EDITORIAL

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Forensic Medicine and Toxicology: Challenges and Opportunities of the Future in India

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Abstract

Now forensic medicine and toxicology specialty has been a well-established branch since it was introduced in India in 1935. This specialty has grown since its inception. It is time to look back and find the hurdles in the growth of this specialty. Simultaneously we need to dream for the future and start working on it. It is understood that a tough road is ahead for this specialty to survive. We need to look at the journey, find the reasons for its slow growth compared to other medical science disciplines, and find the remedial measures. We need to know the challenges to the practice of FMT, teach the subject and research on this subject as well as grab the opportunities of the future for this subject. There is a strong need to develop the subspecialties of FMT. Without forgetting the fundamentals of this specialty, we need to think of the newer prospects of this discipline, dream big and work hard to achieve what we dream of.

Keywords: Challenges, Forensic Medicine, Opportunities, Toxicology.

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Introduction

Challenges

From Pandemic to Endemic Disease

We should be ready to work in all situations. Initially, when all the post-mortem work was stopped or reduced all over the world as World Health Organization (WHO) had directed that disease can spread by post-mortem examination.

In one of the studies, post-mortem work was reduced by 70% due to a shortage of protective equipment and inadequate mortuaries lacking negative pressure. There were challenges, but more so, the challenges were microbiological.[1]

Such pandemics can come in the future, and we should be ready to provide forensic services to the community. We should have the protocols ready to proceed in such circumstances.

The number of clinical forensic cases decreases because they cannot seek help due to lockdowns and the fear of getting the disease as clinical forensic centers are in the hospitals where such cases are admitted.[1]

There can be not only microbiological challenges but also radiological and chemical challenges in the future. We need to prepare protocols for such challenges.

The virtual autopsy can be of immense help in such situations.[2,3]

With lockdowns after the pandemic, education suffered, and the education of the medical students was not an exception. There was panic and confusion among the medical students as well as the faculty to initiate the online teaching.[4] In one study, various issues were reported, out of which Communication issues were 59%, student assessment 57.5%, use of technology tools 56.5%, stress 48%, time management 35%, and technophobia 17% were the main issues. Teaching and conference had become online as these were the only solutions in times of pandemics.

Lawsuits against medical professionals have also increased because of so many deaths in this pandemic.[1] Litigation will increase in the times to come as the people become more educated and come to know about their rights.

Age Estimation

The biggest challenge is to determine the age precisely. Age estimation is still a challenge as age is always given in the range of months and years, and it may not solve the dispute under the question. Age estimation is better in young persons as compared to adults. In young persons, age is determined by the maturity of the teeth & bones and the external features of the body some of which depend upon sexual maturity whereas in adults age is determined mostly by the degenerative changes in the bones, teeth and other parts of the body and this degeneration can depend upon many factors depending upon the environment, food and health of the individual.

There are so many methods for the determination of age. There is a challenge in the selection of a method because

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each method has its limitations and may be more useful for a particular age group.[5]

Despite the best efforts, chronological age may differ from the maturity, and degenerative changes and a multidisciplinary effort will be the best way to solve it.[6]

It is challenging to find the age of different racial and ethnic groups.[7]

Ethnic and geographical data for the same age group is very important and must be taken into consideration,[8] and if not present, research is required to get it, and then it can be applied more confidently.

Deep learning for skeletal age estimation is important.[9] We must develop deep learning for the skeletal and dental age determination for the various ethnicities, age groups and genders.

Artificial intelligence is the future in determining age as it takes away the bias of the individual examiner and is based entirely on scientific facts.

Injury Certification

Writing the description of the injury is not an issue for an experienced person, and the same is true for declaring the weapon and nature of the injury. When the age of the injury is determined morphologically usually a wide range is there and there is a need to work on this aspect to narrow these ranges. Work has been done to determine this age by histology, immune histo-chemistry, and immune fluorescent methods.

There is a need to work on bio-markers and work at molecular and cellular levels. There is a need to work on the molecular pathology of wound healing to generate the data that can help estimate the wound age more precisely. Digital slice scanning system and immune-fluorescence multiple staining automated techniques can simultaneously test three to four markers and can be useful in the future.[10]

The Ribonucleic acid (mRNA) levels of cytokines and enzymes can be of help in the early period of wound production, and real-time polymerase chain reaction (PCR) of mRNA can produce sufficient mRNA to be used for estimating the age of the wound. Enzyme-linked immunosorbent assays can detect protein levels and are more sensitive than immune-histochemistry.[10]

If the ageing of the wound is to be done in the dead then those biomarkers which get affected by decomposition (cannabinoid receptor type-2 mRNA) (andmatrix metalloproteinase-2 and the tissue inhibitors of metalloproteinase-2 mRNA) will be less useful as compared to those which remain stable for a long time (argininosuccinate lyase mRNA which remains stable for 18 hours). Sodium-coupled neutral amino acid transporter (SNAT2) mRNA is still better as it remains stable for 48 hours after death. Microtubule-associated protein 1A/1B-light chain 3 (LC3)-II and sequestosome 1 remain stable for 4 days after death. The use of a combination of biomarkers will reduce the error.

If we will use a combination of morphological and molecular techniques comprising genomics, proteomics, and metabolomics, we will be able to be more precise as compared to the most commonly used morphological changes

Electric impedance spectroscopy using an isobaric tag can help in estimating age if further studies are done on this.[11]

For the recording of the injuries, 3D scanning can be done with three scans, and the injuries can be reconstructed whenever needed.[12]

Shortage of Medicolegal Experts

Though there is no shortage of doctors doing medicolegal cases, there is an extreme shortage of forensic medicine experts. There is a need to work at the state levels to have more posts for forensic experts as has been done in Punjab with the efforts of the Punjab Academy of Forensic Medicine and Toxicology (PAFMAT). Persistent efforts at the organizational level highlighting in the media, and communicating with the concerned governmental officials produce results.

Sexual Assault Examinations

Examination of Sexual assault cases is mostly considered a burden by the gynecologist, and they rarely get involved by choice. Female forensic medicine experts will go a long way in helping in the final successful outcome of the prosecution. Involvement of forensic nurses, especially sexual assault nurse examiners [SANE], as is being done in many other advanced countries, can also help in our situations. Still, protocols and laws may need to be changed for that.

Developing more one stop centres and using kits to examine the victims will produce better results for the victims.

Microbiome analysis can also help in finding out sexual contact. This can be helpful when no other evidence is forthcoming.[13]

Post-mortem Examination

Microbiome analysis can help in identification. The personal microbiome is usually specific to an individual. Skin microbiome markers will be helpful in identification. Corynebacterium or Helicobacter pylori can help in the identification. It can also help in finding the cause of death is drowning, and A. hydrophila and A. salmonicida were found in drowning cases. This can also help in finding out the location of the death.[13]

Actinomycetaceae, Bacteroidaceae, Alcaligenaceae, and Bacilli can help determine post-mortem interval by 16S rRNA gene sequencing. Different dominance of organisms being present at different time intervals.[13]

In traumatic brain lesions, a virtual autopsy can be of special help, especially in cases of micro lesions.[14]

Disaster Victim Identification

Identification of individuals in mass disasters is an important humanitarian aspect and requires a multidisciplinary approach. Usually, forensic pathologists are key, yet it requires forensic odontologists, forensic nurses, forensic anthropologists, forensic radiologists, fingerprint experts, forensic biologists, forensic technicians, photographers, forensic psychiatrists,

and financial managers and police officials to manage the disasters holistically.

Mass disasters can be open (bombing) or closed (shipwreck-where the list of passengers is known), or mixed (aircraft crash at a crowded place).

Whenever mass disasters occur, identification of the dead and survivors is a big issue in most circumstances. Interpol has protocols and guidelines to follow to make it easy and complete. All the member countries follow this to make it a uniform practice. Coordination at the crime scene, post-mortem examination, antemortem data collection, and reconciliation of antemortem data and post-mortem data coordination have been described, along with identification methods.[15] All the required forms are also provided in these guidelines.

Anthropologists can help in avoiding comingling of the body parts. Imaging and tissue sampling by forensic anthropologists are important tools for identification in disasters. They can help in preparing the biological profile of the victims.[16] Portable X-ray machines and mobile CT Scanners further help in this process. Handheld X-ray machines help the odontologists too.

Mapping of the bodies at the crime scene is important, and this can be done manually, but with the advancements, electronic mapping equipment e.g., total stations, drones, or handheld GPS devices, better mapping can be done.

(DVI) database, e.g., DVI System (by PLASS DATA), will help quick identification.

Humanitarian Forensics

Not only the identification of the dead bodies and survivors is important, but it is also important to identify the unconscious living victims. Taking care of the survivors of mass disasters is also a big issue, and their health and rehabilitation should never be ignored. They also need to be protected from further violence and negligence by care providers. Their psychological health is of special importance and should be taken care of.

It is also important to take care of the physical and mental health of all the health workers involved in this process and to support the survivors and their families.

Educating and training the health workers to perform best and cope with challenging situations is important.

Treatment of Poisoning Cases

Detection of Poisons

Alcohol biomarker Phosphatidylethanols (PEth) is better than other alcohol biomarkers (carbohydrate-deficient transferrin, gamma-glutamyltransferase, and ethyl glucuronide) as it has prolonged delectability in the red cells after consumption of alcohol and has better accuracy and precision.[17]

Nanotoxicity by nanomaterials can be caused, which we will need to understand. Nanotechnology will be next-generation technology and replace the conventional technology in nanotoxicology in cells, genetic studies, and 3D organs. Further research is needed to control risks in commercial nanomaterials, carbon nanotubes and metal-oxide nanoparticles, and 42% of all nanomaterials being used in health products, e.g., silver, titanium, and silicone.[18] They may result in damage to DNA through mutations, necrosis, and decreasing the viability of the cells[19] and are the Asbestos of the future.[20]

Analytical Aspects

In vitro sedimentation diffusion and dosimeter are used to detect nanotoxicity.[21] In addition to this gene expression analysis, genotoxicity detection and in vitro hemolysis is also used. Microscopic, spectroscopic, scanning electronic microscopy and X-ray spectroscopy (SEM-EDX), transmission electron microscopy (TEM), atomic force microscopy (AFM), video-enhanced differential interference contrast (VEDIC) microscopy, and fluorescence spectroscopy are used individually or in combination with each other are also used.[22]

Micro RNA is an important biomarker as they are very stable and specific in anti-doping tests.[23]

Future of the Discipline

Artificial Intelligence

Deep learning is a part of machine learning; it can also learn from images. This can be used in bone skeletal age estimation.[24] Research on this seems quite promising for the future.

Three-dimensional conventional neural network (3D CNN) learns in three-dimensional ways can perform generative and descriptive tasks and can be very helpful in forensic anthropological tasks. It can be applied in forensic medicine to identify age, sex, cephalometric landmark annotations, growth vector predictions, and facial reconstruction by determining soft tissue thickness from the skulls. Input is usually from Cone Beam Computed Tomography scans of the head. It is a better system that never gets tired and has no subjective bias.[25]

In sudden death, it can also be useful by evaluating hard tissues and inapparent damage that may be responsible for a death.[26]

AI applications on cephalometric parameters; angles, ratios, and distances can be used for the determination of gender and age.[27]

Forensic Palynology

The use of pollen DNA profiling can be useful in forensic palynology in the future. The application of pollens evidence can be better utilized in the future.[28]

Forensic Entomology

There is a need to know the shortcomings in using forensic entomology for the determination of post-mortem intervals. An expert should do[29] sample collections for the study of insects, and it should be well preserved. Research work should be correlated with the casework, and knowledge in the gaps should be filled by research,[30] and better done in more regions and more environments.[31] There is no standard format for the reporting, and it varies from country to country. A standard format was produced by Kotze *et al*., 2021.[32] Most commonly

order Diptera and the family Calliphoridae have been studied worldwide.[33]

Teaching of Forensic Medicine

Usually, lecture, practical, and case showing in mortuaries and emergency is the teaching method. Some have used innovative Twine software, which provides an interactive learning atmosphere around the creation of non-linear stories, positively impacting their understanding of students.[34]

Visit the (CSI) lab and crime scenes; (FSL) increases the interest of the students, broadens their perspective, and adds value to the academic training.[35]

Virtual Reality in Teaching

The technology of virtual reality (VR) allows visualization of 3D information by immersing oneself in the scene and has been used at the crime scene to plot the distances.[36] It is very good for practical experience but needs experience, and the cost is a significant factor,[37] especially in India. It helps a lot in providing skills to the learners. Most of the students enjoy this experience and produce good results in reconstructing the crime scene using different software tools.[38,39]

Augmented Reality Technology in Teaching

Augmented reality teaching is being used in other disciplines of medicine and education. It increases perception and interaction with the real world. Augmented Reality Software Development (ARSD) Kit is used in Teaching Forensic Medicine in some parts of the world. Vuforia has been used in Thailand.[40] AR recognition (brain), AR tracking (Eyes), and AR content rendering (imagining virtual objects) are the important components of AR Technology.

During the autopsy, it can record injuries on the surface and their deeper manifestations by CT by using a tablet, camera, and computed tomography (CT) Scan. This available data can help during future post-mortem examinations and will make things simple and economical too.[41]

mARble–software is used on mobiles and tablets for teaching forensic medicine. This software has already been evaluated.[42]

Virtual Autopsy

Though virtual autopsy cannot replace the routine autopsy, it can be useful in many circumstances, especially in the COVID-19 scenario.[43] In India cost factor is a big issue, and the availability of trained forensic radiologists is another issue.

Virtual anatomy labs and virtual forensic medicine labs may be combined and will be useful both for teaching and casework, especially for identification for determination of age and gender, especially in those cases where a routine autopsy is not preferred due to religious reasons, or the body is infected, the danger of toxic exposure or bio-hazardous due to biological or nuclear hazards.[3]

Cost is the barrier to using virtual autopsies in India. It also needs robotic assistance for the needle core biopsies and imaging. Picture archiving and communication systems can be used.

In small areas where only CT is there, but Magnetic resonance imaging (MRI) is not present, and where the budget is less, virtual autopsy software can be used, e.g., PACStopsy. 2D images of CT scans can be converted to 3D images by pathologists. Even gross tissue images and pathology slides images can be uploaded. This can also be accessed remotely by an App.[44]

The most significant advantage is that virtual autopsy can be completed very quickly, i.e., within minutes, and can be especially useful in traffic accidents, homicides, suicides, falls from heights, and drowning. It also prevents needle pricks, cuts, and exposure to pathogens. But it has limitations that the tissue samples cannot be taken, and a routine autopsy is the only way if needed.[44]

A virtual autopsy can complement the routine autopsy.

Poison Gardens

Some gardens have plants that can kill a person. One such garden is The Alnwick Garden- Poison Garden on the grounds of Alnwick Castle in Northumberland, England, where such plants can be studied. Many medical colleges have developed such gardens though the scale is minuscule. One should follow the rules of the garden for a safe visit.

Visits in Open Having Plants

There are botanical gardens that have some poisonous plants. Some plants just grow as wild plants.

Visits to Snake Zoos

The visit will greatly facilitate knowing all types of snakes and seeing how they look when alive. By this, we will be able to identify non-poisonous snakes and not unnecessarily kill snakes that are not poisonous and which are friendly for the farmers as they eat the reptiles that harm the crops. Such a zoo tout will be quite helpful.

Dealing with the Effect of Witnessing the Trauma

Dealing with trauma and death can produce psychological stress. It is poorly studied and poorly managed at present. The first thing is the recognition of its existence. One of the studies identified belief in the just world, coping strategies, and resilience are predictors of psychological stress.[45] This prediction will help in identifying and managing psychological stress.

Determining the Cause of Death in Difficult Cases

Determining the cause of death is sometimes difficult, especially in sudden natural deaths. Biomarkers in these circumstances can be quite helpful e.g., Brain Natriuretic Peptide (BNP) and *N*-terminal proBNP (NT-proBNP) are useful biomarkers for heart failure in living persons, and the same can be useful even in forensic pathology cases.[46]

Fixing the cause of death as anaphylaxis is difficult after post-mortem examination. Serum tryptase levels (STL) from the post-mortem samples in a systematic review and metanalysis levels of STL in anaphylactic deaths were higher as compared to non-anaphylactic deaths. It can be a biomarker for anaphylactic deaths if its level is higher than 30.4 μg/L.[47]

If death is due to poisons and the post-mortem interval is being determined, then the effect of the poison on the insects must be taken into consideration. Sometimes conventional samples for toxicological analysis are degraded, then the detection of the poisons can be done from the insects.[48]

Sudden unexpected death in epilepsy (SUDEP) also poses a problem to the forensic pathologist.[49] Neuropathology, cardiac and genetic findings are important to concluding.

Human organs on chips can help in the research on the various aspects of toxicology e.g., effects of Medicines on the organs[50] and similar effects of the poisons on the organs can be studied and the solutions found for the treatment by research.

Biobanking

Biobanks are places where human tissue can be stored for many years and are good for genetic studies, and are good for trans-disciplinary studies. It needs quality controls and documentation.[51] It has been frequently observed that reports coming from the pathology department are not helping the outcome of the case. Autolysis of the samples is frequently reported. Proper biobanking can give good results even after 10 years of sampling.[52] Tissues in the biobanks can be a good material for research and data and also helps to standardize the policies for the conservation of the tissues.[53] It can help in DNA data banking, but its ethical issues are still under debate.[54] It will be a good source for a second opinion of the tissues if needed.

3D Printing

3D printing provides three-dimensional information compared to ordinary photographs, which provide only 2-dimensional information. It can be useful in forensic odontology, forensic anthropology, and facial reconstruction. It can also be used in ballistics, fingerprints, and other situations.

It can also be used as demonstrative evidence during the trials in the courts for a better understanding of the information by the courts e.g., weapon, injury on the bone. It can document human remains when the original cannot be preserved for cultural and religious reasons. From virtual autopsy, 3D prints can be made and studied to prevent exhumation.[55]

Many materials can be used but commonly used is Polylactic Acids which may have poor durability. There can be other costly and better options.[56]

It can help in the identification when 3D printing can be done of the dentition, mandible, and skull. Even it can in the case of bite marks when the bite marks and teeth of the accused can be 3D printed.

Criminals, too, are using 3D technology by 3D printing guns and other weapons, and tracing such weapons is difficult. It can also print fingerprints and handprints, and fake retinal blood vessel prints.[57]

Organ Harvesting

This needs to be respected if the person is willing to donate organs. Quality of dying can be taken care of by the nurses and patient and family comfort. Such patients need to be stabilized, and good assistance in dying is provided till the organs are retrieved.[58]

Definition of death needs to be replaced by conditions permitting organ harvesting when a dying person is still biologically alive but no longer a person. Organs harvesting should be done from persons in the vegetative stage but persons with the whole brain death.[59]

Many people need organs. Can we help in this process to take care of the needs of recipients in a legal way? Living donors are not sufficient; we should also try to increase the number of living donors.[60]

There are socio-cultural challenges in organ donation from the dead, where victims of road traffic accidents can donate their organs. But there are beliefs and superstitions which prevent this along with a lack of support from the institutions and communications with the families of the deceased. Donations from the dead body can be an alternative in some conditions, but there is a need for quick transport and green corridors to transport these organs.[61] There are multiple factors for the poor retrieval of the organs e.g., conflict of interests, altruistic values, and ethical dilemmas in many situations.[62] Forensic pathologists should have a positive attitude to help in this process of taking care of the laws of the land and but no person should become a victim of the wrong attitude of the health professional.

Cautious

Innocence Project

Many persons are wrongly convicted due to false scientific pieces of evidence too. Edwin M Borchard was the first person to advocate the cause of wrongful convictions to save the innocents.[63] Innocence Project of Texas was started. The first post-conviction DNA exoneration happened in 1989.[64] No wrong person should be convicted as that will leave the criminal doing more crimes.[65]

The innocence project has been started in various parts of the world. This should be started in India, too, so that no person suffers due to false shreds of evidence.

In India, Innocence network has been started for the wrongfully convicted persons. Society needs to wake up to act on wrongful convictions and take remedial measures.[66]

Separate Subspecialties

There is a need to develop the sub-specialties of forensic medicine and toxicology. These will not usurp the specialty

but will help to develop it further by being more accurate and more useful. Manpower too will increase, and we will be able to provide better and more efficient services.

Fellowship in Each Sub-specialty

Doctor of medicine (DM) courses and fellowships should be started in the sub-specialties. In this way, research will be possible, and our specialists will progress further. As we will prove more useful to society, better respect and avenues will be available.

Toxicology

Forensic Nursing

Forensic nursing is emerging as a new branch that has established itself in many advanced countries. In India, too, with the efforts of INPAFNUS, forensic nursing teaching has become a part of undergraduate courses in the whole of India. This will be a branch of science that will greatly improve the collection of the biological pieces of evidence at the crime scenes, emergencies, and mortuaries of the health system and help in other disciplines of forensic medicine and toxicology.

Clinical Forensic Medicine

Forensic Psychiatry

This is the branch that has to deal with patients who have a stigma of being a victim (rape cases) or offender. They provide fitness certificates to be prosecuted. They also have to opine about the criminal liability of the offenders if there is an issue of mental illness. Forensic psychiatry is an important branch that can help in the reduction of violence and reduction of deaths due to mental disorders.[67]

Different subspecialties of forensic psychiatry are developing worldwide, e.g., forensic psychiatry for those with intellectual and developmental disabilities, forensic psychiatry for child and adolescent patients, and forensic psychiatry for older patients.

Recovery subscales of dangerousness are an important tool in the secure recovery of forensic psychiatry patients, e.g., coming to terms with the past, hope, health, intervention, sense of self, and connectedness.[68]

Forensic psychiatrists have played an important role in managing prisons and secure hospitals for mentally ill persons at the time of COVID-19[67] and will be an asset in future pandemics too.

Forensic Pathology

Electrochemical biosensors for the detection of pathogens (Bacteria and viruses) may be an important tool for the future.[69]

Micro RNA is an important biomarker as they are very stable and specific; wound vitality determines the time of death and drowning.[23]

Mortuaries of the Future

Virtual Autopsy

A virtual autopsy cannot replace the routine autopsy, but it can improve the services. Radiological facilities need to be enhanced in the mortuaries, and gradually a provision should be made for the virtual autopsy too.

Robotic Post-mortem Examination

Modern facilities in the morgues should be provided. Cold storage must be increased to take care of the increased number of cases in mass disasters.

Humanitarian forensics is coming in a big way, and forensic pathologists need to take the lead and be a good team leader and involve other specialists to get the best possible results.

Digitalization in Forensic Medicine

Now people are talking about health, the Internet of Things [IoT], and sensors, and we need to know about them so that if faced with these things, we should be ready to use, interpret and incorporate them into forensic practice. Biosensors are now available for fitness, blood glucose, and home-based diagnostics. If death is due to hypoglycemia or hyperglycemia, then a record of these biosensors may be useful.[70]

With digitalization, there is a danger of leakage of information. Blockchain technology can now be applied to the health care system to prevent this. A secure system can be developed for peer-to-peer review of the information about the patient. Further research can be made to make it more effective and more useful. this can be integrated with the artificial intelligence and cloud computing-based solutions too by using Ethereum platforms or private blockchain platforms.[71]

Microbiome analysis after death can help in many important areas after death. It can help in determining post-mortem intervals when the decomposition sets in the body after death.[13]

Micro RNA is a good biomarker as it is very stable and is good for degraded samples. It is good for identification from body fluids, wound vitality in dead for age determination of wound, in the investigation of anti-doping and drowning.[23]

Preventive Forensic Medicine

How to decrease the violence, how to decrease the deaths, both suicidal and homicidal as well as the accidental deaths

Forensic Odontology

In dentistry, we are seeing the introduction of new technologies which are handheld portable X-ray devices,[72] insertion of microchips in dental implants,[73] artificial intelligence (AI), smart toothbrushes, augmented reality (AR), virtual reality (VR), teledentistry, computer-assisted designing and 3D printing, intraoral camera, regenerative dentistry, Clustered regularly interspaced short palindromic repeats (CRISPR),[74] and Cone Beam Computed tomography.[75] A new procedure introduced is Virtopsy of the Head and Neck which can solve many issues in a non-invasive way.[76] There is much software

that can help in the identification of the teeth and can be useful in forensic odontology.[77]

Medical Ethics

Corruption is a big social problem in India and the medical profession is not an exception. Though the extent of corruption level may be debatable in forensic medicine, it cannot be denied totally, and there are a few black sheep which we need to identify and take remedial measures so that there is work produced which is scientific and par any doubt.

We must inculcate the right values in the medical students so that they become ethical doctors. There is a need to provide them with role models, and a forensic physician can be a good role model.

With the digitalization of health data, breaches in health data are a sensitive issue. It is attractive data for cybercriminals.[78] There is a need to take steps so that this does not happen as this impacts the privileges of the patients.

Advance Directives

There is a need to respect the advance directives of the patient that at the life of end care how he should be treated.

Use of Social Media

Social media is now being used to update the public about disasters, including images, videos, or texts.[79] While using social media, ethical aspects must be taken care of to avoid disclosure of information about a patient to whom it should not be disclosed. There is a danger of tarnishing a person's online reputation, including forensic professionals if due care is not taken care of.

Discussion

Everything Under One Roof

It is good if the majority of the forensic facilities are provided under one roof when a post-mortem examination is to be conducted. In this way, many bottlenecks will be removed. A post-mortem examination and Forensic science laboratory division (FSL) in one complex will greatly enhance the outcome as there will be minimum delay and distortion of the evidence. Similarly, one-stop centres for the victims of sexual assault will go a long way in managing the survivors of the sexual assaults.

When dealing with the victims, offenders, and their families, their cultural and religious values must be respected to have the best cooperation from them and ultimately get good results. In this process, legal requirements should not be compromised.

Digital visual interface (DVI) teams should be ready and have protocols for biological, radiological, chemical, and nuclear scenarios.

There is a need to update ourselves with the latest technologies emerging and amalgamate these technologies to the area where we are practicing.

There is a need for constant research to have the data where these researches can help especially in the areas where we have many challenges.

Conclusion

We need to know our weaknesses and strengths. Only after identification of the weaknesses and problems can we find a solution. Toxicology is one such area where a lot of progress can be made. We need to develop and strengthen other subspecialties. We need to dream big and start working on these dreams to strengthen our discipline. This is the only way to progress, provide efficient services to society and move forward.

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