

Curriculum of PhD by course in critical care for allied health sciences

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Preface:

Critical care is evolving part of today's medicine and because of population aging, industrialization, motor vehicle accidents and new diseases every year greater part of community need critical care not just for end of life support but for caring patients until their return to normal life or with less disability.

Critical care of patients need staff from medical nursing and allied medicine for offering better care and increase level of care so we are planing to train students among allied health medicine graduates to provide care in a level between physicians and nurses and direct education and research in this field.

Name of the course:

Phd by course in critical care for allied health sciences

Descriptiobn of the course:

PhD of critical care is a field in allied health medicine which graduates are involved in care of patients in critical care units under direct supervision of medical staff independent practice need's permission of ministry of health in each country. They are also involved in management, training and research in this field.

Admission requirements:

Volunteers should have master of science (MS) or Doctor of Medicine (MD) degree, anesthesia or critical care nursing approved by deputy of education of ministry of health.

English speaking writing and reading.

History and evolution of course in the world and Iran:

University of Birmingham¹, Nottingham², Liverpool³ and London⁴ started PhD course in critical care some years ago and at present time there are many centers in Austria, China and other contries running this course all over the world.

In Iran this is the first time that Tehran university of medical sciences is going to offer this course just for internation students and not for domestic students.

Job position and work place of graduates:

Position of graduates is supervising nursing and non medical personel in:

Intesive care units for adults pediatric and neonates

Respiratory care units

Coronary Care units

Intermediate care units

Directing educational programs in faculty of allied health sciences and training students in related field

Directing research programs

¹ - [Anaesthetics and Intensive Care PhD;](http://connectuniversities.com/collegelayout/collegelayout/University_of_Birmingham_-126019-id-10258.html)

http://connectuniversities.com/collegelayout/collegelayout/University_of_Birmingham_-126019-id-10258.html

² - <https://www.nottingham.ac.uk/medicine/research/research-areas/anaesthesia-and-critical-care/index.aspx>

³ - <https://www.liverpool.ac.uk/study/postgraduate-research/degrees/critical-care/>

⁴ - <https://www.city.ac.uk/prospective-students/courses/postgraduate/critical-care>

Philosophy (Values and beliefs):

In the curriculum of this course there is special attention to the mentioned values and beliefs:

Human being is vicegerant of god in the earth and he has dignity , sacred and should have all rights even in acute illness.

We believe in scientific authority and will do our best in achieving to highest quality of care based on science and wisdom.

Receiving best quality of care is basic right of the patients.

Revising the course is based on:

1-Care of the patients should be comprehensive and covering not only daily needs of patients but also physical , social , psychological and emotional needs of patients.

2-Comprehensive care of patients depends on team work based on professional co-operation.

3-Optimum quality of care needs procedural skills and knowledge.

4-Trainees independence in learning procedural skills based on practical courses should be emphasised.

Outlook:

Phd of critical care would increase quality of care in intensive care units and would improve research and training of personel and patients in this field in the region and world.

Mission:

Mission of graduates is giving best care to the patients for decreasing mortality , morbidity and complications in critical care unit.Consulting , research and education are another duties of graduates.

General goals:

General goal of this course is to train trainees with good knowledge , practical skills , insite and abilities in professionalism , communication skills , information technology , life time self training , research , management , improving quality , critical thinking , and problem solving in critical conditions in order to increase quality of care in patients.

Roles of graduates in the community:

Graduates from this course have different roles including:

1-Patient care

2-Education

3-Research

4-Management

Expected outcome from graduates:

Graduates should be able to:

- Fulfill patients needs and solve their problems.
- Have good knowledge about drugs and their mechanism of action, side effects, interactions ,and contraindications in critical care unit and related fields.
- Use invasive and noninvasive monitoring devices
- Design research programs in related fields.
- Help in policy making in related fields.

Expected abilities and skills of graduates:

General competencies:

- Communication and conversation skills
- Educational and teaching skills
- Cognitive skills
- Management skills
- Research skills
- Team work skills
- Critical thinking and problem solving skills
- Evidence based practice
- Professionalism
- ❖ Above mentioned skills should be trained during the course.

Table 1- Tasks and responsibilities of trainees and related course codes

Special competencies	Task explanation	Course codes
1-Clinical judgement and decision making in critical care unit	a- Evaluation and diagnosis: Diagnosis of patients disease and families needs in critical care units Optimal care of patients according to priorities Data gathering and analysis in critical care Defining practical problems in the work place Performing necessary noninvasive patient's evaluation and helping in invasive evaluation of the patients	5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27
	b- Thinking and analysis Interpretation of clinical data and data derived from monitoring devices Interpretation of laboratory data and diagnostic procedures Calculation dose of commonly used drugs in ICU	3,17
	c- Planing and implementing care program	1,2
2-co-operation in research and applying research results	Design and conduct of practical research about problems in care of critically ill patients Creat evidence and publish of articles in valid journals Conducting common research programs with other centers and present the result of study to related authorities in the country Conducting research programs with co-operation of domestic and international research centers in the related fields	2,17
3- Management in critical care units	Planning, organizing , evaluating and directing related health care subjects Planning, monitoring, supervising and evaluating programs in critical care units Controlling quality of care in critical care units and related wards	1
4- Education in critical care units	Training patients and their family in related wards Collaboration in training students of other fields in critical care units Collaboration in training of staff in form of continuous education and in-service education according to their needs Co-operation in providing educational content in form booklet , pamphlet , leaflet , software and application	2

Table 2- Expected Procedural Skills

Course code	Expected skill	Expected level of learning and number of trials			
		Observation	Assistance in performance	Independent performance	Total
4,6,28,29	Insertion of oropharyngeal airway	3	3	3	9
4,6,28,29	Insertion of nasal airway	1	2	2	5
4,6,28,29	Tracheal intubation	3	3	3	9
4,6,28,29	Close and open endotracheal tube suction	3	3	6	12
4,6,28,29	Tracheostomy suction	3	3	6	12
4,6,28,29	Cuf pressure control in tracheal and tracheostomy tube	1	1	7	9
4,6,28,29	Non invasive ventilation	3	3	3	9
4,6,28,29	Invasive ventilation	3	3	6	12
4,6,28,29	Ventilator check and setting	3	3	3	9
4,6,28,29	Connecting patient to ventilator	3	3	3	9
4,6,28,29	Extubation of tracheal and tracheostomy tube in	1	2	3	6
4,6,28,29	Weaning from ventilator	1	2	3	6
4,6,28,29	Incentive spirometry	1	2	3	6
4,6,28,29	Respiratory physiotherapy	3	3	3	9
4,6,28,29	Care of chest tube	3	3	6	12
4,6,28,29	Chest tube removal	3	3	3	9
4,528,29	Swan-ganz catheter insertion and data analysis	1	2	2	5
4,928,29	Implementing sedation scores like: Riker Sedation-Agitation Scale (SAS) Richmond Agitation-Sedation Scale (RASS)	3	3	3	9
4,6,28,29	Patient preparation for weaning by Burn score	3	3	3	9
6,28,29	practical training of respiratory exercise	1	2	3	6
6,28,29	Setting portable ventilator	1	2	3	6
4,6,28,29	Puls oximetry data interpretation	1	2	3	6
4,6,28,29	Capnography data interpretation	1	2	3	6
4,28,29	Bronchoscopy	1	1	-	2
4,5,28,29	Using advanced oxygen therapy devices like high flow nasal oxygen , nebulizer , non invasive ventilation and venture mask	3	3	6	12
4,5,28,29	spirometry	1	1	2	4
4,5,6,28,29	Using cardiac and respiratory	1	2	3	6

	monitoring devices NIBP, SPO2, EtCO2, TEMP, RESP, ECG				
4,5,28,29	Advanced ECG interpretation	3	3	6	12
4,5,28,29	CPR, BLS , ACLS , ATLS	1	2	3	6
4,5,28,29	Cardioversion and defibrillation	1	1	2	4
4,5,28,29	External pace maker setting	1	1	2	4
4,5,28,29	Temporary pace maker setting	1	1	2	4
5,28,29	Exercise test	1	2	1	4
5,28,29	Cardiovascular angiography	1	1	-	2
4,5,28,29	Vascular doppler	1	-	-	1
4,5,28,29	Transthoracic and transesophageal echocardiography	3	-	-	3
4,5,28,29	Angioplasty	1	-	-	1
4,5,28,29	Using external counter pulsation	1	-	-	1
4,5,28,29	Intra aortic balloon pump insertion	1	-	-	1
4,5,28,29	Management of patient with intra aortic balloon pump	1	2	1	4
4,5,28,29	Invasive blood pressure monitoring	3	3	3	9
4,5,28,29	Arterial cannulation	3	3	3	9
4,5,28,29	Central venous catheter insertion	1	2	-	3
4,5,28,29	Monitoring and interpretation of central venous pressure	3	3	3	9
4,5,28,29	Thermo- dilution cardiac out put monitoring	1	1	1	3
4,5,28,29	Non invasive cardiac out put monitoring	1	1	1	3
4,5,28,29	Interpretation of cardiac out put data	1	1	1	3
4,28,29	Using infusion and syring pumps	3	3	3	9
4,5,28,29	cardiac surgery with cardiopulmonary by pass	3	-	-	3
4,5,28,29	Using cardiopulmonary by pass machine	1	-	-	1
4,5,6,28	Using ECMO	1	-	-	1
4,5,28,29	Evaluation of DVT with Wells score	1	2	3	6
4,5,28,29	Using Sequential Compression Device	1	1	1	3
4,5,28,29	Using Enhanced External Counter Pulsation	1	1	1	3
9,28,29	• Assessment of level of consciousness with GCS and	2	2	8	12

	Four Score				
9,28,29	Assessment of cranial nerves	1	2	3	6
9,28,29	Assessment of brain stem function	1	2	3	6
9,28,29	Interpretation of vital signs in neurologic disorders	1	2	3	6
9,28,29	Interpretation of neurologic signs in determining brain death	1	1	2	4
9,28,29	Assessment of pain severity by Non-Verbal Pain Scale (NVPS) Critical Pain Observation Tool(CPOT)	2	2	2	6
9,28,29	ICP monitoring	1	1	1	3
9,28,29	Assessment of disease severity and outcome using APACHEE and SOFA scores	2	2	8	12
9,28,29	Lumbar puncture	1	1	-	2
4,9,28,,29	Transcranial dsoppler	3	-	-	3
4,9,28,29	brain angiography	3	-	-	3
4,28,29	CT scan	3	-	-	3
9,28,29	MRI Brain	3	-	-	3
9,28,29	Electroencephalography	1	1	1	3
9,28,29	Seizure control	1	2	-	3
8,28,29	Hemodialysis machine settingand priming	1	2	3	6
8,28,29	Continuous renal replacement therapy	1	2	3	6
28,29	Connecting patient to hemodialysis and CRRT	1	2	3	6
8,28,29	Pertoneal dialysis	1	1	1	2

Educational Strategies:

- Task based
- Problem based
- Subject directed
- Evidence based
- Community oriented
- Hospital based
- Systematic education

Educational methods:

- Conference
- Seminar
- Small group discussion
- Work shop
- Journal club
- Book reading
- Case presentation
- Morning report
- Educational rounds
- Self education

Ethical expectations:

Trainees are expected to:

- Implement patient's right charter
- Implement safety measures for patients and personnel
- Implement Dress code rules
- Protect instruments and devices
- Respect to medical , nursing and other personnel in work place
- Follow ethical rules in research

Trainees assessment:

- Written exam
- Oral exam
- Computer based interactive evaluation
- 360 degree exam
- MCQ (multiple choice questions)
- Mini CEX (clinical evaluation exercise)
- OSCE(Objective Structured Clinical Examination)
- DOPS(Direct Observation of Procedural Skills)
- Project Based Assessment
- Portfolio
- Log book

Assessment interval:

At the end of each theoretical or practical/Intership course

Part 2

Minimum requirements for establishment of PhD program for allied health sciences

Minimum attending staff for starting the program:

One professor or two associate professors of critical care medicine(FCCM)

Required specialties and departments for starting the program:

Anesthesiology and critical care
Emergency medicine
Infectious disease
Internal medicine
Surgery
Pediatrics
Obstetrics
Neurology
Neurosurgery
Pharmacology
Basic sciences
Epidemiology
Nutrition

Required personel for starting the program:

Experienced nursing staff
Physiotherapist
Physical medicine
Nutritionist
Psychotherapist

General physical and educational spaces for program establishment:

Class room
Trainees room
Conference hall
Library
Computer room with wifi
Skill lab

Special spaces for program establishment:

ICU, CCU, operating room, hemodialysis, Transplant ward, emergency ward, laboratory

Special educational spaces for program establishment:

Surgery ward , Internal medicine ward , emergency ward, rehabilitation center

Patients population:

Critically ill patients, patients who need organ support, end stage patients, post surgical patients and trauma patients from all ages except neonates

Part 3
**Educational courses for PhD of critical care for
allied health sciences**

Curriculum specifications:

Name of the program:

PhD of critical care for allied health sciences

Length of the program:

3 to 5 years depending on accomplishment of thesis

Total Credits :54

Total credits are 54
consist of followings:

Core credits: 40

Non core credits:4

Thesis: 10

Table 3-Theoretical core courses of PhD by course program

Course code	Course	Credits	hours	prerquisiste
1	ICU organization and management	3	25	non
2	Training and Research in the ICU	1	5	non
3	Pharmacotherapeutics In the ICU	3	26	non
4	Critical Care Procedures, Monitoring	5	40	non
5	Critical Care Cardiovascular Disease	2	14	1-4
6	Critical Care Pulmonary Disease	1	11	1-4
7	Critical Care Infectious Disease	0.5	5	1-4
8	Renal Disease and Metabolic Disorders in the Critically Ill	0.5	6	1-4
9	Neurologic Disease in the Critically Ill	0.5	6	1-4
10	Physical and Toxic Injury in the Critically Ill Patient	0.5	5	1-4
11	Administrative, Ethical, and Psychological Issues in the Care of the Critically Ill	0.5	5	1-4
12	Gastro intestinal disease in the critically ill	0.5	5	1-4
13	Hematologic disease in the critically ill	0.5	5	1-4
14	Intensive Care of the Cancer Patient	0.5	5	1-4
15	Critical care in pregnancy	0.5	5	1-4
16	Nutritional support in critilly ill	0.5	5	1-4
17	Epidemiology and biostatistics	2	15	non
36	Thesis	10	250	non
Total core theoretical credits		32		

Trainees should pass all the core or obligatory courses

Table 4- Theoretical non-core courses of PhD by course program

Course code	Course	Credits	Hours	Prerequisite
18	Imaging in critical care	1	10	1-16
19	Rehabilitation therapy in critical care	1	10	1-16
20	Neurosurgical intensive care	1	10	1-16
21	Pediatric intensive care	1	10	1-16
22	Cardiothoracic intensive care	1	10	1-16
23	Coronary care unit	1	10	1-16
24	Critical care in transplant ICU	1	10	1-16
25	Critical care in burn ICU	1	10	1-16
26	Critical care in intermediate care unit	1	10	1-16
27	Information technology in Critical care	1	10	

Trainees should pass 4 credits of non-core courses

Table5- Practical*/Internship courses of PhD program for allied health sciences**

Course code	Rotation	Credits	Duration	Prerequisite
28	Surgical ICU**	6	12 months	non
29	Medical ICU**	6	12 months	non
30	Operating room**	2	3 months	non
31	Hematologic disease*	1	2 months	28,29,30
32	Renal disease**	1	2 months	28,29,30
33	Infectious disease**	1	2 months	28,29,30
34	Endocrine disease**	1	2 months	28,29,30

Course description:

For theoretical courses trainees should obtain good knowledge about subjects of each course and at the end of the course they will be evaluated by MCQ and OSCE.

Course 1 ICU organization and management:

The intensive care unit:

Design of the ICU
Staffing models in the ICU
Rapid response teams for the critically ill
In-hospital transfer of the critically ill
Pre- and inter-hospital transport of the critically ill and injured
Regional critical care delivery systems
Integration of information technology in the ICU
Multiple casualties and disaster response in critical care
Management of pandemic critical illness
Effective teamwork in the ICU
Communication with patients and families in the ICU
Telemedicine in critical care

Safety and quality:

Patient safety in the ICU
Policies, bundles, and protocols in critical care
Managing biohazards and environmental safety
Managing ICU staff welfare, morale, and burnout

Governance:

ICU admission and discharge criteria
Resource management and budgeting in critical care
Costs and cost-effectiveness in critical care

Medico-legal and ethical issues:

Informed consent in the ICU
Patient rights in the ICU
Medico-legal liability in critical care

Critical illness risk prediction:

The role and limitations
of scoring systems
Severity of illness scoring systems
Organ failure scoring
Genetic and molecular expression
patterns in critical illness

Course 2 Research and training in the ICU:

Clinical skills in critical care
Simulation training for critical care
Leadership skills in the ICU
Evidence-based practice in critical care
Research ethics in the ICU

Course 3 Pharmacotherapeutics In the ICU:

Respiratory drugs:

Oxygen in critical illness
Bronchodilators in critical illness

Cardiovascular drugs:

Vasopressors in critical illness
Vasodilators in critical illness
Inotropic agents in critical illness
Anti-anginal agents in critical illness
Anti-arrhythmics in critical illness
Pulmonary vasodilators
in critical illness

Gastrointestinal drugs:

Gastrointestinal motility drugs
in critical illness
Stress ulcer prophylaxis and treatment
drugs in critical illness

Nervous system drugs:

Sedatives and anti-anxiety agents
in critical illness
Analgesics in critical illness
Antidepressants in critical illness
Antiseizure agents in critical illness
Inhalational anaesthetic agents
in critical illness
Muscle relaxants in critical illness
Neuroprotective agents in critical illness

Hormonal drugs:

Hormone therapies in critical illness

Insulin and oral anti-hyperglycaemic agents in critical illness

Haematological drugs:

Anticoagulants and antithrombotics in critical illness
Haemostatic agents in critical illness

Antimicrobial and

immunological drugs:

Antimicrobial drugs in critical illness
Steroids in critical illness
Immunotherapy in critical illness

Fluids and diuretics:

Colloids in critical illness
Crystalloids in critical illness
Diuretics in critical illness

Course 4 Critical Care Procedures, Monitoring and Pharmacology:

Cardiac Arrest and Cardiopulmonary Resuscitation:

Cardiopulmonary Resuscitation
Advanced Cardiac Life Support
Postresuscitation Care

Airway Management in the Critically Ill Adult:

Structure and Function of the Normal Airway
Assessing Adequacy of the Airway
Management of the Airway
Physiologic Sequelae and Complications of Tracheal Intubation
The Difficult Airway
Confirming Tube Position in the Trachea
Surgical Airway
Extubation in the Difficult Airway Patient (Decannulation)
Tube Displacement in the Critical Care Unit
Human Factors
Common Problems in Airway Management

Assessment of Cardiac Filling and Blood Flow:

Cardiac Filling
Hemodynamic Status and Blood Flow

Arterial, Central Venous, and Pulmonary Artery Catheters:

Arterial Catheters
Central Venous Catheters
Pulmonary Artery Catheters

Cardiac Pacing:

Electrocardiographic Considerations
Clinical Evaluation of AV Block
Management of Bradycardia and Indications of Temporary Pacing
Cardiac Pacing Techniques
Common Clinical Scenarios in Which Pacing Should be Considered
Conditions That Do Not Normally Require Pacing
Permanent Pacing
Indications for Permanent Pacemaker Implantation
Complications of Permanent Pacemaker Implantation
Special Considerations in Permanent Pacing

Pericardial Tamponade:

Clinical Presentation
Diagnosis
Catheter-Based Therapies
Pericardiocentesis
Post-Pericardial Drain
Percutaneous Balloon Pericardiotomy
Surgical Drainage of Pericardium

Percutaneous Assist Devices:

Intraaortic Balloon Pump Counterpulsation
Active Mechanical Circulatory Systems
Impella Devices
High-Risk Percutaneous Coronary Intervention
Extracorporeal Membrane Oxygenation

Echocardiography:

Approach to Echocardiography
Echocardiographic Modalities
Indications for Echocardiography
Hemodynamic Assessment
Stroke and Other Systemic Emboli

General Principles of Mechanical Ventilation:

History
Mechanical Ventilation
Indications for Mechanical Ventilation
Mechanical Breath Generation
Ventilator Modes
Other Modes of Mechanical Ventilation
Positive End-Expiratory Pressure
Monitoring the Ventilated Patient
Maintaining Support of the Ventilated Patient
Weaning From Mechanical Ventilation
Complications of Mechanical Ventilation
Noninvasive Positive-Pressure Ventilation

Ventilatory Management of Obstructive Airway Disease:

Special Challenges of Patients With Severe Airflow Obstruction
Problems and Hazards of Ventilation With Positive Pressure
Principles of Managing the Ventilated Patient With Severe Airflow Obstruction
Practical Management of the Ventilated Patient
PEEP and CPAP in Severe Airflow Obstruction

Mechanical Ventilation in Acute Respiratory Distress Syndrome:

History
Physiologic Basis of Mechanical Ventilation
Patient Characterization
Respiratory Mechanics, Chest Wall Elastance, and Lung Volume
Mechanical Ventilation in ARDS:
Available Evidence
Individualizing Mechanical Ventilation in Patients With ARDS
Possible Adjuncts to Mechanical Ventilation

Bronchoscopy and Lung Biopsy in Critically Ill Patients:

Fiberoptic Bronchoscopy-Induced Physiologic Changes
Airway Evaluation and Management
Diagnosis of Infection
Lung Biopsy: Surgical, Transbronchial, and Cryobiopsy
Special Situations
Complications and Death

Noninvasive Respiratory Monitoring:

Gas Exchange
Respiratory Neuromuscular Function
Respiratory Mechanics

Bedside Tracheostomy in the Intensive Care Unit:

Definition
History
Epidemiology
Indications
Contraindications
Techniques

Chest Tube Thoracostomy:

Historical Perspective
Anatomy and Physiology of the Pleural Space
Physiologic Changes With Pleural Effusions and Pneumothorax
Indications for Tube Thoracostomy
Contraindication to Tube Thoracostomy
Drainage Systems
Optimal Chest Tube Size for Drainage
Technique of Chest Tube Insertion
Management of the Chest Tube and Troubleshooting

Complications

Multimodality Intracranial Monitoring:

Intracranial Pressure Monitoring
Cerebral Blood Flow Monitoring
Brain Tissue Oxygenation Monitoring
Cerebral Microdialysis

Gastrointestinal Endoscopy:

History
Endoscopic Equipment
Anesthesia
Esophagogastroduodenoscopy
Wireless Capsule Endoscopy
Enteroscopy
Colonoscopy
Endoscopic Retrograde Cholangiopancreatography
Endoscopic Ultrasound
Endoscopy in the Pregnant Patient

Bedside Ultrasonography in the Critically Ill Patient:

Basic Ultrasound Terminology and Probe Characterization
Basic Critical Care Echocardiography
Performance of the CCE Examination
The Basic CCE Examination
Utility of Basic Critical Care Echocardiography
Advanced Critical Care Echocardiography
Thoracic Ultrasonography
Clinical Applications of Thoracic Ultrasonography
Abdominal Ultrasonography
Ultrasonography for Guidance of Critical Care Procedures
Quality Assurance and Imaging Archival Systems

Continuous Renal Replacement Therapy:

Physiologic Principles
Principles of Ultrafiltration
CRRT Modalities
Patient Selection and Timing of Initiation
Discontinuation of CRRT
Continuous RRT Versus Intermittent RRT
Prescription Variables
Technical Considerations
Complications and Troubleshooting
Multiorgan Support Technologies With CRRT
Quality Assurance and Improvement for CRRT

Use of Sedatives, Analgesics, and Neuromuscular Blockers:

Considerations in Managing Sedation, Analgesia, and NMB in the ICU
Pain Management in the Intensive Care Unit

Sedation Management
Neuromuscular Blocking Agents
The Effect of Critical Illness on Pharmacokinetics and

Pharmacodynamics:

Physiologic Changes in Critical Illness
General Pharmacokinetic Principles
Pharmacodynamics
Dosing Considerations in Select Critical Care Patients
Pharmacogenetics
Principles of Therapeutic Drug Monitoring

Course 5 Critical Care Cardiovascular Disease:

Shock:

Definitions and Categorization of Shock
Classification:
Pathogenesis and Pathophysiology of Shock
Organ System Dysfunction Owing to Shock
Diagnostic Approach and Evaluation
Management and Therapy

Cardiogenic Shock:

Definition
History
Incidence
Etiology and Epidemiology
Pathogenesis
Clinical Assessment and Initial Management
Therapy
Other Causes of Cardiogenic Shock
Mechanical Support

Severe Sepsis and Septic Shock:

Historical Perspective and Introduction
Definitions
Epidemiology
Pathogenesis and Pathophysiology of Severe Sepsis and Septic Shock
Clinical Presentation
Cardiovascular Profile of Septic Shock
Management of Severe Sepsis and Septic Shock

Cardiac Tamponade:

Fundamentals of Tamponade
History and Physical Examination
Diagnostic Tests
Overall Assessment
Special Syndromes in Tamponade
Settings in Which Tamponade Is Seen

Management

Hypovolemia and Traumatic Shock:

Classic Neuroendocrine Response
The Hypovolemic Patient
Inflammation and Shock After Injury
Blood Component Therapy
Endpoints
Clinical Strategies
Management of Traumatic Shock in the ICU
Special Problems

Severe Heart Failure:

Definition, Epidemiology, and Staging of Heart Failure
Pathophysiology
Diagnosis and Serum Natriuretic Peptides
Acute Heart Failure Syndromes
Pharmacologic Management of Acute Heart Failure
Transition to Chronic Pharmacologic Therapy for Severe Heart Failure
Acute Coronary Syndromes and Acute Heart Failure: Special Considerations
Heart Failure With Preserved Left Ventricular Ejection Fraction (Diastolic Heart Failure)
Myocarditis and Acute Heart Failure
Device Therapy for Heart Failure and Ventricular Tachyarrhythmias: Implanted Cardioverter Defibrillator and Cardiac Resynchronization Therapy
Severe Heart Failure and Mechanical Circulatory Support

Anaphylaxis and Anaphylactic Shock:

Pathophysiology
Symptoms and Clinical Diagnosis
Treatment and Management
What Should Be Done After Recovery for Anaphylactic Shock?

Acute Coronary Syndromes and Acute Myocardial Infarction:

Definitions
ST-Segment Elevation Myocardial Infarction
Unstable Angina and Non-ST-Segment Elevation Myocardial Infarction

Valvular Heart Disease in Critical Care:

Aortic Stenosis
Aortic Insufficiency
Mixed Aortic Valve Disease
Mitral Regurgitation
Hypertrophic Obstructive Cardiomyopathy
Mitral Valve Stenosis

Prosthetic Heart Valves

Cardiac Arrhythmias:

Bradycardias
Supraventricular Tachycardia
Management of SVT
Ventricular Arrhythmias
Metabolic Derangements

Hypertensive Crises:

Introduction and Terminology
Pathophysiology
Approach to Management
Specific Clinical Considerations

Acute (Thoracic) Aortic Dissection:

History
Types of Thoracic Aortic Dissection
Risk Factors for Thoracic Aortic Dissection
Pathophysiology
Diagnosis
Perioperative Management
Operative Approach
Outcomes and Prognosis

General Principles of Postoperative Intensive Care Unit Care:

General Principles
Best Practices: General Postoperative Care
Surgical Complications
Specific Surgical Specialty Operations

Postoperative Management of the Cardiac Surgery Patient:

Early Postoperative Care
Common Postoperative Management Challenges
Late Postoperative Care
Cardiology
Pulmonary
Neurology
Endocrine
Renal
Hematology
Gastrointestinal

Chourse 6 Critical Care Pulmonary Disease:

Acute Respiratory Failure:

Acute Respiratory Failure–Types 1 and 2
Hypoxemic Respiratory Failure
Hypercapnic Respiratory Failure

Acute Respiratory Distress Syndrome
Incidence and Prevalence
Future Considerations

Life-Threatening Asthma:

Epidemiology
Genetics and Pathophysiology
Signs and Symptoms
Inhaled Therapies
Systemic Therapies
Mechanical Ventilation in Patients With Asthma
The Future for Those With Life-Threatening Asthma

Chronic Obstructive Pulmonary Disease:

Definitions
Background
Pathophysiology
Clinical Manifestations
Precipitating Factors
Initial Management
Noninvasive Mechanical Ventilation
Invasive Mechanical Ventilation
Terminal Care for the Patient With End-Stage COPD

Hypoventilation and Respiratory Muscle Dysfunction:

Decreased Neuromuscular Capacity
Respiratory Muscle Weakness
Increased Load
Hypercapnia-Induced Hypoventilation

Pneumonia:

Definitions
Pathogenesis
Community-Acquired (Community-Onset) Pneumonia
Hospital-Acquired Pneumonia/Ventilator-Associated Pneumonia

Weaning from Mechanical Ventilation:

Pathophysiology of Weaning Failure
Weaning-Predictor Testing
Weaning Trials

Acute Pulmonary Embolism:

Prevalence of Venous Thromboembolism in Intensive Care Unit
Patients
Risk Factors
Deep Venous Thrombosis
Pathophysiology
Clinical Presentation
Recognition of Pulmonary Embolism During Intensive Care Unit

Admission
Diagnostic Testing for Pulmonary Embolism
Risk Stratification
The Management of Acute Pulmonary Embolism
Special Populations
Prophylaxis
Long-Term Prognosis

Pulmonary Hypertension:

Pathophysiology of PH and RV Failure
Management of PH and RV Failure in the ICU
Augmenting RV Cardiac Output

Massive Hemoptysis:

Anatomic Considerations
Causes of Hemoptysis
Invasive Pulmonary Interventions
Management

Pneumothorax and Barotrauma:

Definition and History
Incidence
Pathophysiology
Classification
Clinical Features
Electrocardiographic Features
Diagnostic Imaging Modalities
Differential Diagnosis: Conditions Mimicking Pneumothorax
Management
Complications Related to Management

Toxic Gas, Fume, and Smoke Inhalation:

Epidemiology
Pathogenesis of Inhalation Injury
Diagnostics and Treatment

Course 7 Critical Care Infectious Disease:

Nosocomial Infection in the Intensive Care Unit:

Incidence and Profile
Morbidity and Economic Impact
Pathogenesis and Epidemiology
Pathogenesis and Epidemiology
General Infection Control Measures
Nosocomial Infections and Specific Infection Control Measures
Avant Garde Infection Control Measures
Approach to a Nosocomial Epidemic
Approach to a Nosocomial Epidemic
Protection of Health Care Workers in the Intensive Care Unit
Goals for the Future

Principles Governing Antimicrobial Therapy in the Intensive Care Unit:

Right Drug
Right Time
Right Dose
Right Duration
Antibiotic Stewardship in the Intensive Care Unit

Antifungal and Antiviral Therapy:

Systemic Antifungal Agents
Specific Indications and Uses for Antifungals
Candida Infections
Areas of Controversy in Antifungal Therapy
Antiviral Agents
Specific Indications and Uses for Antivirals

Critically Ill Immunosuppressed Host:

Definition
Overview of Immune and Inflammatory Responses
General Approach to Management of Patients With Altered Immune and Inflammatory Responses
Management of Specific Patient Populations

Specific Infections With Critical Care Implications:

Overwhelming Infections of the Central Nervous System
Fulminant Endovascular Infections
Primary Bacteremias
Toxin-Mediated Infections
Serious Skin and Soft Tissue Infections
Serious Gastrointestinal and Intra-abdominal Infections
Life-Threatening Infections of the Head and Neck
Serious Vector-Borne Infections
Severe Viral Infections
Potential Agents of Bioterrorism

Course 8 Renal Disease and Metabolic Disorders in the Critically Ill:

Acute Kidney Injury:

Definition
Pathogenesis
Clinical Manifestations
Diagnostic Approach
Prevention
Management of Established Acute Kidney Injury
Prognosis and Outcomes

Chronic Kidney Disease:

Introduction
Physiology of Chronic Kidney Disease
End-Stage Renal Disease

Kidney Transplantation
Drug Dosing

Acid-Base, Electrolyte, and Metabolic Abnormalities:

Metabolic Disorders of Acid-Base Homeostasis
Disorders of Potassium Homeostasis
Disorders of Water Homeostasis
Calcium
Disorders of Magnesium Homeostasis
Phosphorus

Acute Diabetic Emergencies, Glycemic Control, and Hypoglycemia:

Diabetes Mellitus: Epidemiology and Classification
Diabetic Ketoacidosis and Hyperglycemic Hyperosmolar State
Glycemic Control in the ICU
The Effect of Parenteral Nutrition, Enteral Nutrition, and
Glucocorticoids on Glycemic Control
Hypoglycemia

Adrenal Insufficiency in the Critically Ill Patient:

Incidence and Prevalence
Etiology and Pathogenesis
Clinical Features
Diagnosis
Critical Illness-Related Corticosteroid Insufficiency
Management
Etomidate

Thyroid Disorders:

Thyroid Physiology
Thyroid Function Tests
Drug Effects and Thyroid Function
Nonthyroidal Illness Syndrome
Hypothyroidism and Myxedema Coma
Thyrotoxicosis and Thyroid Storm

Course 9 Neurologic Disease in the Critically Ill:

Coma:

Consciousness and Its Clinical Spectrum
Neurobiology of Consciousness
Assessment and Acute Management of Coma
Assigning a Neurologic Profile
Electrophysiology
Initiating Target Treatments Based on Etiology of Coma
Ethical Considerations

Neurologic Criteria for Death in Adults:

Historical Perspective and Definitions
Determination of Brain Death
Confirmatory Testing
Special Circumstances

Stroke:

Historical Background
Overview
Advances in Radiology
Thrombolysis in Stroke
Endovascular Mechanical Thrombectomy
Symptomatic Carotid Disease/Stenting
Anticoagulation in Stroke
Antiplatelet Agents in Stroke
Patent Foramen Ovale
Prolonged Cardiac Monitoring
Massive Hemispheric Cerebral Infarct
Critical Care Consultation
Myasthenia Gravis and Guillain-Barré Syndrome:
Guillain-Barré Syndrome
Myasthenia Gravis
Complications

Seizures in the Critically Ill:

History
Epidemiology
Nosology and Semiology
Pathogenesis
Pathophysiology
Clinical Manifestations
Diagnostic Approach
Management Approach
Prognosis

Head Injury:

Incidence
Diagnostic Approach
Primary Head Injury
Secondary Head Injury
Specific Treatment Considerations

Course 10 Physical and Toxic Injury in the Critically Ill Patient:

Critical Care of the Severely Burned:

Introduction
Epidemiology
Phases of Burn Care
Initial Assessment and Triage (Phase I)

Primary Survey
Fluid Resuscitation: The First 48 Hours (Phase II)
Optimizing Burn Wound Coverage (Phase III)
Critical Care (Phase III Continued)
Rehabilitation (Phase IV)

Poisonings:

Resuscitation and Stabilization
Diagnosis
Gastrointestinal Decontamination
Enhanced Elimination
Specific Poisonings

Hypothermia, Hyperthermia, and Rhabdomyolysis:

Hypothermia
Hyperthermia
Malignant Hyperthermia
Neuroleptic Malignant Syndrome
Rhabdomyolysis

Course 11 Administrative, Ethical, and Psychological Issues in the Care of the Critically Ill:

Performance Improvement and Severity Scores in Critical Care:

Critical Care Performance Improvement
Culture Transformation and Organizational Learning
Critical Care Scoring Systems
Summary and Conclusions

Ethical Considerations in Managing Critically Ill Patients:

Informed Consent and Decision Making in Critical Care
Practical Aspects of Withdrawing Life-Sustaining Treatments in the ICU

Delirium, Sleep, and Mental Health Disturbances in Critical Illness:

Overview
Acute Brain Dysfunction or Delirium
Sleep Disruption in the Critically Ill
Posttraumatic Stress Disorder
Long-Term Cognitive Impairment After Critical Illness
Depression
Concluding Thoughts

Intensive Care Unit Administration and Education:

ICU Administration
Education in Critical Care: An Administrator's Perspective

Course 12 gastrointestinal disease in critically ill:

Diagnosis and Management of Liver Failure in the Adult:

Decompensation of Chronic Liver Disease
Acute (Fulminant) Liver Failure

Gastrointestinal Bleeding:

Clinical Presentation
Upper Gastrointestinal Bleeding
Stress-Related Mucosal Disease
Lower Gastrointestinal Bleeding
Obscure Gastrointestinal Bleeding

Acute Pancreatitis:

Definitions and Terminology
Pathogenesis
Etiology and Risk Factors
Clinical Presentation and Diagnosis
Early Management of the Critically Ill Patient With Acute Pancreatitis
Management of the Late Complications of Severe Acute Pancreatitis
Long-Term Outcome and Quality of Life

Course 13 Hematologic disease in critically ill:

Hemorrhagic and Thrombotic Disorders:

Approach to a Critically Ill Patient With Hemorrhage or Thrombosis
Laboratory Tests of Coagulation
Disorders of Platelets
Complex Thrombohemorrhagic Disorders
Catastrophic Antiphospholipid Syndrome
Disorders of Hemostasis
Venous Thromboembolism
Anticoagulants

Use of Blood Components in the Intensive Care Unit:

Blood Components and Indications for Transfusion
Adverse Effects of Blood Component Transfusion
Special Transfusion Situations in the Critical Care Setting
Alternatives to Transfusion of Blood Components
Legal Issues in Transfusion Medicine

Course 14 Intensive Care of the Cancer Patient:

Reasons for ICU Admission
Triage of Cancer Patients for ICU Care
Palliative, Ethics, and End-of-Life Care Issues

Course 15 Critical Care Medicine in Pregnancy:

Physiologic Changes in Pregnancy
Critical Care Management
Ventilatory Support
Pregnancy-Specific Conditions Requiring ICU Care
Conditions Not Specific to Pregnancy

Course 16 Nutritional support in critically ill:

Malnutrition
Starvation Versus Stress Metabolism
Indications for Nutrition Support
Goals of Nutrition Support
Nutrition Support in Critical Illness
Route and Timing of Administration
Types of Nutritional Formulas
Nutritional Assessment and Monitoring

Course 17 Epidemiology and Biostatistics:

Introduction to health economics
Analysis of patients data
Sampling methods
Research methods
Clinical epidemiology
Systematic reviews
Meta-analysis
Randomized trials
Measurements in epidemiology
Analytic epidemiology
Principles of biostatistics
Biostatistical research method
Multivariable methods in biostatistics
Statistical software
Multi-level modelling
Causal modeling

Course 18 Imaging in critical care:

Interpretation of CXR
Interpretation of chest CT scan
Interpretation of brain CT scan
Interpretation of brain and chest MRI

Course 19 rehabilitation therapy in critical care:

Role of early ambulation in ICU patients
Methods of early ambulation in ICU patients
Promotion therapy in critical care
Rehabilitation in trauma patient
Rehabilitation in cachectic patient
Rehabilitation in ICU psychosis

Course 20 Neurosurgical intensive care:

Management of increased ICP in critically ill
Management of patient with invasive ICP monitoring
Care of patient with cerebrovascular surgery
Care of patient with neurosurgical cancer
Care of patient with neuro trauma
Care of patient before and after Spinal surgery
Care of patient with stereotactic surgery

Course 21 pediatric intensive care:

Air way management in pediatric patient
Fluid and electrolyte balance in pediatrics
Nutritional support in pediatric ICU
Monitoring in pediatric patient
Organ support in pediatric critical care
Ventilator therapy in pediatric patient
Common problems in pediatric critical care

Course 22 Cardiothoracic intensive care:

Critical care in:

Acute coronary syndrome and CABG
Aortic dissection and aneurysm
Cardiothoracic surgery
ECMO/ECLS
Aortic Balloon pump
Heart transplant
Lung transplant
Induced hypothermia
Valvular heart disease

Course 23 coronary care unit:

Acute coronary syndrome and primary PCI
Supra ventricular and ventricular arrhythmia
Heart failure
Nutrition to prevent or manage heart disease
Resuming normal activity after a heart attack
Psychological aspects of heart disease

Course 24 Transplant intensive care:

Acute hepatic failure
Chronic hepatic failure
Acute kidney injury
Chronic kidney disease
End stage renal disease
Pancreatic disease
Care of patient before and after liver transplant
Care of patient before and after kidney transplant
Care of patient before and after pancreas transplant

Course 25 Burn intensive care:

- Infection control in burn patient
- Water and electrolyte balance in burn patient
- Infection control in burn patient
- Nutrition in burn patient
- Smoke inhalation and air way problems in burn patient
- Mechanical ventilation in burn patient
- Psychological support in burn patient

Course 26 intermediate care unit:

- Preparing patient for discharge from intermediate care
- Patient needs after discharge
- Psychological support of patient
- Rehabilitation of patient
- Early ambulation of patient

Course 27 information technology in critical care:

- Data management and analysis
- Web design and application development
- Networking and communication
- Management of information systems

Practical/ Intership course description:

Trainees are expected to learn all procedural skills in each practical/ Intership course according to table 2

At the end of each rotation trainees will be evaluated by DOPS and log book.

Table 6- List of obligatory work shops for the PhD program

Schedule	Workshop	Hours
First semester	Advanced airway management	6
	BLS-ACLS-PLS	6
Second semester	Basic ventilator support	12
	Advanced ventilator therapy	12
Third semester	Advanced hemodynamic monitoring	8
	Hemodialysis and CRRT	8

All workshops are obligatory for trainees

Part 4 standards of program

Standards of educational program

The followings are minimum standards that should be considered in program validation:

- 1-Institute should provide all educational facilities like class room ,conference hall, library,computer and internet,necessary software,and data recording.
- 2-Institute should provide all necessary spaces like attending room,trainees room,self service,prayer room and dormitory for trainees.
- 3-Institute should provide all necessary educational spaces like library and hospital wards for trainees.
- 4-All basic departements and rotational wards should approval from deputy of education ministry of health.
- 5-Department should provide all necessary educational materials like patient avtive hospital beds,laboratory samples and drugs.
- 6-Institute shloud provide all instruments and disposables to educating department
- 7-All practical and research facilities should be available for attendings and trainees
- 8-Attending staff in Educating department should meet the requirements of program in aspect of scientific degree and number.
- 9-Number and degree of personnel in educating department should be according to requirements of program.
- 10-Curriculum of program should be available for all trainees and staffs.
- 11-All instructions , guidelines , rules ,regulations and educational provisions shloud be available for trainees and staffs and trainees should meet the regulations
- 12-All reference books and journals should be available for trainees.
- 13-Educational content of theoretical courses should meet at least 80% of educational program.
- 14-That is necessary for trainees to participate in all classes , conferences , seminars , practical courses , and research programs according to their educational program.
- 15-Method of teaching for practical skills should satisfy the trainees and evaluators.
- 16-Trainees should meet the rules of Dress code.
- 17-Trainees should behave according to departments rules and regulations.
- 18-Trainees should have portfolio and certificates , results of exams and evaluations should be recorded.
- 19-Trainees should have log book and all procedures , practices and their results should be recorded.
- 20-At the end of each pracrical course attendings should evaluate and sign trainees log book.
- 21-Trainees should participate in research programs of department and record their activities.
- 22-Trainees should get certification at the end of each practical rotation.
- 23-Educational methods of department should meet at least 70% of requirments of educational program.
- 24-Evaluation of trainees should be according to educational program.
- 25-Educating institute should meet requirements of program.

Part 5 program evaluation

Program Evaluation

Method of program evaluation:

The program evaluation is a structured continuous process that will be executed as following:

1-Formative evaluation:

The evaluation is done two times a year and trainees , attendings , staffs and chief of department take part in evaluation in 4 distinct subjects:

Satisfaction with educational content

Satisfaction with educational methods

Satisfaction with assessment methods

Satisfaction with educational facilities

2-Summative evaluation:

Is done at the end of training course and trainees take part in evaluation in 4 distinct subjects:

Satisfaction with educational content and assessment methods

Suitability of knowledge insite and function for the future

Comparing goals obtained by trainees with intended goals

Assessing problems reported by trainees and patients

Conditions of final program evaluation:

1-Passing 3 years of program running

2-Deep technological or conditions changes which necessitates program change

3-Decision of health care policy makers

Table 7-Indicators of program revision

Indicator	Criterion
Level of trainees satisfaction from program	70%
Level of attendings satisfaction from program	70%
Level of health care managers satisfaction from results of program	80%
Level of compensation of needs and solving problems by graduates	According to evaluators
Quality and quantity of scientific products and research by graduates	According to evaluators

Method of evaluating the program:

Survey of attendings, trainees, and graduates using questionnaire of evaluation and accreditation department of ministry of health

Responsible authority for program evaluation:

Expansion council of medical science universities in ministry of health

Method of program revision:

Steps of program revision are as follows:

Gathering survey data and expert opinion

Request from expansion council for program revision

Discussing data gathered in revision committee

Revision of requested parts of program and presenting draft to secretariat of expansion council

Study References:

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3. Journal of Critical Care Medicine.
4. Journal of Intensive Care.
5. Web based Critical Care Articles.