic intubation, video assisted intubations etc.) Score _____	5. Self confidence Score _____
		6. Contribution to the department activities Score _____

Assess yourself on a scale of 1-10

Theory	Clinical knowledge	Skills & Patient management	Communication and teamwork	Others

Important complications

Summary of self assessment - 3 and targets for next assessment

**Assessment 4. At the end of 30 months**

Date : \_\_\_\_\_

**1. Theory**

1. Recent advances: go through the last 4 years question papers of different topics. Assess your knowledge
2. Journal articles : Interpretation of studies, clinical pro and con arguments, controversies, recent advances including in the last 30 months
3. Recent guidelines and trends
4. Knowledge of related subjects
5. Confirmation of brain death

**2. Clinical skills**

Parameters	Score	Remarks/ numbers
<p><b>1. Advanced intubation techniques</b></p> <ul style="list-style-type: none"> <li>• Fiberoptic guided intubation</li> <li>• Intubation through SGAD</li> <li>• Retrograde intubation</li> <li>• Front of neck access techniques:</li> </ul> <p><b>2. Regional techniques</b></p> <ul style="list-style-type: none"> <li>• Thoracic epidural</li> <li>• Labor epidurals</li> <li>• Caudal</li> <li>• USG guided nerve blocks</li> </ul> <p><b>3. Vascular access techniques</b></p> <ul style="list-style-type: none"> <li>• Central vein cannulations</li> <li>• Arterial lines</li> <li>• Intraosseous</li> </ul> <p><b>4. Independent conduct of Anaesthesia (or under supervision) for ASA 3 and more patients.</b></p>		

**Clinicals and academics**

Parameters	Score	Remarks/ numbers
1. Confidence about case presentation 2. Knowledge of drugs ( new drugs also should be considered) 3. Interpretation of ECG (Normal waves and values, diagnosis of axis, arrhythmias, ischemia, blocks) 4. Interpretation of blood gases 5. Interpretation of X Ray: Chest X Ray, Spine, neck, 6. CT and MRI 7. Ultrasound: probe selection and sonoanatomy 8. Completion of dissertation work and publications		

**Overall performance as you assess yourself on a scale of 1-10**

Knowledge	Clinical skills	Communication	Exam phobia	Others

**Complications**

Summary of self assessment - 4

## Anaesthesia Terminologies

Purpose of this chapter is to introduce important anaesthesia related terminologies to the new residents since many of these terms are not used elsewhere. The list and description are by no means complete. It is an attempt to help the residents synch into their new roles and responsibilities with ease. In-depth information about these terminologies are available in standard anesthesia textbooks. This chapter can be viewed as a “micro-dictionary”.

**Adjuvants (anaesthetic adjuvants):** A group of drugs used with the primary drugs during general or regional anaesthesia to achieve specific objectives. During GA, adjuvant drugs potentiate the analgesic and anaesthetic effects of primary drugs, reduce the requirement of inhalational agents or prevent or minimize adverse effects of the primary anaesthetic drugs. With RA, they have benefits like prolonged duration of anaesthesia and analgesia, faster onset of action and denser block. These include a wide array of drugs like opioids, alpha 2 blockers, magnesium sulfate to name a few.

**Algorithms:** Evidence-based sequence of actions used for optimal management of specific clinical situations to improve success, ensure patient safety and improve outcome. Examples are different algorithms for difficult airway management and ACLS algorithms.

**Airway :** This is the anatomical passage with unique physiological characteristics, extending from oral cavity/nose to the vocal cords. Consists of nasopharynx, oropharynx, hypopharynx and larynx. Airway management techniques are among the core topics in anaesthesia.

**Airway adjuncts :** Equipment which aid in securing airway in difficult airway conditions and includes stylets, bougie, airway exchange catheters, oropharyngeal and nasopharyngeal airways. They enhance the success of primary techniques like endotracheal intubation.

**Amnesia :** loss or absence of memory and is one of the primary goals of general anaesthesia. Anterograde and retrograde amnesia refer to the events after and prior to the administration of the drug with amnesic properties. Nitrous oxide and midazolam are two common examples.

**Anaesthesia :** The word Anaesthesia (or Anesthesia) was first used by William Osler to mean “Privation of Senses”

**Analgesia :** Absence of or relief from pain, is another primary goal of any type of anaesthesia. It can be produced by different group of drugs administered systemically or as regional anaesthesia. Analgesia produced by a combination of drugs and

techniques with different mechanisms of action and different routes of administration is called multimodal analgesia.

**Anaphylaxis** : Potentially fatal adverse drug interaction, often requiring aggressive management. Opioids, some induction agents, antibiotics and muscle relaxants, all used during anaesthesia can be potential sources. Ring and Messmer four step (I-IV) grading scale is used to describe the severity of perioperative anaphylaxis.

**Antanalgesia** : Medications which decrease pain threshold. Thiopentone, once popular induction agent, possesses antanalgesic effects.

**Apneic oxygenation** : Techniques for maintaining oxygen supply to the body, during periods of apnoea, primarily during laryngoscopy and intubation. This strategy is mainly required when the patient is at risk of developing hypoxia due to poor oxygen reserve or has difficult airway.

**Arterial blood Gas (ABG) analysis** : Measurement and interpretation of acid base related parameters from an arterial blood sample. It gives information about the pH, oxygen, carbon dioxide, bicarbonate and lactate concentrations in blood. Used in high- risk patients, in pre and perioperative period during major and long procedures and in ICU.

**Arterial line** : Access to an artery is obtained by means of introducing a cannula into a peripheral artery like radial, ulnar or femoral artery. It is used to obtain beat by beat real time blood pressure and for obtaining samples for ABG analysis. Indications include ASA 3 and more physical status, major and prolonged surgeries, contraindications to noninvasive blood pressure measurement, critical care etc. One of the essentials of modern anaesthesia.

**American Society of Anesthesiologists physical status (ASA-PS) grading** : Risk stratification of patients scheduled to receive anaesthesia based on clinical assessment. A patient can range from ASA 1 to 6 ASA-PS. E is added for emergency procedures. Higher the risk grading, higher the risk of anaesthesia.

**Bain's Circuit** : It is a popular type of coaxial breathing system (Mapleson D circuit) used for controlled ventilation in adults. Designed by Bain and Sporel in 1972.

**Balanced Anaesthesia** : Also written as boogie, it was the concept introduced by Lundy in 1926 to denote the use of multiple anesthetic drugs to produce not just unconsciousness but also amnesia, analgesia and muscle relaxation, that is, a holistic coverage with anesthesia.

**Bougie** : One of the airway aids and is primarily used as intubation assist device.

**Breathing circuits/ Breathing systems** : Assembly of tubing, valves and reservoir bag

in a specific order to provide ventilation during anaesthesia. A CO<sub>2</sub> absorber filled canister is an integral part of modern breathing system. A breathing system is the “bridge” between the anaesthesia machine and the patient's airway device. They are of different types, and each has its own indications, advantages and disadvantages. Examples are Mapleson systems, open, semi open and closed system (circle system). Circuits can be either “open type” where absorption of carbon dioxide in expired gases doesn't take place and low flow anaesthesia is not possible or can be “closed type” where both these functions can be achieved. There are specific circuits for both adult and pediatric population. Jackson - Rees modification of Ayer's T Piece was specifically designed for children less than 20Kg.

**Boyle's machine** : It is the original standard anaesthesia machine introduced nearly a century ago and which continues to be used even now with several modifications. It was developed by Henry Edmond Gaskin Boyle.

**Bronchospasm** : Sudden severe and reflex spasm of bronchial smooth muscles in response to stimuli such as light planes of anesthesia, airway instrumentation in presence of preexisting reactive airways (asthma, active upper respiratory infection), mechanical obstruction of airways to name a few. This can result in decreased saturation and tight bag and requires immediate intervention. Important to watch for in every general anaesthesia. Endobronchial intubation is the most common cause of bronchospasm, particularly in otherwise healthy patients.

**Capnogram** : Monitoring of end tidal carbon dioxide (EtCO<sub>2</sub>) in the expired air of anaesthetized or sedated patient in OT or ICU. Display is real-time and both as a graph (capnograph) and numerical values. Capnography is an important aspect of anaesthesia training. Dr Bhavani Shankar Kodaly, an Indian origin scholar and senior anaesthesiologist in USA, is a pioneer in the development of capnography ([www.capnography.com](http://www.capnography.com)).

**Circle absorber (Carbon dioxide absorbent)** : These are the granules contained in transparent canisters as integral part of circle system in modern anaesthesia workstations. They absorb the carbon dioxide in exhaled gas and help in recycling of gas mixtures during anaesthesia. There is usually a colour indicator incorporated which changes colour denoting exhaustion and need for replacement of the absorbent.

**Cardiopulmonary bypass** : It is a mechanism of bypassing the heart and lungs by using an artificial external set up which performs the work of heart and lungs while the surgeon performs a cardiac surgery.

**Caudal anesthesia** : It is a form of central neuraxial block wherein the epidural space is approached in sacral region through the sacral hiatus to deliver local anesthetics. It is

usually administered in children up to 7 years of age.

**Central neuraxial blockade** : It refers to the selective blockade of the central neuraxis, that is the spinal cord, at the subarachnoid (commonly referred to as “spinal anesthesia”) space or epidural space (epidural block at cervical, thoracic, lumbar or caudal level) using local anaesthetic drugs.

**Central venous cannulation** : Refers to vascular access into central veins (subclavian, internal jugular, axillary and femoral) using a single or multi lumen catheters for specific indications, such as pressure monitoring, large volume fluid administration and for certain drug administration. When cubital veins are cannulated with a long flexible catheter, it is called peripherally inserted central vein (PIC) cannulation or commonly referred to as PIC lines.

**Cricoid pressure** : Also called as Sellick's maneuver, it is the application of pressure by an assistant over the cricoid cartilage as the patient loses consciousness while inducing general anaesthesia, to compress the esophagus and prevent regurgitation and aspiration of gastric contents. This is used in full stomach scenarios and requires the assistance of a trained assistant.

**Dead space** : The space not utilized for gas exchange in the airways is referred to as dead space. Important concept in anaesthesia and ICU with immense practical applications. It can be anatomical dead space (starting from nostrils to terminal bronchioles which only transport gases), physiological dead space (areas of ventilation-perfusion mismatch, that is either only ventilation or only perfusion takes place with no effective gas exchange) or machine dead space (the space between patient- airway instrument interface and the point where inspiratory and expiratory gases branch off).

**Defibrillation** : Administration of a high intensity electric shock to a fibrillating heart (cardiac arrest due to ventricular fibrillation and pulseless ventricular tachycardia). Related term is cardioversion wherein much lower energy is used to revert different kinds of abnormal rhythm to sinus rhythm.

**Delayed recovery** : The term is used when patient takes more than few minutes (usually not more than 10-15 min) during recovery from general anaesthesia. This could be due to a variety of causes.

**Double lumen tube** : A special endotracheal tube used for lung isolation and one lung ventilation in thoracic surgeries. It consists of two parallel tubes fused together, with one opening into the trachea and the other into either of the main bronchus.

**Effort tolerance/ METS** : This is used to quantitate the level of physical activity of the patient preoperatively to assess his cardiopulmonary status. One MET (metabolic

equivalent of the task) is the amount of oxygen consumed by a normal adult male at rest. 3.5 ml oxygen/kg/ min.

**Emergence delirium** : Delirious and confused state seen in a patient at the end of anesthetic, most commonly after administration of sevoflurane and desflurane. Preschool children are most vulnerable.

**Entonox** : Combination of nitrous oxide and oxygen in 1:1 ratio, in the same cylinder, used for labour analgesia.

**Endotracheal tube** : The standard device used for securing the airway by placing it in the glottis with the help of a laryngoscope. Several modifications are available to suit the requirements of various surgeries.

**Epidural anesthesia/ analgesia** : It is a form of central neuraxial blockade where the local anesthetic is deposited in the epidural space using a special epidural needle to achieve segmental block of the required dermatomes. Inserting a catheter into this space helps to not only prolong the anesthesia but also provide analgesia in post operative period.

**Extubation** : Removal of endotracheal tube at the end of a surgical procedure or when the patient improves in the ICU is called extubation. It is performed after appropriate clinical criteria are met, to ensure patient safety.

**Flexible video endoscopy** : is a technique of visualizing the airway with a flexible video endoscope (fiberoptic bronchoscope). This is used for different indications in airway management, primarily for difficult intubation.

**Frailty** : A state of increased vulnerability, a syndrome of decreased physiological reserve and resistance to stressors. It can lead to increased adverse outcomes after surgery and anaesthesia. A detailed evaluation, preparation and planning is necessary for safe anaesthetic management.

**Head tilt, chin lift maneuver** : This is the basic maneuver used to open the airway and maintain its patency. It consists of pushing the forehead down with palm of one hand and pulling the chin up with the fingers of the other hand.

**Holiday Segar formula** : This is the formula used to calculate fluid requirement intra operatively, considering the duration of fasting, requirement of maintenance fluid and extra fluid losses during the operative period.

**Hyperventilation and hypoventilation** : Excessive and inadequate ventilation respectively. During anaesthesia, ventilation is mostly controlled with mechanical ventilation. Hyper and hypoventilation are reflected by EtCO<sub>2</sub>.

**Incentive spirometry** : Respiratory exercise advised to the patient, starting ideally

from the preoperative period itself and continued into post operative period, to improve the respiratory function and reduce postoperative pulmonary dysfunction.

**Induction (Inhalational /Intravenous) :** Induction is administration of either an intravenous or an inhalational agent to induce a controlled and reversible state of unconsciousness as a part of general anaesthesia. This follows pre oxygenation and premedication. It can range from a simple to extremely complex process.

**Informed consent (IC) :** Informed consent for anaesthesia is the written voluntary approval by the patient for the anaesthesia for the scheduled procedure. It implies that the patient is well informed about the type of anaesthesia, alternatives available, risks and complications etc., clearly. It is an important clinical and medicolegal document, and the resident must learn to obtain an informed consent from patients.

**Intraosseous route :** Insertion of a needle (specific, purpose made) into the bone marrow to administer fluids, blood, drugs and to obtain blood samples. It is usually used in an emergency when intravenous line is difficult to secure. Usual sites include tibial tubercle, sternum, humeral head and iliac crest.

**Infusion pump :** An electrically driven medical device used to administer drugs or fluids in a controlled manner. They are of different types based on the technology. Volumetric and syringe infusion pumps are the two common varieties. They enable safe and accurate administration of fluids and drugs.

**Inhalational anesthetics :** These are potent anesthetic agents available in liquid form and converted to vapor in specialized chambers called vaporizers present on the anesthesia machine. They are unique to anaesthesia.

**Jackson-Rees circuit (JR circuit) :** This is Mapleson F circuit, used for pediatric patients upto 20 kg weight.

**Jaw thrust :** This is a maneuver used to open and maintain a patent airway and one of the components of triple maneuver (other two are chin lift and head tilt). It is useful in cases of cervical spine injury as the neck movement is minimal and It consists of applying an upward thrust at the angle of both the jaws with the four fingers of each hand, simultaneously mobilizing the maxilla with the thumb

**Labour analgesia :** Providing relief to a mother in labour using various techniques. Epidural analgesia is the popular method of labour analgesia. Entonox is another method.

**Light plane of anaesthesia :** The level of unconsciousness induced by general anaesthesia is described in terms of depth or planes of anaesthesia: light, adequate or deep. Light plane implies patient is unconscious but reflex response to certain stimuli might still be retained leading to complications.

**Laryngoscope:** Battery operated, handheld visualizing device, to facilitate visualization of the structures, mainly glottis, to aid in passing an endotracheal tube into the trachea to secure the airway.

**Laryngospasm :** Spasm of the vocal cords impairing breathing and speech. It is a dreaded complication during peri operative period as it can be catastrophic if not recognized and treated promptly.

**Local anesthesia/ anaesthetics :** Drugs which act at the sodium channels of the neural membranes to block impulse transmission, the result of this are anaesthesia and analgesia. These drugs are usually deposited in proximity of the nerves by means of central neuraxial blockade techniques.

**MAC (Monitored Anesthesia Care) :** A specific anesthesia service for diagnostic or therapeutic procedures performed under local anesthesia along with sedation and analgesia, titrated to a level that preserves spontaneous breathing and airway reflexes. Sometimes anaesthesiologist may not perform any intervention except monitoring the patient for any serious adverse events which might require intervention.

MAC also means minimal alveolar concentration, a key measure in inhalational anaesthesia, indicator of potency.

**Mallampati classification :** Grading of the structures visualized when an upright patient opens his mouth maximally and protrudes tongue without phonating. The structures assessed include faucial pillars, uvula and posterior pharyngeal wall. This remains an important and integral component of airway assessment during pre-anesthetic evaluation. This simple scoring system helps predict space available for laryngoscopy and ease of intubation. Originally it had 3 grades and later modified by Young into 4 grades.

**Metabolic equivalents (METS) :** It is the energy consumption or the calorie expenditure at rest. 1 MET = 3.5 ml of oxygen per kg body weight per minute. It is used as a surrogate marker of patient's functional capacity and exercise tolerance of the patient. See also effort tolerance.

**Monitoring :** This is an integral component of anaesthesia and consists of continuous evaluation of the patients' parameters under any form of anesthesia. Monitoring includes heart rate, blood pressure, oxygen saturation of blood (SpO<sub>2</sub>), electrocardiogram (ECG), end tidal carbon dioxide, urine output, central venous pressure, temperature to name a few. It also involves being vigilant about the surgical blood loss and proceedings of the surgery in general. A vigilant anaesthesiologist is the best monitor!

**Multimodal analgesia** : Providing maximal analgesia to a patient using various approaches in combination, like central neuraxial blocks, intravenous drugs, transdermal patches etc. It helps to reduce the dose of individual drugs (and thereby the toxicity) without compromising the quality of analgesia.

**Maintenance of anaesthesia** : Keeping the patient under adequate level of anaesthesia for the surgeon to operate comfortably using either inhalational or intravenous agents or a combination of both.

**Manual in line stabilization (MILS)** : The cervical spine is maintained in neutral position by application of upward traction by an assistant while performing laryngoscopy and intubation in patients with cervical spine injury.

**Neuroleptanalgesia** : A form of analgesia accompanied by general quiescence and psychic indifference to environmental stimuli, without loss of consciousness, and produced by the combined administration of a major tranquilizer (neuroleptic) and a narcotic. When nitrous oxide is added to this it becomes neuroleptanaesthesia.

**Neuromuscular blockers (skeletal muscle relaxants)** : These are drugs which act at neuromuscular junction and produce profound muscle paralysis during general anaesthesia. These drugs provide relaxation for securing the airway and for surgery. Two subtypes are depolarizing and nondepolarizing agents.

**One lung ventilation** : Isolation of one lung to provide ventilation or to protect or to prevent loss of ventilation. This is required in thoracic surgeries where the lung on the operative side is selectively collapsed, and another lung is ventilated. This is achieved with the help of lung isolation devices like double lumen tube and bronchial blockers.

**Obstructive sleep apnea (OSA)**: It is a sleep disorder characterized by recurrent episodes of upper airway collapse during sleep resulting in hypoventilation, apnea and recurrent waking up from sleep. Presence of OSA poses problems with mask ventilation, laryngoscopy and intubation, delayed awakening and post operative respiratory depression. OSA is a group of disorders called sleep disordered breathing.

**Opioids** : A class of drugs which act on opiate receptors and produce analgesia besides other actions like respiratory depression, nausea, vomiting, itching and urinary retention to name a few. It is mainly used for its analgesic properties.

**Patient controlled analgesia (PCA)** : A novel mode of analgesic administration, delivery of drug determined and controlled by patient. Patient satisfaction, lesser sedation and complications are some of the benefits.

**Peripheral nerve block** : Blockade of the nerve plexuses like brachial and lumbar plexus or individual nerves to achieve anesthesia by deposition of local anesthetics in close vicinity of the target nerves. This can be achieved either by blind landmark

techniques, using peripheral nerve stimulator or with ultrasound guidance.

**Pneumothorax** : It is the presence of air in the pleural space and occurs as a complication of subclavian vein cannulation, brachial plexus block, spontaneously or due to surgical causes. Clinical features vary depending on the severity. It could be life threatening when it is tension pneumothorax. Diagnosed clinically and with ultrasound.

**Pharmacodynamics & Pharmacokinetics** : Pharmacodynamics is what the “drug does to the body”, that is, the action of the drug on various organ systems like cardiovascular, respiratory, hepatic system etc. Pharmacokinetics is what the “body does to the drug”, that is, how the drug is treated- metabolized, broken down and eliminated from the body.

**Pre anesthetic evaluation** : The comprehensive evaluation of the patient before administering any type of anesthesia is called pre anesthetic evaluation. Several institutions have dedicated preanaesthetic clinics (PAC).

**Prehabilitation** : is the process of preoperative optimization of surgical patients to improve the outcome, reduce hospital stay and reduce incidence of perioperative adverse events. Components of prehabilitation are a) optimization of medical conditions or/and correction of physiological derangements (control of blood pressure, reversal of bronchospasm, weight reduction, etc), b) physical exercise (helps in early ambulation aslo) c) Nutrition management and d) psychological support.

**Premedication** : Medications administered before GA/RA, either previous night, or 2h before procedure or before induction, to ensure smooth conduct of anaesthesia.

**Pre oxygenation** : Also called denitrogenation, administration of 100% oxygen before induction of GA to increase oxygen reserve to prevent hypoxia during period of apnoea during laryngoscopy and intubation. Apneic oxygenation is a continuation of preoxygenation. Together, it can be called peri oxygenation also.

**Preventive analgesia/ preemptive analgesia** : This is the administration of an analgesic before the actual tissue injury/ surgical insult. It helps by minimizing the sensitization to noxious stimuli in peri operative period.

**Procedural sedation** : Refers to techniques, medications, and maneuvers performed to help a patient tolerate unpleasant or painful procedures that cannot be tolerated in fully conscious state.

**Peripheral nerve stimulator** : A device used for stimulation of nerves by application of electric current of small amplitude. This is used for peripheral nerve blocks and for assessing adequacy of muscle paralysis during general anesthesia. Electrical nerve stimulators also find application in treatment of chronic pain conditions.

**Plethysmograph** : By definition, this means an instrument for recording and measuring variation in the volume of a part of the body. In anesthesia, most used is the pulse oximeter plethysmograph to measure oxygen saturation.

**Post Dural Puncture Headache (PDPH)** : It is a complication of SAB, seen in post operative period wherein the patient complains of headache on assuming upright posture or on ambulation.

**Post operative care unit (PACU)** : Dedicated area usually near the OT meant for monitoring and observing patients in their immediate post operative period as they recover from anesthesia and surgery.

**Quincke spinal needle**: Commonly used spinal needle with a beveled tip and is a cutting type of needle.

**Rendell Baker Soucek mask (RBS mask)** : A triangular shaped face mask with minimal dead space, specifically used in small infants and neonates.

**Reservoir bag** : It is an expandable purpose made (for anaesthesia purpose) bag which is a part of a breathing system. It facilitates manual ventilation and acts as a reservoir for the peak inspiratory flow.

**Resistance** : Resistance in the airway refers to the impedance to the flow of air in the respiratory tract during inspiration and expiration

**Sellick's maneuver** : See Cricoid pressure above.

**Supraglottic airway devices**: These are devices used to secure the airway. The tip of these devices lies above the level of glottis, hence the term- "supraglottic". They can be used as alternate to endotracheal tube and face mask.

**Spinal anesthesia/ sub arachnoid block** : This is a form of central neuraxial blockade wherein the local anesthetic drug is deposited in sub arachnoid space (between the arachnoid and pia mater) with the help of a specialized spinal needle to achieve anesthesia.

**SpO<sub>2</sub>/SaO<sub>2</sub>** : Symbol for oxygen saturation in the arterial blood, measured using pulse oximeter.

**Stress response** : The stimulation of pharyngeal and laryngotracheal nociceptors during laryngoscopy and intubation results in an increase in heart rate and blood pressure. This can be deleterious in patients with poor cardiac reserves and several methods are used to reduce this stress response.

**Supine hypotension and supine hypotension syndrome** : The compression of the gravid uterus on inferior vena and aorta (Aortocaval compression) in pregnant women

resulting in decreased venous return and consequent hypotension in supine position. It is subjectively felt as dizziness, nausea and palpitations upon assuming supine position especially in later months of pregnancy (Supine hypotension syndrome).

**Thromboelastography (TEG)** : A hemostatic assay that measures the global viscoelastic properties of whole blood clot formation under low shear stress. TEG shows the interaction of platelets with the coagulation cascade. It is an important test during liver transplantation and cardiac surgeries and guides transfusion strategy.

**Train of four stimulation** : One of the patterns of stimulation during neuromuscular blockade monitoring.

**Trendelenburg position** : Any degree of head low position of a supine patient. This position is requested for by surgeons for certain procedures and has anaesthetic implications.

**Vaporizer** : An important part of anaesthesia machine/workstation and converts liquid volatile anaesthetics into gases when carrier gas mixture (oxygen or its mixture with N<sub>2</sub>O or air). Concentration of the delivered vapors can be accurately controlled as required.

**Video laryngoscopes** : These are specialized laryngoscopes which have a camera at the tip of the blade. The images can be transmitted to a monitor and an enlarged view of the glottis and surrounding structures can be obtained. This is useful in difficult airway scenarios and for teaching purposes.

**Workstation** : Modern anaesthesia machine with high degree of sophistication and provides accuracy, safety, flexibility and customization capabilities in a cost- effective manner. They have mechanical, electrical, electronic, pneumatic and software components.

---

**Prof. (Dr) Raveendra Ubaradka S. & Dr. Vyshnavi S.**

---

## References and further reading

1. Sykes WS. Essays on the First Hundred years of Anaesthesia, Vol. 1, Churchill Livingstone, London, 1960
2. A.F. Simpao, L.M. Ahumada, M.A. Rehman. Big data and visual analytics in anaesthesia and health care. *British Journal of Anaesthesia* 2015;115 (3): 350-356
3. Macintosh RR. Deaths under anaesthetics. *Br J Anaesth* 1949; 21: 107-36
4. Sundaram LV, Desai SP. The Anesthesia Records of Harvey Cushing and Ernest Codman. *Anesth Analg.* 2018 Jan; 126(1): 322-329
5. Divekar V M, Naik L D. Evolution of anaesthesia in India. *J Postgrad Med* 2001; 47: 149
6. *Trends Biotechnol.* 2006 Aug. 24(8):372-7.)
7. Mahmud Arif Pavel, E. Nicholas Petersen, Hao Wang, Richard A. Lerner, Scott B. Hansen. Proceedings of the National Academy of Sciences Jun 2020, 117 (24) 13757-13766;
8. Glavin RJ. Excellence in Anesthesiology. The Role of Nontechnical Skills. *Anesthesiology*:
9. *The Journal of the American Society of Anesthesiologists.* 2009;110(2):201-3.
10. Leonard M, Graham S, Bonacum D. The human factor: the critical importance of effective
11. teamwork and communication in providing safe care. *BMJ Quality & Safety.* 2004;13(suppl 12. 1): i85-i90.
13. R. Flin, R. Patey, R. Glavin and N. Maran Anaesthetists' non-technical skills *British Journal of Anaesthesia* 105 (1): 38-44 (2010)
14. Fletcher G, Flin R, McGeorge P, Glavin R, Maran N, Patey R. Rating non-technical skills: developing a behavioral marker system for use in anesthesia. *Cognition, Technology, and Work* 2004;6
15. Gaba D, Fish K, Howard S. *Crisis Management in Anaesthesiology.* New York: Churchill Livingstone,1993.
16. Flin R, Patey R. Improving patient safety through training in non-technical skills. *Br Med J* 2010; 339: 3595
17. Endsley MR. Design and evaluation for situation awareness enhancement. In proceedings of the Human Factors Society 32nd Annual Meeting. October 24-28, 1988 Santa Monica: pp 97-101
18. Christian Schulz, and Mica R. Endsley. Situation Awareness in Anesthesia: Concept and Research *Anesthesiology* March 2013, vol.118,729-742
19. Andrew James Beamish, Jessica Jane Foster, Harry Edwards, Torsten Olbers. What's in a smile? A review of benefits of the clinician's smile. *Pstgrad Med J* 2019;0:1-5s
20. Rhoton MF: Professionalism and clinical excellence among anaesthesiology resident. *Acad Med* 1994; 69:313-5
21. David B. Waisel, M.D., Robert D. Truog, M.D. An Introduction to Ethics. *Anesthesiology* 1997; 87: 411-7
22. Seetharaman Hariharan Ethical Issues in anesthesia: the need for a more practical and contextual approach in teaching. *J Anesth* (2009) 23;409-412
23. Coulehan J. Viewpoint: today's professionalism: engaging the mind but not the heart. *Acad Med.*2005; 80:892-8
24. Simini B. Anaesthetist: the wrong name for the right doctor. *Lancet.*2000; 355:1892
25. White SM. Consent for anesthesia. *J. Med. Ethics.* 2004; 30:286-300
26. Walker J, Stander S . The role of anesthesiologist in perioperative patient safety. *Curr Opin Anesthesiol* 2014, 27: 649-656
27. J. M. Weller Best practice and patient safety in anaesthesia Editorial I *British Journal of Anaesthesia* 110 (5): 671-3 (2013)
28. Gelb, A.W., Morriss, W.W., Johnson, W. et al. World Health Organization- World federation of Societies of Anaesthesiologists (WHO- WFSA) International Standards for a Safe Practice of Anesthesia. *Can J*

- Anesth/J Can Anesth 65, 698-708 (2018)
29. C. J. Peden<sup>1</sup>, M. Campbell, and G. Aggarwal. Quality, safety, and outcomes in anaesthesia: what's to be done? An international perspective. *BJA: British Journal of Anaesthesia*, Volume 119, Issue suppl\_1, December 2017, Pages i5–i14.
  30. David H Chestnut, On the Road to Professionalism. *Anesthesiology* 2017;126:780-786
  31. Kathryn E. McGoldrick. History of Medicine. The History of Professionalism in Anesthesiology. *AMA Journal of Ethics*, March 2015, Vol 17, No 3: 258-264
  32. Smith A: In search of excellence in anesthesiology. *Anesthesiology* 2009;110: 4-5
  33. James C. Eisenach, In Search of Excellence in Anesthesiology. *Anesthesiology* 2009; 110:4–5
  34. Glavin RJ: Excellence in anesthesiology: The role of nontechnical skills. *Anesthesiology* 2009; 110: 201-3
  35. Professionalism in Anesthesiology (Editorial). *Anesthesiology* 2009; 110: 700-2
  36. *Anaesthesia*, 2010, 65, pages 184–191
  37. *British Journal of Anaesthesia* 110 (1): 4–6 (2013)
  38. Kim, D.D., Kimura Jr, A., Pontes, D.K.L. et al. Evaluation of anesthesiologists' knowledge about occupational health: Pilot study. *BMC Anesthesiol* 18, 193 (2018).
  39. Ian Thomas, John Anthony Carter. Occupational Hazards of Anaesthesia. *Continuing Education in Anaesthesia, Critical Care & Pain*. Volume 6, Number 5, 2006
  40. Sukhminder Jit Singh Bajwa and Jasbir Kaur. Risk and safety concerns in anesthesiology practice: The present perspective. *Anesth Essays Res*. 2012 Jan-Jun; 6(1): 14-20
  41. 1.<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>
  42. Yang Y, Peng F, Wang R, Guan K, Jiang T, Xu G, Sun J, Chang C. The deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China. *J Autoimmun*. 2020 May;109:102434. doi: 10.1016/j.jaut.2020.102434. Epub 2020 Mar 3. Review. PubMed PMID: 32143990; PubMed Central PMCID: PMC7126544.
  43. Peeri NC, Shrestha N, Rahman MS, Zaki R, Tan Z, Bibi S, et al. The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned? *International Journal of Epidemiology*. 2020.
  44. Shelton CL, Smith AF, Mort M. Opening the black box: an introduction to qualitative research methods in anaesthesia. *Anaesthesia*. 2014 Mar;69(3):270-80.
  45. Pace NL. Research methods for meta-analyses. *Best Pract Res Clin Anaesthesiol*. 2011 Dec;25(4):523-33.
  46. Armstrong RA, Mouton R. Definitions of anaesthetic technique and the implications for clinical research. *Anaesthesia*. 2018 Aug; 73 (8): 935-940
  47. Sessler DI, Imrey PB. Clinical Research Methodology 3: Randomized Controlled Trials. *Anesth Analg*. 2015 Oct;121(4):1052-1064.
  48. Kacha AK, Nizamuddin SL, Nizamuddin J, Ramakrishna H, Shahul SS. Clinical Study Designs and Sources of Error in Medical Research. *J Cardiothorac Vasc Anesth*. 2018 Dec;32(6):2789-2801.
  49. K Gandhi, N Sahni, SK Padhy, PJ Mathew. Comparison of stress and burnout among anaesthesia and surgical residents in a tertiary care teaching hospital in North India. *J Postgrad Med*. 2018 Jul-Sep; 64(3): 145–149.
  50. Sun H, Warner DO, Macario A, Zhou Y, Culley DJ, Keegan MT. Repeated Cross-sectional Surveys of Burnout, Distress, and Depression among Anesthesiology Residents and First-year Graduates. *Anesthesiology*. 2019 Sep;131(3):668-677.
  51. Hochberg MS, Berman RS, Kalet AL, Zabar SR, Gillespie C, Pachter HL. The stress of residency: recognizing the signs of depression and suicide in you and your fellow residents. *Am J Surg*. 2013 Feb;205(2):141-6

## Notes





