Curriculum

FNB Fellowship

Trauma Anaesthesia and Critical Care

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I. INTRODUCTION

Trauma is a leading public health problem in our country. Nearly 1.5 to 2 million persons are injured and 1 million succumb to death every year due to trauma. Considering the magnitude of the problem, a fellowship curriculum in Trauma Anaesthesia and critical care aims to produce an anaesthesiologist who after undergoing training will be able to deal effectively with the needs of a trauma patient in various setups. These fellows will be in high demand in the coming decades as there is transition in the national disease burdens, with a large number of trauma patients requiring medical care. Several major trauma centres and teaching institutions in the country have already been established. The medical professionals who will up this specialty will be able to build up a pool of doctors to meet this demand.

II. GOALS AND OBJECTIVES

The goal of this curriculum is to produce a competent physician who:

1. Can function independently as a faculty/ physician in the management of trauma patients in the emergency department, operating room and the Intensive care unit.
2. Is capable of prioritising, rapidly assessing, resuscitating, doing emergency interventions at a primary and secondary health centre. He should be capable of stabilising and safely transferring the patient to a higher centre.
3. Is skilled in all aspects of trauma care in a tertiary care centre: rapid assessment, resuscitation, interventions, analgesia on arrival, intraoperative anaesthesia care, perioperative pain management, and critical care management.
4. Has expertise in recognizing and managing critically ill trauma patients requiring invasive monitoring and support.
5. Is aware of contemporary advances & developments in medical sciences as related to Trauma Anaesthesia and various areas concerned with this discipline.
6. Can effectively interact with multi-professional teams involved in practising Trauma Care.

7. Is oriented to principles of research methodology and can actively participate in the ongoing research project, collect and analyse data of patients being managed in the department.
8. Has acquired skills in effectively communicating with the patient and his family.
9. Has acquired the competencies pertaining to the specialty and its sub-areas that are required to be practised in the community and at all levels of improving the health system.
10. Has acquired the competency to train and educate undergraduates and postgraduates the various skills and knowledge required for trauma care.

III. TEACHING AND TRAINING ACTIVITIES

The training program would focus on development of skills, attitude and improvement of knowledge of the candidate. It would include research methodology and teaching. The various methodologies include:

1. Lectures
2. Discussion
3. Student Directed Learning
4. Case Based Learning
5. Simulated Patient Lab
6. Electronic & Computer Simulators
7. Web Based learning

The components of training will consist of:

1. **Theoretical training:** Knowledge would be imparted to the candidates through Didactic learning (theory lectures, seminar and journal club sessions).
2. **Clinical Training:** The candidates would follow an in-hospital residency program which would include rotation in various areas like emergency medicine department, operating rooms, postoperative areas including high dependency units and intensive care units. They would be allowed to manage simple trauma cases independently while complex ones under supervision.

3. **Bedside:** Candidates would acquire skills of communication, physical examination and intervention. They would work up cases and discuss the management of these patients with the faculties.

Teaching schedule:

1. Seminars: Presentation on different topics as per syllabus by the residents (Once a week)
2. Journal Club: Presentation of latest interesting articles related to the subject by Faculty and residents. (Once a week)
3. Case presentation: Case presentation by the residents and moderated by the Faculty. (Once a week)
4. Participation in multi speciality discussion on complex cases.
5. Clinical Audit (discussion on morbidity and mortality): Once a month
6. Faculty lecture: once a month
7. Poster or oral presentation in a national or international conference.

Rotation:

1. Emergency Department: 3 months
2. Operating Room:1 year 2 months
3. Radiology Suite: 1 month
4. ICU including HDU: 6 months

IV. SYLLABUS AND COMPETENCIES

The fellow should be trained in all aspects of trauma care for all patients with various mechanisms of injury involving various systems. The training should include trauma in special population like paediatric, geriatric and obstetric patients.

The training path should include all content related to prehospital care, resuscitation, anaesthesia for emergency trauma surgery, acute pain management and care of critically ill trauma patients in ICU.

The Fellow should have knowledge about local and systemic consequences of trauma involving various organs and regions:

1. Traumatic Brain Injury: Types and Severity
2. Spine and Spinal cord Injury
3. Maxillofacial Injuries
4. Ophthalmic injuries
5. Laryngo Tracheobronchial injuries
6. Penetrating or blunt neck injuries
7. Thoracic injuries: Blunt and Penetrating
8. Abdominal and Pelvic trauma
9. Musculoskeletal Injuries- Long bone fracture, soft tissue injuries, crush injury, Rhabdomyolysis, Compartment syndrome
10. Vascular and Nerve injuries
11. Polytrauma
12. Burns and Inhalation Injuries

The training will be inclusive of the following core content

1. Trauma Acute Care (Evaluation and resuscitation of the Injured in Emergency Department)
2. Trauma Anaesthesia (Administering Anaesthesia to trauma patients)
3. Trauma Critical Care (Care of the trauma patient in the ICU)
4. Care of Postoperative surgical and Neurosurgical patients
5. Acute Pain Management
6. Knowledge of CRRT, Hemodialysis
7. Basic Trauma surgical skills (surgical cricothyroidotomy, Chest tube insertion, percutaneous tracheostomy, etc)
8. Management of Brain-dead patient in OR and ICU
9. Training in Trauma Systems management and Mass casualty management
10. Knowledge of Injury Surveillance systems and Trauma Epidemiology
11. Knowledge of Trauma Scoring systems and trauma registry procedures.
12. Non-technical skills

The detailed curriculum should include knowledge and Skills in the following fields

The program must possess a well-organized and effective curriculum, both didactic and clinical. The curriculum must also provide fellows with direct experience by **progressive responsibility for patient management.**

1. TRAUMA ACUTE CARE (Immediate Care in the Emergency Department):

The training should include trauma care systems, trauma Epidemiology, Mechanisms of Injury, Prehospital Care and all aspects of initial evaluation and resuscitation of an acutely injured patient.

a. Knowledge:

i. Trauma Care System, Epidemiology, Mechanisms of Injury, and Prehospital Care

- Systematic approach to trauma care systems that includes national and state-wide trauma systems and categorization of institutions and emergency departments.
- Common causes of trauma.
- Mechanisms of blunt and penetrating injuries.
- Mechanisms of blast and high velocity injuries.
- Patho-physiologic response to various types of injury.
- Management of mass casualty and Triaging.
- Pre-hospital care and on-site resuscitation
- Arrangement of Field teams (van calls or mass casualties): composition, directions and communication with the trauma centre.
- Modes of transport-both on ground and air- and understanding urgency of transport.
- Environmental hazards in trauma patient-Heat stroke, prolonged exposure to cold, water immersion etc.
- Tetanus prophylaxis.
- Injury prevention/ epidemiology.

ii. Initial Evaluation and Management with Team Approach

- To learn principles of Emergent Trauma Care and to develop an organized approach to the assessment, resuscitation, stabilization and provision of definitive care for the trauma victim.
- Organization prior to trauma patient arrival – reception, directions and planning.

- Trauma team activation on patient arrival – role of team leader and each team member.
- Principles and practice of Advanced Trauma Life Support, Basic life support, Advanced cardiac life support, paediatric cardiac life support, Neonatal Life support, Advanced burn life support and Advanced hazmat life support.
- Principles of pre-hospital trauma care including the role of BLS and ALS ambulance services and air transport services.
- Organization of an emergency room.
- Recognize and treat immediate life and limb threatening injuries in the trauma victim.
- Special considerations in the evaluation and management of the special population like pregnant, paediatric and geriatric trauma victim.
- Airway assessment and management in trauma
- Guidelines and algorithms for emergency intubation.
- Airway equipment and techniques for emergency airway management in trauma.
- Oxygenation – principles, Indications and devices
- Breathing and ventilation in chest trauma – principles & techniques of chest drain insertion
- Vascular cannulation – peripheral and central.
- Anatomy and physiology of circulation, pathophysiology of hypovolaemia and blood loss, cardiac, renal and brain function in shock state.
- Shock – identification, resuscitation and fluid therapy, damage control resuscitation
- Blood component therapy and trauma coagulopathy, massive transfusion protocols.
- Measurement of injury severity- various scales grading for different types of injuries.
- Evaluation of an unconscious patient and confounders.
- Effects of major burns and crush injuries on various body systems.
- Laboratory investigations during assessment and resuscitation – timing and interpretation.
- Radiological Imaging of trauma patients – "FAST" protocols, eFAST, X rays, CT, MRI, musculoskeletal USG, Echocardiography.
- Identification of each individual injury and reassessment.

- Intra-hospital transfer – to CT scan, OR other intensive care areas
- Resuscitation in Special situations like polytrauma, burns drowning, high velocity trauma, battlefield injuries etc.
- Know special aspects of paediatric trauma/child abuse, pregnant trauma patient and geriatric trauma patient.
- To learn the principles of disaster management including Chemical, Biological, Radiological, Nuclear and Use of explosive (CBRNE)
- To learn the principles of burn management.

iii. Medico-Legal Aspects Related to Trauma - suspected assaults, consent, brought dead patient, trauma documentation, need for autopsy, etc.

b. Skills:

The core competencies will include the following in context of treating a patient in the Emergency Room/ Emergency Department.

Through the above learning processes a Trauma Anaesthesia and Critical Care Fellow should be able to:

i. Demonstrate ability to rapidly and thoroughly assess victims of major and minor trauma.
ii. Demonstrate ability to establish priorities in the initial management of victims of life-threatening trauma.
iii. Should be able to rapidly triage patients in ER and identify patients requiring urgent attention.
iv. Should be able to perform primary survey rapidly and initiate emergency management as per protocols.
v. Should be able to identify potentially threatened/compromised airway and safely manage it.
vi. Anticipate and manage different airway management in various types to trauma patients-oxygenation, tracheal intubation, or surgical airway – cricothyroidotomy or percutaneous tracheostomy.
vii. Should be able to anticipate difficult airway and should be well versed with use of video laryngoscope and supraglottic airway devices.
viii. Should identify overt or occult blood loss and assess severity of hypovolemia. Demonstrate ability to manage fluid resuscitation of

trauma victims-selecting fluid type and judge adequacy of volume replacement.

ix. Should be able to secure vascular access rapidly including difficult cases like obesity, burns, shock state. Should demonstrate ability to perform the following procedures: intra-osseous needle insertion, insertion of large bore peripheral and central venous lines

x. Should be able to identify life threatening conditions like pneumothorax. haemothorax, flail chest, pericardial effusion and appropriately manage it.

xi. Demonstrate ability to perform the following procedures: tube thoracostomy, splinting of extremity fractures, and reduction and immobilization of joint dislocations, pericardiocentesis

xii. Identifies disability in case of head or suspected spinal cord injury and prevents secondary injury.

xiii. Demonstrate ability to calculate the Glasgow Coma Score and discuss its role in the evaluation and treatment of head injured patients.

xiv. Demonstrate the ability to assess and initially manage facial trauma.

xv. Demonstrate the ability to evaluate and initially manage anterior neck injuries in ED.

xvi. Demonstrate the ability to assess and initially manage penetrating and blunt chest trauma in ED.

xvii. Demonstrate the ability to evaluate and manage blunt and penetrating abdominal trauma in ED.

xviii. Demonstrate the ability to diagnose and initially treat pelvic fractures, keeping in mind its potential to cause massive bleeding.

xix. Demonstrate ability to use spine immobilization techniques in trauma victims.

xx. Demonstrate ability to diagnose and initially manage trauma victims with extremity fractures, dislocations and subluxations in ED.

xxi. Demonstrate ability to manage soft tissue injuries including lacerations, avulsions and high-pressure injection injuries.

xxii. Discuss the diagnosis and emergent management of compartment syndromes.

xxiii. Demonstrate the ability to manage the acute burns patient

xxiv. Demonstrate the ability to diagnose and treat smoke inhalation.

xxv. Be able to use point of care ultrasonography for diagnosis of injury, for assisting interventional procedures and to judge response to management.

xxvi. Able to do miscellaneous procedures – urinary catheterization-in male & female patients, Nasogastric tube insertion, chest tube insertion, Needle decompression of chest, traction splint application etc.

xxvii. Appropriately manage ventilator strategies for various types of trauma patients.

xxviii. Should be able to monitor response to resuscitation.

xxix. Demonstrate ability to use and interpret imaging modalities in the evaluation of trauma patients. Demonstrate ability to interpret radiographs on trauma patients, including chest, cervical, thoracic and lumbar spine, pelvis and extremity films.

xxx. Demonstrate appropriate use of analgesics and sedatives in trauma patients.

xxxi. Demonstrate appropriate use of antibiotics in trauma patients.

xxxii. Demonstrate ability to coordinate consultants involved in the care of multiple trauma patients.

xxxiii. Discuss principles of disaster management and participate in disaster drills.

xxxiv. Discuss factors unique to the evaluation and initial management of paediatric geriatric, and pregnancy trauma in ED and demonstrate ability to direct trauma resuscitation.

xxxv. Demonstrate skills in Advanced Trauma Life Support, Basic life support, advanced cardiac life support, paediatric cardiac life support, Neonatal Life support, advanced burn life support and advanced hazmat life support.

xxxvi. Discuss the continuing care of the trauma victim, including operative, post-operative and rehabilitative phases of care.

2. TRAUMA ANAESTHESIA AND PAIN MEDICINE

a. Knowledge:

i. Understand the pre-operative issues relevant to the anaesthetic care to trauma patient including: coexisting morbidities, medications,

allergic reactions, the physical examination and the evaluation of abnormal findings.

ii. Importance of reassessment with noting treatment received till then, complete physical examination, evaluating response to resuscitation.

iii. Know the indications for surgical intervention, pathophysiology, and anaesthetic implications for common trauma surgical conditions.

iv. Understand urgency of surgery in trauma and correlate with risks involved while timing the individual surgery.

v. For emergent surgeries-know concepts for resuscitative surgery, damage control surgery and definitive surgeries.

vi. Understand the appropriate ordering of preoperative laboratory testing and interpretation in emergency settings.

vii. Understand fasting principles in trauma and its impact on gastric contents.

viii. Understand the basis of pharmacokinetic and pharmacodynamics differences for various trauma conditions for all ages and obstetric patient- differences in drug volume of distribution, MAC, protein binding, metabolism, and excretion. Of all sedatives and anaesthetic agents.

ix. Know the doses of intravenous anaesthetic medications including induction agents, opioids, neuromuscular blockers, reversal agents and emergency medications including side – effects and contraindications in hypovolemic trauma patients of all ages [including burns and obstetric patient].

x. Understand difficult airway and know the criteria for surgical airway-tracheostomy for head and neck trauma patients.

xi. Understand principles of increased intracranial pressure, cerebral blood flow & cerebral metabolism and measures to manage them intraoperatively.

xii. Knowledge about effects of massive blood loss, transfusion protocols, trauma coagulopathies and principles of blood component therapy.

xiii. Knowledge about criteria for extubation in different kinds of trauma and indications for delayed extubation and ventilatory support.

xiv. Understand the indications and contraindications for regional anaesthesia and peripheral nerve blocks in trauma patients with side effects complications for anaesthesia or analgesia.

xv. Understand the post-operative anaesthetic complications for trauma patients-nausea/vomiting and emergence delirium and their management.

xvi. Knowledge about indications and reasons of damage control surgery and multiple staged surgeries.

xvii. Understand the implications of laparoscopy surgery-pneumoperitoneum and the physiological changes due to carbon dioxide/air insufflations.

xviii. Understand the haemodynamic changes in thoracoscopic procedures and the physiology of one lung ventilation lung trauma patients. Know Lung isolation techniques in thoracic surgery and the devices available in the appropriate age group.

xix. Understand the implications of providing monitored anesthesia care/ sedation for CT scan, MRI, cardiac procedures and additional procedures outside of the traditional OR environment.

xx. Basic principles and practice of Battlefield Anaesthesia and Analgesia – drugs, techniques and limitations.

xxi. Understand methods for recognition, assess and measure pain indifferent trauma age groups.

xxii. Know various methods for treatment of acute postoperative pain in trauma patients.

xxiii. Understand the various opioid analgesics and its indications in trauma patient.

xxiv. Know different regional analgesia techniques for acute and acute postoperative pain relief.

xxv. Understand the pathophysiology and treatment of common chronic or acute on chronic painful conditions-reflex sympathetic dystrophy.

b. Skills:

The trainee will develop advanced skills relevant to the care of the trauma patient, particularly trauma resuscitation, anaesthesia and pain management.

The Skills will include:

i. OT preparedness for anticipated emergency surgery.

ii. Performs appropriate preoperative evaluation of all trauma patients, identifies newer developments in status and evaluates response to resuscitation.

iii. Obtain information about medical and surgical history from patient or informant when possible.
iv. Obtain informed consent from a trauma patient and next of kin.
v. Administer appropriate premedication.
vi. Able to do basic non-invasive monitoring and invasive hemodynamic monitoring using appropriate devices.
vii. Develop skills to manage anaesthesia for all types of trauma patients and techniques involved in it for its management.
viii. Appropriately administer anaesthesia to all age groups and all types of trauma patients posted for various types of surgical operations.
ix. Perform inhalation inductions in a trauma patient if required.
x. Develop the ability to choose appropriately between endotracheal intubation, supraglottic devices, or facemask ventilation for any trauma surgical procedures.
xi. Perform face mask ventilation, SGD [supraglottic device] placement and tracheal intubation on trauma patients.
xii. Airway management skills including awake fibreoptic aided intubation, airway blocks, and perform one lung anaesthesia when indicated.
xiii. Should be able to demonstrate simple surgical procedures (e.g. needle cricothyroidotomy, percutaneous cricothyroidotomy) and use of trans-tracheal jet ventilator
xiv. Appropriately manage upper airway obstruction, laryngospasm, and bronchospasm in trauma patients.
xv. Resuscitation skills: Basic principles of damage control resuscitation
xvi. Secure venous access, both peripheral and central through various routes in indicated patients.
xvii. Able to secure arterial line in major trauma cases.
xviii. Able to appropriately select intravenous fluids and judge adequacy of fluid therapy.
xix. Calculate maximum permitted blood loss in trauma patient.
xx. Demonstrate the ability to estimate blood loss in trauma patients and replace with appropriate blood components. Manage massive blood transfusions as per protocols
xxi. Monitor patient temperature and perform warming methods to prevent and treat hypothermia.
xxii. Able to appropriately manage intraoperative increased ICP.

xxiii. Able to conduct of Minimal access surgery (laparoscopy and thoracoscopy) in trauma patients.

xxiv. Able to discuss different aspects and risks involved for surgery and plan time and extent for surgery in unstable or high-risk trauma patients.

xxv. Able to manage intraoperative cardiac or respiratory complications.

xxvi. Perioperative management of hip fracture patients as per International guidelines

xxvii. Management of brain dead patient in OR for Organ Donation

xxviii. Interpretation of diagnostic imaging (including FAST, trans thoracic echocardiography, CXR, lung US, etc)

xxix. Provide general and regional anaesthesia for a range of elective and emergency trauma cases, including neurotrauma, thoracic trauma, abdominal trauma, orthopaedic trauma, facial trauma and burns

xxx. Should be safely able to perform Regional Anaesthesia procedures - Upper and lower limb blocks (Landmark / USG guided/ PNS), perineural catheter insertion and pain management.

xxxi. Demonstrate the ability to develop and carry out plan to manage and treat postoperative pain.

xxxii. Learn and perform epidural catheterization an regional nerve blocks for acute pain relief.

xxxiii. Learn the use of portable epidural pumps and Patients Controlled Analgesia pumps.

xxxiv. Demonstrate the ability to treat refractory postoperative pain.

xxxv. Be able to evaluate and treat common complications of analgesic therapy in children (e.g., nausea, vomiting, pruritus, and respiratory depression).

xxxvi. Be able to evaluate and manage trauma patients with epidural analgesia and break-through pain.

xxxvii. Learn the diagnosis and treatment of chronic pain (result of trauma-neuropathic pain in amputations). · · ·

xxxviii. Code Blue Team Resuscitation. Knowledge of LA, its toxicity and management of LAST.

3. TRAUMA CRITICAL CARE (Care of the critically ill Trauma Patient in the Trauma Intensive Care Unit):

The Trauma critical care training must enable the trainee to acquire an advanced body of knowledge and level of skill in the management of critically ill trauma patients in order to assume a leadership role in teaching and in research in trauma critical care.

This advanced body of knowledge and level of skill must include the mastery of

1. The use of advanced technology and instrumentation to monitor and treat the physiologic status of adults or children of both sexes, including those in the neonatal, pediatric, child-bearing, or advanced years.
2. Management of Postoperative patient
3. Organizational and administrative aspects of a critical care unit; and
4. Ethical, economic, and legal issues as they pertain to critical care.

Didactic Curriculum

The program must provide the opportunity for residents to acquire advanced knowledge of the following aspects of critical care, particularly as they relate to the management of patients with hemodynamic instability, multiple system organ failure, and complex coexisting medical problems:

1. Cardiorespiratory resuscitation
2. Physiology, pathophysiology, diagnosis, and therapy of disorders of the cardiovascular, respiratory, gastrointestinal, genitourinary, neurological, endocrine, musculoskeletal, and immune systems, as well as of infectious diseases
3. Detailed knowledge about various aspects of respiratory failure and its management by adequate ventilator management with the help of mechanical ventilation.
4. Metabolic, nutritional, and endocrine effects of critical illness
5. Hematological and coagulation disorders
6. Analgesia: IV and regional analgesia techniques for pain relief in trauma victims.
7. Renal disorders and their management in trauma patients.
8. Critical obstetric and gynecologic disorders in injured females
9. Trauma, thermal, electrical, and radiation injuries
10. Inhalation and immersion injuries

11. Monitoring and medical instrumentation
12. Critical pediatric surgical conditions
13. Pharmacokinetics and dynamics of drug metabolism and excretion in critical illness
14. Ethical and legal aspects of surgical critical care
15. Principles and techniques of administration and management of ICU
16. Biostatistics and experimental design

a. Knowledge

The candidate must understand the pathophysiology, construct a differential diagnosis and apply the appropriate prophylactic and therapeutic interventions in the following disorders.

i. Respiratory

Management of airways (including respiratory arrest, upper airways obstruction, smoke or burns airways damage), pulmonary oedema, adult respiratory distress syndrome and hypercapnic respiratory failure, severe asthma, chest trauma, disorders, thoracic surgery. Understand the indications and principles of mechanical ventilation and modes of ventilation and weaning in trauma patients.

ii. Cardiovascular

Haemodynamic instability and shock, cardiac arrest, acute myocardial infarction and unstable angina, heart failure, common arrhythmias and conduction disturbance, specific cardiac disorders (cardiomyopathies, valvular heart disease, atrial or ventricular septal defects, myocarditis), cardiac tamponade, pulmonary embolism, aortic dissection, hypertensive crisis, peripheral vascular diseases. Cardio pulmonary resuscitation (CPR), Advanced Trauma Life Support (ATLS), and Advance Life Support (ALS)

iii. Neurology

Coma, traumatic brain injury, intracranial hypertension, cerebrovascular accidents, cerebral vasospasm, post anoxic brain damage, acute confusional states, spinal cord injury, neurosurgery, brain death. Understand principles and determinants of intracranial

pressure (ICP). Various techniques to measure ICP. Understand measures to prevent secondary brain injury. Understand sequelae of spinal cord trauma-spinal shock, autonomic hyper-reflexia, etc – and their management

iv. Renal

Oliguria. Acute renal failure, renal replacement therapy

v. Metabolic & Nutritional

Fluid electrolyte and acid-base disorders, endocrine disorders (including diabetes), nutritional requirements, monitoring of nutrition.

vi. Haematological

Disseminated intravascular coagulation and other coagulation disorders, haemolytic syndromes, acute and anaemia, blood component therapy, blood conservation techniques and immune disorders.

vii. Infections

Severe infection due to aerobic and anaerobic bacteria, viruses, fungal, nosocomial infection, infection in the immune-compromised, tropical disease, antimicrobial therapy, immunotherapy.

viii. Gastro-intestinal

Inflammatory bowel diseases, pancreatitis, acute and chronic liver failure, prevention and treatment of acute G.I. Bleeding, peritonitis, mesenteric infarction, perforated viscus, bowel obstruction, abdominal trauma.

ix. Environmental Hazards

Burns, hypo-and hyperthermia, near-drowning electrocution, radiations, chemical injuries, animal bites.

x. Toxicology, poisoning

Acute intoxications, drug overdose, serious adverse reactions, anaphylaxis.

xi. General

- Pharmacology, pharmacokinetics and drug interactions. Analgesia, sedation and muscle relaxants, inflammation and anti-inflammatory agents, multiple trauma, transport of the critically ill, multisystem disorders (including Multi-Organ Dysfunction syndrome MODS and the Systemic Inflammatory Response Syndrome SIRS) Management of the organ donor.
- Support of the potential organ donor.
- Knowledge about Positioning of trauma case and immobilization.
- Know techniques of prevention of DVT, pulmonary embolism, fat embolism and bed sores.
- Rehabilitation and supportive care in trauma.
- Psychiatric issues following traumatic injuries including PTSD.
- Role of physiotherapist and occupational therapist for trauma patients

b. Skills

i. General

Pharmacology, pharmacokinetics and drug interactions. Analgesia, sedation and muscle relaxants in critically ill patient, inflammation and anti-inflammatory agents, multiple trauma, transport of the critically ill, multisystem disorders (including Multi-Organ Dysfunction syndrome MODS and the Systemic Inflammatory Response Syndrome SIRS) Management of the organ donor.

ii. Respiratory

Mannagement of airway, endotracheal intubation (oral and nasal) and emergency cricothyrotomy, suctioning of the airway, setting and turning of the respirator with different modes of ventilation, titration of oxygen therapy, techniques of weaning from mechanical

ventilation, placement of a intercostal tube and percutaneous tracheostomy, implementation of respiratory pharmacological support, fiberoptic bronchoscopy, interpretation of arterial and mixed venous blood gases, assessment of gas exchange and respiratory mechanics. Knowledge of High frequency oscillatory ventilation, ECMO, etc.

iii. Cardiovascular

Placement of a central venous catheter (by different routes), arterial catheter (by different routes) measurement and interpretation of the hemodynamic variables (including the derived variables), implementation of cardiovascular support antiarrhythmic therapy and thrombolysis. Invasive and noninvasive monitoring techniques including TEE, Cardiac Ultrasound and transvenous pacing.

iv. Neurologic

Basic interpretation of brain CT/MRI scan, Able to use various techniques of intracranial pressure monitoring. Application of Transcranial Doppler in traumatic brain injury. Diagnosis and management of brain dead patient

v. Nutrition

Metabolic and Nutritional Implementation of intravenous fluid therapy. Should be able to calculate and provide enteral and parenteral nutrition.

vi. Haematologic

Correction of haemostatic and coagulation disorders, interpretation of a coagulation profile, blood conservation techniques, implementation of thrombolysis.

vii. Renal:

Bladder catheterization, renal replacement techniques.

viii. Gastro-intestinal and Hepatic:

Placement of gastric tube, utilisation of gastrointestinal intubation and endoscopic techniques in the management of the critically ill

patient; application of enteral feedings; management of stomas, fistulas, and percutaneous catheter devices.

ix. Infectious disease:

Diagnosis of infections and application of isolation techniques, pharmacokinetics, drug interactions, and management of antibiotic therapy during organ failure; nosocomial infections; indications for applications of hyperbaric oxygen therapy.

x. Monitoring/bioengineering:

use and calibration of transducers, amplifiers, and recorders.

xi. Analgesia:

Intravenous and regional anaesthetic techniques for adequate pain relief

xii. Miscellaneous:

use of special beds for specific injuries; employment of pneumatic anti-shock garments, traction, and fixation devices

4. NON-TECHNICAL SKILLS

1. Informed written Consent/Consent in unknown patient
2. Principles of Crisis management, conflict resolution and debriefing
3. Breaking bad news
4. Counselling relatives for Organ donation in brain dead patient
5. Ethical and family issues in trauma
6. Medicolegal aspects in trauma
7. Disaster Management strategies and prevention measures by Government and other authorities

V. LOG BOOK

The Trauma Anaesthesia and Critical Care fellow shall maintain a Log Book of all the procedures/operations/cases (assisted/performed) during the training period, duly certified by the concerned faculty/Consultant/Head of Department

The Log book shall be made available to the board of examiners for their perusal at the time of final examination. The log book should show evidence that the above mentioned subjects were covered with dates and the name of teachers. The candidate will maintain the record of all academic activities undertaken by him/her in a log book.

- Personal profile of candidate
- Educational qualification
- Case history Record
- Procedures performed
- Record of case presentation/demonstration/publication

Every candidate, at the time of practical examination, will be required to produce a performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of Institute.

In absence of production of a log book, results will not be declared.

There will be an EXIT exam after the course completion as per NBE guidelines.

VI. RECOMMENDED TEXT BOOKS, JOURNALS AND WEBSITES

TEXT BOOKS:

1. Essentials of Trauma Anesthesia and Intensive Care: Babita Gupta. Peepee Publications: 1st edition, 2016
2. Trauma Anesthesia: Charles E Smith: Cambridge Publications: 2nd Edition,2017
3. Anesthesia for Trauma: Scher CS: 2014: Springer
4. Essentials of Anesthesia for Neurotrauma: Prabhakar H, Mahajan C, Kapoor I, 2018, CRC Press

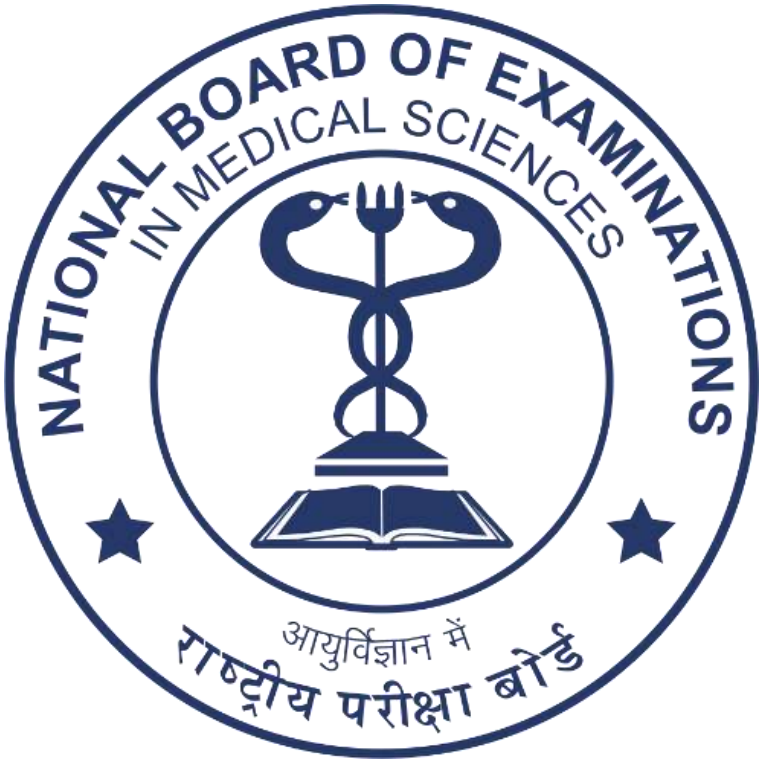
5. Trauma: Faliciano DV, Mattox KL, Moore EE. 9th edition,2020. McGraw Hill.
6. The Trauma Manual: Trauma and Acute Care Surgery. Petzman AB, Rhodes M,Schwab CW, Yealy DM. 5th Edition, 2021. Lippincott.
7. Textbook of critical care: including Trauma and emergency care. Yatin Mehta, Jeetendra Sharma, Mukesh Gupta. 2016. Jaypee Brothers.
8. Millers Anesthesia: Ronald Miller. Elsevier. 8th Edition.
9. Clinical Anesthesia: Dr. Nishkarsh Gupta and Anju Gupta. Wolters Kluwer. SA edition
10. Emergency Medicine for Students and Practitioners. Editor- Chugh SN, Chugh A. 2019, CBS.
11. Emergency Ultrasound made easy: Justin Bowra, Russell Mc Laughlin, Paul Atkinson, Jaimie Henry. 3rd Edition. Elsevier Health SciencesNYSORA website for USG guided block
12. Textbook of Regional Anesthesia and Acute Pain Management: Admir Hadzick. 2nd Edition. Mc Graw Hill Education.

JOURNALS:

1. The Journal of Trauma and Acute care Surgery
2. Journal of Trauma and Critical care
3. Journal of Emergencies, Trauma and Shock.
4. European Journal of Trauma and Emergency Surgery
5. Indian Journal of Neurotrauma
6. Indian Journal of Anesthesia
7. Journal of Anesthesiology and clinical Pharmacology
8. Anaesthesia and intensive care
9. British Journal of Anaesthesia.

RECOMMENDED WEBSITES:

1. https://www.nysora.com
2. https://www.ra-uk.org
3. https://www.usra.ca



आयुर्विज्ञान में राष्ट्रीय परीक्षा बोर्ड

स्वास्थ्य एवं परिवार कल्याण मंत्रालय, भारत सरकार

मेडिकल एन्क्लेव, अंसारी नगर, नई दिल्ली – 110029

NATIONAL BOARD OF EXAMINATIONS IN MEDICAL SCIENCES

Ministry of Health & Family Welfare, Govt. of India

Medical Enclave, Ansari Nagar, New Delhi- 110029