

Forensic Medicine: Introduction

Competencies

- FM1.1** Demonstrate knowledge of basics of forensic medicine like definitions of forensic medicine, clinical forensic medicine, forensic pathology, state medicine, legal medicine and medical jurisprudence
- FM1.2** Describe history of forensic medicine
- FM4.10** Describe communication between doctors, public and media
- FM4.14** Describe and discuss the challenges in managing medico-legal cases including development of skills in relationship management—human behavior, communication skills, conflict resolution techniques
- FM4.15** Describe the principles of handling pressure—definition, types, causes, sources and skills for managing the pressure while dealing with medico-legal cases by the doctor
- FM4.16** Describe and discusses bioethics
- FM4.17** Describe and discusses ethical principles: respect for autonomy, non-maleficence, beneficence, and justice
- FM4.22** Explain oath—Hippocrates, Charaka, and Sushruta and procedure for administration of oath
- FM4.23** Describe the modified declaration of Geneva and its relevance

LEARNING OBJECTIVES

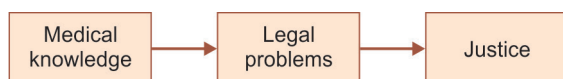
- Definition of forensic medicine and subspecialties in forensic medicine
- Medical etiquette
- Morality
- Origin of ethics
- Medical ethics
- Bioethics
- Oath: Charaka, Sushruta and Hippocratic Oath
- Declaration of Geneva
- Communication between doctors, public and media
- Skills in relationship management
- Human behavior
- Communication skills
- Conflict resolution techniques
- Handling pressure: Definition, types, causes, skills and
- History of forensic medicine

FORENSIC MEDICINE

Definitions

Forensic Medicine

Forensic medicine is the application of medical knowledge to solve legal problems for administration of justice. The word “Forensic” has come from forum or market place. In ancient Rome, disputes were settled in the market place, much like panchayat in India. Forensic medicine is called legal medicine in some countries of Europe.



State Medicine

State medicine was coined by Dr Stanford Emersion Chaille in 1949 to regulate the conduct and professional activities of registered medical practitioners. It is so named because the State (Country) has the power to regulate the conduct of doctors. The term is no longer used.

Medical Jurisprudence

Medical jurisprudence (Juris—law, prudentia—knowledge) deals with the legal knowledge of medical practice. It includes what is to be done and what not to be done while treating a patient like doctor–patient

relationship, duties of a doctor, professional misconduct, medical negligence, consent, etc.

Subspecialties in Forensic Medicine

Clinical forensic medicine: Clinical forensic medicine deals with examination of living person and its certification in medico-legal cases like injury, sexual assault, child abuse, age estimation, etc. It is emerging as a specialty unto itself.

Forensic pathology: Forensic pathology deals with postmortem examination, microscopic study, and chemical analysis to find out the cause of sudden, suspicious, and unnatural deaths. Forensic pathology deals after death whereas clinical forensic medicine deals with the living.

Forensic anthropology: Forensic anthropology deals with identification of human skeletal remains to solve legal problems for administration of justice.

Scopes in forensic medicine: Forensic medicine extends into almost every branch of medicine and is not confined only to criminal matters. Advances in knowledge and technology during the past decades have opened fields like, Forensic Biology, forensic ballistics, forensic serology, etc.

MEDICAL ETIQUETTE

Medical etiquette deals with the conventional code of courtesy observed between the members of the medical profession. It encompasses the following:

Never criticize: A doctor should never criticize another doctor in front of a patient.

Never ask for fees: When a doctor treats another doctor or his close relations, he should never ask for fees, it is a professional courtesy.

Help: A doctor should always help his fellow doctor in professional matters.

Consultation: If a patient is referred to a specialist, the referred doctor should ensure that the patient returns back to the doctor after consultation.

MORALITY

Morality is the building block of ethics. It is difficult to understand ethics without knowing what morality is. Morality and ethics often interchange. Morality deals with moral values like truth, honesty, integrity, justice etc whereas ethics deals with morality in a group like medical ethics, business ethics, banking ethics.

Elliot Turiel, a psychologist, who worked with morality, defined morality as right or wrong in an individual human behavior. Morality is a belief that some behavior is right and acceptable, while some behavior is wrong. In immorality, there are victims who suffer.

There is no fixed definition of morality. Killing an enemy soldier is an act of bravery and ethically correct but killing the same soldier after arresting him is an offence of murder. Morality differs from person to person. *Example:* X takes vegetarian food because he believes in non-violence. He is morally correct. Y is non-vegetarian. He is also morally correct. Morality differs in different societies and cultures. *Example:* In New York Metro station if a boy and girl hugs, it is appreciated because romantic relation is valued there. In Dum-Dum metro station, Kolkata, in 2020 a boy hugged a girl, they were thrashed by fellow passengers. A few years back it was in the news, a male student talked with a female classmate in Kabul University, Afghanistan, in an ice cream parlor, it resulted in police firing and death.

Theories on Morality

Virtue Ethics

Virtue, or moral character. Virtue ethics was founded by the Greek philosopher Aristotle (384 BCE) who said living ethically is the foundation of life and key to wisdom. His emphasis was on developing character. Virtues include honesty, courage, compassion, gratitude, generosity, fidelity, patience, diligence, fairness, self-control, good temper and prudence.

Deontological Theory

(*deon*: “duty”, *logos*: “science”) Relationship between duty and human actions. It was founded by Immanuel Kant, the 18th-century German Philosopher “Duty for duty’s sake”, “Virtue is its own reward”, and “Let justice be done even if the heavens fall”. This theory is embedded in elements of Bhagabat Gita which he studied. Morality depends on the rightness or wrongness of action and not the result. Deontology is commonly followed by doctors before taking a decision.

Consequential Theory

Morality is understood entirely in terms of the consequences produced or good outcome.

Explanation

A terrorist comes with a loaded revolver searching for X in his house. His brother Y can make out terrorist is in a killing spree. Y knows his brother is inside the house. Y also knows if he tells Y the truth, his brother will be killed.

As per Deontological theory, Y is ethical if says his brother is inside the house, fully knowing his brother will get killed.

As per Consequential theory, Y is ethical if he says his brother is not in the house. Y saved his brother by this consequence having good outcome.

Doctrine of Double Effect

It is an ethical dilemma. Killing or harming someone in order to bring greater good but ethics never allow killing. *Example*: Killing a terrorist who is about to kill numerous innocent people or bombing an ammunition factory.

In the animal kingdom, morality is not an innate quality, as it stands in the way of survival of the fittest, and consequentially, evolution. Human being as higher animals have to learn morality, for betterment and excellence.

In India, Lord Buddha (564 BCE) taught the code of morality called Silas which are:

Abstaining from:

1. Killing
2. Stealing
3. Sexual misconduct
4. Wrong speech (telling lies)
5. Intoxication

Moralities or silas are simple but profound and are relevant in present time. It is based on non violence, do not do unto others which one will not like to be done to oneself, one will not like to be killed so he should refrain from killing, it is the same for other silas. Lord Buddha found greed as the root cause of human suffering. Doctors must practice morality to become successful.

Morality and Ethics

Differentiating features of morality and ethics are given in Table 1.1.

ETHICS

Ethics (*ethikos* = rules of conduct) the moral conduct of right and wrong in a civil society, which comes from within. It is a branch of philosophy.

Medical ethics: Medical ethics are the moral principles guiding doctors for the best possible outcome of the patients. Ethics is a preventive

Table 1.1: Difference between morality and ethics

	Morality	Ethics
Definition	Principles of right and wrong, in an individual	Principles of right and wrong, in a professional group
Guided by	Social and cultural norms	Professional norms
Applicability in medical profession	As an individual	In group, like medical ethics
Consistency	It differs in different societies	It is uniform in a group

aspect as it prevents a doctor from wrongdoing. The aim of medical ethics is to maintain honour of the noble medical profession. It is different from law, which is enforced on an individual after wrong is done. It is popularly said when ethics ends law takes over. Ethics creates more questions than answer.

Medical ethics tends to be narrow and limited to patient and doctor, which lead to the formation of bioethics having wider application, touching upon the philosophy of science. The two fields often overlap.

BIOETHICS

Bioethics is a branch of applied ethics regarding the philosophical, social, and legal issues emerging from advances in biological research. Conflicting issues like organ donation, genetic research, death and dying, cloning, etc. require doctors to make difficult decisions about who would receive treatment and which patient would be allowed to die. Law cannot dictate moral issues. It was developed on four principles by Tom Beauchamp and James Childress in their book, *Principles of Biomedical Ethics* in 1985. Bioethics emerged as a field of study since 1960s.

Principles of Bioethics in Health Care

1. **Autonomy:** "Self-rule". Right of the patient to retain control over own body, a doctor should respect the autonomous decisions of competent adults. Doctor can only suggest or advise.
2. **Beneficence:** "The best interest". Doctor must do what is best for the patient in a given situation.
3. **Nonmaleficence:** "Above all, do no harm,". Doctor should do no harm to the patient; it is the best known of the four principles. It is also there in Hippocrates Oath, first do no harm.
4. **Justice:** "Fairness and equality" The distribution of scarce health resources and the decision of who gets what treatment with fairness and equality. Doctor should

act fairly in all medical decisions with limited healthcare resources deciding the resources versus the benefit. Doctors cannot cure everyone, so priorities must be set with justice according to the available recourses which may lead to conflict between autonomy, beneficence, and non-maleficence.

Example: Blocking few available ICCU beds by patients whose chances of survival are less (Fig. 1.1.).

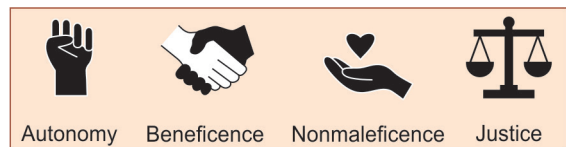


Fig. 1.1. Four principles of bioethics in health care

Unethical Doctors

Doctors not following medical ethics are like individual armed with a knife having a license to kill. Medical history has examples of unethical doctors who brought shame not only to the doctor community but also to the mankind, like, Dr. Brandit, Hitler's main medical authority, who destroyed more than 70,000 innocent lives under Nazi euthanasia program to eliminate "life unworthy of life". Code-named "Aktion T 4". Dr. Kazu Tabei of Japan, feed typhoid bacteria to prisoners by mixing with milk, Dr. Hisato Yoshimura, froze captivities to death during World War. There are innumerable examples of unethical acts.

Medical ethics gained importance after World War II, following Doctor's Trial at Nuremberg, German, because doctors, like Dr. Brandit, on the order of Hitler and his commanders, carried out experiments on prisoners to find new medicine to cure diseases. Newer methods of treatment were experimented, because of free access to prisoners. Humans were exposed to pressure chamber, freezing cold, malaria, mustard gas, sea water consumption, sterilization with X-rays. Regretfully lots of advancements in medicine happened during World Wars at the cruel cost of human life.

OATH

Oath is defined as a solemn promise, invoking divine witness, regarding one's future action. Oath is traditionally linked with religious beliefs. Currently medical graduates take oaths before they start their career as a doctor. In olden days, oath was taken before starting of education in front of the sacred fire, in presence of their elders, peers and famous physicians. The oath sets a high moral standard and established medicine as a profession that ordinary people could trust. Chapter 8 (8.3 to 8.14) of Charaka Samhita called rogabhivishagitiya deals with selection of teachers and various aspects of good medical training.

India

Ancient India, as evident from excavation of Harappa, Mohenjo-Daro and Kali Banga was the cradle of civilization and Ayurveda is the most ancient system of medicine.

In ancient India, there was no uniform code of Medical Ethics as seen in west. Numerous famous doctors were born and each set his own code of ethics. The doctors were called vaidya. Vaidya was expected to be friendly and sympathetic towards his patients; at the same time, he should have a practical approach, pay attention to the curable and be indifferent to those likely to die. Vaidya was expected to "try to get more and more knowledge without any prejudice." Should possess (i) theoretical knowledge, (ii) experience, (iii) practical skill, and (iv) cleanliness. The ancient texts talk in detail about the doctor-patient relationship.

Thou shalt speak only the truth.....be free from envy..... thou shalt behave and act without arrogance and with undistracted mind, humility and constant reflection....day and night however thou mayest be engaged, thou shalt endeavor for the relief of patients with all thy heart and soul. Thou shalt not desert or injure thy patient even for the sake of thy life....thou shalt not commit adultery even in thought. Thou shalt act always with a view to the acquisition of knowledge.

Charaka was born in, 200 BC. Charaka Sanghita, says "Not for self, not for the fulfillment of any earthly desire or gain, but solely for the good of suffering, should you treat your patients and so excel all". 'This science of life is permanent and yielding merit... the practice of medicine is never fruitless, it sometimes gives money, sometimes religious merit, sometimes renown or sometimes the opportunity for study.... those who sell the treatment of diseases as a merchandise of medicine gather dust and neglect gold.' He also said "It is more important to prevent the occurrence of disease than to seek a cure." 'Charaka recommends that the vaidya must keep his conclusions to himself to avoid potential harm. Thou shalt renounce all evil desires, anger, greed, passion, pride, egotism, envy, harshness, meanness, untruth, indolence, and other qualities that bring infamy. 'His attitude to women should be particularly aloof and detached, if he has to treat a woman, he should never go unaccompanied and he should never laugh nor smile nor exchange irrelevant words with her. No gifts offered by her in the absence of her husband should be accepted. Even if he discovers her attachment to him and her amorous overtures, he should not respond. Neither should he divulge them to others. When a doctor visits the patient in his house, he must be respectful and dress appropriately. He should keep his head bent and not be curious about things and persons about him. He should focus on curing the illness, and refrain from discussing domestic affairs or from announcing the impending death of a patient'.

Sushruta was born in 200 AD, he is the *father of surgery*. He said 'When flies come and drop invisible organism on the wound, it flourishes with severe pain and swelling'. He advises doctors to keep their nails trimmed, short haircut, put on clean clothes and to treat each patient like their own child. He advocated severe punishments for medical negligence.

Western World

Hippocrates was born in 460 BCE. He said "Sickness is not sent by God...find the cause we will find the cure", "I will use my power to help the sick to the best of my ability... I will abstain from harming or wronging" Hippocrates placed great emphasis on strengthening and building up the body's inherent resistance to disease. He prescribed diet, gymnastics, exercise, massage, hydrotherapy, and swimming in the sea.

Oath in western world had its foundation as Hippocratic Oath. The oath is not applied in its original form in modern time. The original Hippocratic Oath, translated from Greek into English:

I swear by Apollo, Asclepius, Hygieia, and Panacea, and I take to witness all the gods, all the goddesses, to keep according to my ability and my judgment, the following Oath.

To consider dear to me, as my parents, him who taught me this art; to live in common with him and, if necessary, to share my goods with him; To look upon his children as my own brothers, to teach them this art.

I will prescribe regimens for the good of my patients according to my ability and my judgment and never do harm to anyone.

I will not give a lethal drug to anyone if I am asked, nor will I advise such a plan; and similarly I will not give a woman a pessary to cause an abortion.

But I will preserve the purity of my life and my arts.

I will not cut for stone, even for patients in whom the disease is manifest; I will leave this operation to be performed by practitioners, specialists in this art.

In every house where I come, I will enter only for the good of my patients, keeping myself far from all intentional ill-doing and all seduction and especially from the pleasures of love with women or with men, be they free or slaves.

All that may come to my knowledge in the exercise of my profession or daily commerce with

men, which ought not to be spread abroad, I will keep secret and will never reveal.

If I keep this oath faithfully, may I enjoy my life and practice my art, respected by all men and in all times; but if I swerve from it or violate it, may the reverse be my lot. Hippocrates Oath is divided into two parts. First part deals with the duties of student towards their teacher and family of the teacher loosely, it correspondence to the medical etiquette of the present day.

Second part deals with practice of medicine, do good to your patient, never harm them, maintain professional secrecy, refrain from seduction, abortion and prescribing lethal drugs, which were the requirement of that period and even today.

Declaration of Geneva

International Code of Medical Ethics is based on the general principles mentioned in the Hippocratic Oath. The main goal is to establish the ethical principles among the physicians worldwide. The modernized version of the Hippocratic Oath was approved at the Declaration of Geneva, in II General Assembly of the World Medical Association in 1948. It was further amended in 1949, 1968, 1983, 2006 and in October 14, 2017, in Chicago when it added 'I will attend to my own health, well-being and ability in order to provide care of the highest standard' so that doctors care for their own health which they often neglect.

The Declaration of Geneva (2017), published by the World Medical Association reads:

As a member of the medical profession:

- I SOLEMNLY PLEDGE to dedicate my life to the service of humanity;
- THE HEALTH AND WELL-BEING OF MY PATIENT will be my first consideration;
- I WILL RESPECT the autonomy and dignity of my patient;
- I WILL MAINTAIN the utmost respect for human life;
- I WILL NOT PERMIT considerations of age, disease or disability, creed, ethnic origin, gender, nationality, political affiliation, race, sexual orientation, social standing or any

other factor to intervene between my duty and my patient;

- I WILL RESPECT the secrets that are confided in me, even after the patient has died;
- I WILL PRACTICE my profession with conscience and dignity and in accordance with good medical practice;
- I WILL FOSTER the honor and noble traditions of the medical profession;
- I WILL GIVE to my teachers, colleagues, and students the respect and gratitude that is their due;
- I WILL SHARE my medical knowledge for the benefit of the patient and the advancement of healthcare;
- I WILL ATTEND to my own health, well-being, and abilities in order to provide care of the highest standard;
- I WILL NOT USE my medical knowledge to violate human rights and civil liberties, even under threat;
- I MAKE THESE PROMISES solemnly, freely and upon my honour.

COMMUNICATION BETWEEN DOCTORS, PUBLIC AND MEDIA

Communication refers to the reciprocal exchange of information between two people or within a group. Three components of communication are: i) Listening skills (Active, passive and reflective Listening); ii) Verbal communication (Spoken form); iii) Non-verbal communication (Understanding the body language). Why is communication required? Humans are not mind reader, so listening, talking and understanding the body language is the skill to know other person's mind. The most important in communication is hearing what is not said from non-verbal communication the body language. Listening more and talking less is the key. Good communication can save many unpleasant situations but poor communication can lead to arguments that are never resolved. Successful doctors are good communicator.

Communication between Doctor and Patient

Good communication skills of a doctor enhance better doctor–patient relationship, win patient's confidence and leads to less litigation.

Basic Components

Effective communication has three basic components:

1. *Verbal component*: Content of the message and selection of words.
2. *Nonverbal component*: Body language, facial expression, etc.
3. *Para-verbal component*: Tone, volume of the voice, etc.

Prerequisites

Patient must be at ease and comfortable with the doctor. Patient's confidentiality must be maintained and the tone of voice of the doctor should be agreeable, not critical.

Listen to the patients: Doctors should listen effectively with interest. Eye contact should be maintained. Not to interrupt the patient. Not to use mobile phone when listening. While concluding the doctor must ask the patient if there are any further queries.

Communicating between Doctors

Doctors are expected to follow medical etiquette while communicating with each other.

Communication between Doctor and Public

Doctors are often requested to speak in public, for this the doctor must be well prepared, well rehearsed and should speak with confidence. The communication must be authentic, simple and to the point, it is like speaking in a seminar avoiding medical terms.

Communication between Doctors and Media

Communication with media is commonly, questioning a doctor on some disease, disaster

or mishap. Before facing the media, a doctor must find out if he is authorized to speak. Preferably the doctor should read out a written statement so that nothing is missed in a the charged atmosphere. Doctors must be confident, firm and should not make any statement which the media wants to hear. Any slip of tongue by the doctor can pass as sensational news which can harm the doctor or the institution. Incident: A newly appointed doctor was on a flood relief duty. He replied to the questions of the reporter honestly, stating the poor preparedness and failure of the medical team to handle the flood situation. On returning back he was show-caused, as to why he faced press for which he was not authorized.

Challenges in Relationship Management—Communication Skills, Human Behavior, and Conflict Resolution Techniques

Doctors acquire medical knowledge during MBBS course, as an intern and during post-graduation; however, many doctors lack soft skill and control over emotion (like anger—in anger, the prefrontal cortex shuts down) and to remain calm (temporal delay) when occasion arise, which is difficult to acquire. Doctors must balance between emotion and intellect.

Occasionally there is gap between the expectation of the patient and what the doctor delivers, because:

1. Medical science is not a true science, it does not follow the law of physics or mathematics, so predictable results are not always obtained.
2. Medical knowledge is incomplete, research is on. Doctors' practice (the term is practice). Doctors have knowledge, skill and experience, but they can never guarantee cure.

Unfortunately if a patient dies, relatives may get upset and manhandles the treating doctor or destroy the hospital property. Soft skills like communication skills, correct human behavior and conflict resolution techniques can prevent these mishaps.

Communication Skill

Active listening, paying attention to non-verbal communication, informing about the disease its course and prognosis.

Human Behavior

A British author, philosopher and a doctor, Thomas Percival (1740–1804) first used the term “Patient” to address all sick people regardless of their paying ability. He recommended a balance of compassion and authority. He urged the doctors to be tender. The doctor should be sensitive to patients' feelings and emotions. Doctors should be aware of their fear and anxiety. The caring should be holistic rather than simply treating their ailments. The doctor should develop a familiar confidence with their patients and act in a friendly manner. Doctors should keep up the patient's hope and spirit. ‘Life of a sick person can be shortened not only by act but also by words or manner of the physician. It is therefore a sacred duty..... avoid all things which have a tendency to discourage and depress the patient’.

Conflict Resolution Techniques

Conflict is disagreement between two people or parties. In a medical setting, it is between the doctor and the patient or relations of the patient. Conflict resolution techniques or mitigation is an important soft skill.

Methods of Conflict Management

1. **Collaboration (win, win):** The doctor and the patient come to a common agreement. *Example:* Doctor asks the patient to get admitted in a nursing home; the patient disagrees, stating of a bad experience earlier. Both the doctor and the patient work together to find an alternate nursing home for admission.
2. **Negotiation (some win, some loose):** The doctor and the patient bargain to come to a conclusion to avoid some loss. *Example:* Patient wants discharge. The doctor feels otherwise. The compromise may be, the

patient can go home but keep a trained nurse who will keep informing the doctor about the wellbeing of the patient.

3. **Accommodation (win, lose):** The doctor and the patient come to a common accommodation after disagreement. *Example:* The doctor asks patient to get admitted in a nursing home, patient disagrees, stating of a bad experience earlier, but the doctor states, OT in that nursing home has the trained manpower to conduct the operation patient requires. Patient agrees and gets admitted.
4. **Avoidance (no winners or losers):** The patient rejects an idea, unhappy patient goes to another doctor. Here the conflict is not solved. It is not commonly seen in medical practice.
5. **Domination:** The patient rejects an idea, an unhappy patient goes to the Head of the department, who has the authority to give a decision. This is not realistic in medical practice, it is viable in the army or police, where hierarchy and authority resolve conflict.

The Goal of National Medical Commission is to create "Indian Medical Graduate" as the doctor of first contact or primary care physician, to cater to the health of the community while being globally relevant. To fulfill this goal the doctor must be able to function in the following roles:

1. Clinician
2. Leader and member of healthcare team
3. Communicator, communication with patients, families, colleagues and community
4. Lifelong learner
5. Professional, who is committed to ethics, accountable to patient, community and profession.

To achieve this Indian Medical Graduate must develop the following competencies:

1. Cognigent (Knowledge)
2. Psychomotor (Clinical Skill) like clinical examination, reading ECG, X-ray, lab procedure, etc.
3. Affective (Soft skill) like Human behavior, communication skills, conflict resolution techniques empathy, attitude of serving, etc.

PRINCIPLES OF HANDLING PRESSURE

Introduction

Modern human known as Homo sapiens, evolved 200,000 years ago in East Africa, though mammals evolved 300 million years back. Human brain evolved from Reptilian brain which is identical to the present day reptile, having brainstem (respiratory centre, Ascending Reticular Activating System for consciousness) and cerebellum (balance and coordination). Human brain in addition to reptilian brain has pituitary gland for secreting hormone, hippocampus for storing memory, amygdala for handling emotion (stress and negativity) and prefrontal cortex the command centre responsible for awareness, cognition, planning, personality, problem solving, creativity, etc. The prefrontal cortex is roughly of the same size today as was 200,000 years ago.

Evolution of Stress

Stress and negativity were responsible for survival, when attacked by a man eating tiger, the sympathetic system with fight or flight response, helped to overcome the danger, but primitive human could not sit in peace, for the fear of second attack, so stress chemicals, were important. Paradoxically the chemicals, which helped our ancestors to survive, like cortisol is now responsible for chronic stress. Little has changed in the brain since last 200,000 years.

Mind

If the brain is hardware, mind is the software, mind is a stream flow of thoughts, produced by the brain, like heart produces heart beat. Mind is compared to a monkey, drunk with the wine of desire, stung by the scorpion of jealousy and possessed by the demon of pride, lust, ego, greed, jealousy, anger, depression, stress. It is always searching for external pleasure and ever wandering. If the mind calms down, stress disappears.

Stress

Stress is created by thinking. Stress is the physical response to stressors which can be

a person, a place or a situation. The source of stress is always from outside, like an exam, financial worry or to meet a target.

Types: Short-term Stress and Chronic Stress

Short-term Stress

Stressor causes activation of the sympathetic nervous system, with immediate release of adrenaline and nor adrenaline, preparing the body for fight or flight by increasing the heart rate, blood pressure and respiration rate, the sensitivity to eye and ear alters so words become incoherent and unclear. Afterwards parasympathetic response kicks in, slowing heart rate and relaxing the body.

Chronic Stress

Cortisol is the main stress hormone. Stressor stimulates amygdala (part of brain handling emotion) which sends signal to adrenal glands via hypothalamus and pituitary glands to release cortisol, thereby blood sugar is increased to provide extra energy to fight out the situation. Countless studies linked stress with lifestyle diseases, like diabetes, hypertension, cardiovascular disease, autoimmune diseases, insomnia, inability to concentrate, loss of memory, etc. In an experiment conducted in the University of California, Berkeley, it was found that cortisol degenerate neurons of the hippocampus, the area of memory of the brain. Cortisol interferes with the immune system, by reducing lymphocytes, so before exam one catches cold and infection. Cortisol has catabolic effects in the body.

Skills to Manage Stress

1. **Pharmacological approach:** Treatment with medicine, but the problem is one cannot predict stress.
2. **Physiological approach:** One can act instantly by bringing back the mind to "here and now" by concentrating on any internal or external object. Concentration stabilizes the mind causing calmness and decreases stress.

Principle

Concentration slows down the activities of brain the brain or thought. By concentration stress generating beta waves (12–40 cycles per second in EEG) is voluntarily slowed down to alpha waves (12 cycles per second) which makes mind stress free. Concentrated mind is the most relaxed mind. Balance between sympathetic and parasympathetic system is achieved and stressful chemicals secretion stops. The turbulent mind, full of thoughts like waves in the ocean, becomes still by concentration.

Method

Alpha waves are generated if the mind is concentrated uninterruptedly. In 12 seconds, the mind achieves one unit of concentration. During stress it is difficult to find an external object to concentrate, so observing the breath is the most convenient.

Observing the breath, the outgoing breath, the incoming breath, without altering or manipulating it. If breath comes through the right nostril it is observed, if breath comes through the left nostril it is observed and if it comes from both the nostrils it is observed for few minutes. The mind becomes still and comes out of stress. For prophylaxis of stress, it must be practiced twice daily every day.

Difficulty

It is found while engaged in concentration, thoughts come in between, it is difficult to deal with thoughts, but amidst thought, if the mind is thought free for few seconds, it has there is profound effect, one attains Alpha brain waves and the stress disappears.

History

Meditation is a fancy but inappropriate term used for prolonged and sustained concentration which actually belongs to the field of psychology. Mindfulness-Based Stress Reduction (MBSR) is one such method, very popular in Universities of US and Europe to come out of stress and to concentrate in

studies. It was developed by Dr. Jon Kabat-Zinn who founded the Center for Mindfulness at the University Of Massachusetts Medical School, which he acknowledged to have learned from Vipassana meditation in India. It is a method of observing the breath. It is known as Anapana meditation which is the initial part of Vipassana meditation (<https://www.dhamma.org>)

Experimental Findings

1. Neuro imaging with MRI, rCBF (regional cerebral blood flow) and EEG allow detailed studies in understanding the effect of meditation on neural behavior. In a path breaking paper, using MRI imaging at University of Massachusetts, researchers observed structural changes in brain following meditation ([www.psychiatry Research: Neuro imaging](http://www.psychiatryresearch.org), 2011; 191(1): 36DOI) that revolutionized the belief of Scientific world on concentration/ meditation.
MRI study was done on 44 subjects, who were asked to practice breath observation twice a day, 20 minutes daily for 6 weeks. There was hypertrophy of the grey matters of prefrontal cortex, (cognition, decision making and planning) and hippocampus (long term memory). MRI showed an increased blood flow at those regions. Reason: Repetitive stimulation of the brain, by concentration causes neuroplasty, leading to anatomical changes in brain.
2. EEG: Beta waves changes to Alpha waves, 8–12 cycles per second, which are extremely relaxing. Memory becomes stronger in alpha wave.
3. Cortisol secretion decreases. There is an increase in serotonin (improves mood), endorphin (pleasure) and melatonin (restful sleep).
4. In the short term stress sympathetic nervous system is activated, observation of breathing balances sympathetic and parasympathetic systems with parasympathetic activities predominating. The path is not known, probably through the phrenic nerve.

HISTORY OF FORENSIC MEDICINE

History of Forensic Medicine in India

Manu-smriti (Laws of Manu)

Manu, was the first man according to Indian mythology like Adam in Christianity, who is the mind-born son of the god Brahma. He was the legendary author of, law code, the Manu-smriti (Laws of Manu) which deals among other social laws, medicolegal issues relating to marriage, sexual code of conduct in society, punishment for rape and various sexual offences like adultery, seduction, incest, etc.

Vedas

Vedas are one of the oldest texts of mankind, also called Shruti or heard wisdom, because writing at that time did not exist. The Vedas are authorless, the rishis, revealed Vedas in deep trance, achievable in deep meditation. The Rishis taught the Vedic verses to their students, who memorized by chanting, and was passed from one generation to another by oral transmission since the 2000 BC. There are four Vedas: the Rigveda, the Samaveda, the Yajurveda, and the Atharvaveda. Ayurveda, is derived from Atharvaveda. Experts consider Ayurveda (Ayus + Veda = Knowledge of longevity of life) is the world's most ancient system of medicine. Unlike modern medicine which is based on organ-localization of disease, Ayurveda was prognosis based, since human dissection did not begin at that time. It has a section "Agada - tantra" deals with toxicology, poisons and its treatment. Those days poisoning was a common mode of homicide. Kings and high officials were poisoned to death, clandestinely.

Arthashastra

Kautilya or Chanakya (400 BC) in Arthashastra described death, in the light of forensic medicine. Death can be caused by hanging, strangulation, drowning and poisoning. In poisoning, the suspected food was tested by feeding birds. Chanakya described various mechanisms of death. He used medical

knowledge in law and also punished doctors for negligence.

Charak Samhita

Charak (200 BC) in Charak Samhita (compilation) described the medical ethics, theories of human body, etiology, symptomology and therapeutics for wide range of diseases. It also included sections on the importance of diet, hygiene and medical education.

Sushruta Samhita

Sushruta (200 AD) in Sushruta Samhita (compilation) has 184 chapters on injuries, and 1,120 conditions and on illnesses. It states about the type of weapons, wounds, fractures and surgery. Some of his surgical procedures are still followed in modern surgery. He used to dissect unclaimed dead bodies floating in the river Ganges, in Varanasi, to teach anatomy to his students. Students performed mock surgery on water melons and cucumbers. He wrote a chapter on toxicology. He classified poisons into plant, animal and artificial products. He believed landed assets belongs to the state, he recommended greater punishment to the higher status individuals, compared to poor (all men were not equal before law).

During the medieval period, there was a setback in Indian medical system, when India was invaded by Turks, Mongols, who demolished the Indian Medical System. India, a peace-loving country, was more involved in spiritualism and never fought for material gain thus lost all its tradition including the medical.

British ruled the country from the middle of the eighteenth century to the middle of the twentieth century. In 1822, the first medical school was established in Kolkata and later converted into Medical College in 28 January 1835. The first chair in Medical Jurisprudence was instituted in Calcutta Medical College in 1845, and Dr CTO Woodford was the first Professor of Medical Jurisprudence in the country.

History of Forensic Medicine (World)

Egypt (4000 BCE): Documents related to medico-legal issues was found in Egypt. Egyptians knew how to preserve dead bodies. Imhotep (2730 BCE) the personal physician to King of Egypt was a medicolegal expert, he wrote a medical treatise.

Babylon (1750 BCE): The Code of Hammurabi 1750 BCE, composed in Babylon the present day Iran, contains several clauses relating to doctors. A doctor was paid five silver coins for repairing a broken bone, penalties for medical malpractice were severe, if a doctor caused a patient's death the doctor's hand were cut off.

Greece (460–370 BCE): Hippocratic gave The Medical Oath. He was a well known physician of that time, patients all over Greece came to him for treatment. Aristotle (384–322 BCE) proposed a law to prevent rearing of children with deformity. He limited the age of childbearing in women to 50 years.

Rome (753–673 BCE): It was ordered, women dying from child birth should be opened immediately to save the life of child. In 44 BCE, Roman physician examined the dead body of Emperor Julius Caesar and identified 23 stab wounds in his body. There were medical treatises on suspended animation, sudden natural death, age of fetus, age of menopause. It was also noted, dead men floats in water on their backs but dead women floats with face downwards. In 483–565 AD, Emperor Justinian Code says: "physicians give judgment than testimony, they are not ordinary witnesses" He ordered penalties for wrong doing by doctors.

Chinese and Islamic scholars also contributed to the development of Forensic Medicine. This is, in short, the history of Forensic Medicine.

REVIEW QUESTION

Q1. What is forensic medicine?