UNIT-1
Medical Ethics and Patients Care

Learning objectives

- Medical ethics
- Mlc case

Medical ethics:

Introduction: Medical ethics (bioethics), while a modern term, is as old as medicine itself. The Code of Hammurabi and the Hippocratic Oath, for instance, include provisions concerning the importance of ethical considerations to clinical practice. In addition to its initial focus on ethical issues relevant to clinical care, bioethics concerns the moral, legal, political, and social issues raised by medicine, biomedical research, and life sciences technologies. While medical ethical considerations will remain a central aspect of medicine, it can do so at different levels. One can distinguish between three broad spheres of bioethics. The first is academic bioethics, a sphere primarily focused on how theoretical and practical aspects of medicine affect considerations such as special obligations or responsibilities of clinicians, what is valuable, good, right, etc. in the biomedical context and how one might go about providing systematic accounts of such considerations. The second is public policy and law bioethics, where concerns lies in how legal and extra-legal institutions can and should be involved in the regulation of clinical and research practices. The final sphere is clinical ethics, and its focus is directly related to how the incorporation of bioethics into clinical practice can help to improve patient care. Indeed, as a multidisciplinary field, these spheres are often interconnected, and scholars and clinicians can work across multiple spheres. This book seeks to incorporate the best of all three spheres, with primary attention paid to clinical ethics.

Consent:

Consent can be defined as the ‘‘autonomous authorization of a medical intervention ... by individual patients’’ (Beauchamp and Faden, 2004, p. 1279). There is a widespread consensus in both ethics and law that patients have the right to make decisions about their medical care and to be given all available information relevant to such decisions. Obtaining consent is not a discrete event; rather, it is a process that should occur throughout the relationship between clinician and patient (Arnold and Lidz, 2004). Although the term ‘‘consent’’ implies acceptance of a suggested treatment, the concept of consent applies also to choice among alternative treatments and to refusal of treatment. Consent has three components: disclosure, capacity, and voluntariness. Disclosure refers to the communication of relevant information by the clinician and its comprehension by the patient. Capacity refers to the patient’s ability to understand the information and to appreciate those consequences of his or her decision that might reasonably be foreseen. Voluntariness refers to the patient’s right to come to a decision freely, without force, coercion, or manipulation. Consent may be explicit or implied. Explicit consent can be given orally or in writing. Consent is implied when the patient indicates a willingness to undergo a certain procedure or treatment by his or her behavior. For example, consent for venipuncture is implied by the action of rolling up one’s sleeve and presenting one’s arm. For treatments that entail risk or involve more than mild discomfort, it is preferable to obtain explicit rather than implied consent. A signed consent form documents but does not replace the consent process. There are no universal rules as to when a signed consent form is

required. Some hospitals may require that patients sign a consent form for surgical procedures but not for other equally risky interventions. If a signed consent form is not required, and the treatment carries risk, clinicians should write a note in the patient's chart to document that consent has been given. This chapter will discuss the concept of patient consent and exceptions to the requirement to obtain consent. Subsequent chapters will provide detailed discussions of disclosure, capacity, voluntariness, and truth telling, as well as consent for incapable patients, requirements for consent to participation in medical research, and involving children in medical decisions

Disclosure:

Disclosure refers to the process during which physicians provide information about a proposed medical investigation or treatment to the patient. Disclosure, along with capacity, understanding, voluntariness, and consent, makes up the main elements of informed consent (Beauchamp and Childress, 2001).

Ethics The justification for disclosure related to proposed diagnostic tests and treatments is the same as that for consent generally. The patient has a right to decide about available treatment options grounded in respect for autonomy (Snyder and Leffler, 2005). Physicians have a duty to inform patients about their illness and available treatment options and to help patients to decide which of the options is best for them based on the patient's goal and values. In these ways, physicians show respect for the patient and moreover, show ''they see and care about the person not solely as a patient but more importantly, as a unique person'' (Anderson, 2000, p. 6). In addition to respect for autonomy, disclosure is also grounded in beneficence and the physician's primary obligation of service to their patients (Royal College of Physicians and Surgeons of Canada, 2006). Further, consistent disclosure is necessary for developing a continuing and trusting relationship between the patient and his or her physician

Voluntariness:

In the context of consent, ''voluntariness'' refers to a patient's right to make treatment decisions and decisions about his or her personal information free of any undue influence. A patient's freedom to decide can be impinged upon by internal factors arising from the patient's condition or by external factors. External factors, which are the focus of this article, include the ability of others to exert control over a patient by force, coercion, or manipulation. Force involves the use of physical restraint or sedation to enable a treatment to be given. Coercion involves the use of explicit or implicit threats to ensure that a treatment is accepted (e.g., ''If you don't let us do these tests, then we will discharge you from the hospital!''). Manipulation involves the deliberate distortion or omission of information in an attempt to induce the patient to accept a treatment or make a certain decision (Faden and Beauchamp, 1986; Kuczewski and McCruden, 2001). The requirement for voluntariness does not imply that clinicians should refrain from persuading patients to accept advice. Persuasion involves appealing to the patient's reason in an attempt to help him or her understand and accept the merits of a recommendation (Kuczewski and McCruden, 2001). Although a clinician may attempt to persuade a patient to follow a particular course of action based on medical evidence and clinical judgement, the patient is free to accept or reject this advice.

Truth telling:

Truth telling in healthcare may be defined as the practice and attitude of being open and forthright with patients; that is, it is about encouraging authenticity and genuineness in the relationship

between healthcare professional and patient. Truth telling requires the belief that, in general, truth is better than deception. It also requires an intent and effort to be as accurate and honest as possible with patients and includes the duty to disclose information for consent purposes

Confidentiality:

If a person gives information to another in confidence there is an obligation on the person receiving the information not to disclose it to someone else. This obligation, or duty, of confidentiality can be invoked explicitly by the provider of information stating that the information must not be shared, or it can be implicit in the nature of the relationship between the provider and receiver of information. Consequently, there is both an individual and a public expectation that information given to a health professional in the context of the clinical relationship will not be disclosed to third parties. The duty of confidentiality provides the foundation for trust in the therapeutic relationship. Professional organizations and regulatory bodies place great importance on the duty of confidentiality, and health professionals who breach confidentiality may be subject to disciplinary proceedings. However, there is also an understanding that confidentiality cannot be absolute and that sometimes it may be permissible, or even legally required, to breach confidentiality. The increasing capability to generate and disseminate information in healthcare, together with the increasing complexity of healthcare provision, has implications for our understanding of the nature and limits of confidentiality. Development of multidisciplinary healthcare teams raises questions of how much information can be shared within the team, and who is recognized as a team member for this purpose. Access to electronic patient records for research and management purposes provides a ‘‘public interest’’ challenge to individual confidentiality, which expands the boundary of confidentiality beyond the context of individual patient care.

Advances in genetic testing have prompted debate about whether genetic information creates different responsibilities regarding confidentiality (Hallowell et al., 2003; Plantinga et al., 2003; Parker and Lucassen, 2004). Breach of confidentiality is generally perceived as a deliberate disclosure of information to a third party. However, inadvertent breaches of confidentiality that are easily preventable may also occur in healthcare: a conversation about an ‘‘interesting case’’ in the hospital elevator, patients’ names and/ or diagnoses displayed in a manner visible to nontreating individuals. Healthcare workers should be aware of the risks of inadvertent breaches of confidentiality and take steps to avoid them.

Organ transplantation:

Organ transplantation is both a life-extending and a life-saving medical procedure in which a whole or partial organ (or cells in cell therapy) from a deceased or living person is transplanted into another individual, replacing the recipient’s nonfunctioning organ with the donor’s functioning organ. Advances in the science of organ transplantation since the 1980s have significantly broadened the range of transplantable organs and improved transplant outcomes. Transplant centers in different parts of the world successfully transplant kidneys, livers, lungs, hearts, pancreases, and intestinal organs, and the procedure is considered the preferred treatment for several indications. Since the first kidney transplant in 1954, the increasing success of, and innovations in, transplantation have created a demand for organs that greatly exceeds the supply in most countries. The scarcity of organs is a major impetus behind the continuing search for, and development of, alternative ways to expand the pool of organs and tissues available for transplantation (O’Connor and Delmonico, 2005). A major development is the procurement of organs from family members, and most recently from friends and even from strangers (Matas et al., 2000; Gohh et al., 2001; Hilhorst et al., 2005). We are also witnessing desperate patients soliciting organs on the Internet

(Wright and Campbell, 2006), the compensation of living donors for related expenses or even the bestowing of financial rewards for donation (Larijani et al., 2004), and the experimental use of organs from animals (i.e., xenotransplantation; Daar and Chapman, 2004). These recent trends are at the forefront of current ethical debate on transplantation, and they are gaining varying levels of acceptance in different countries by both the public and the transplant community. The sale of organs is another highly complex subject that has received much attention.

Ethics: Organ transplantation presents several ethical challenges. Amongst these are issues related to the 145 determination of death, organ procurement, and organ allocation (Veatch, 2000). Definitions of death attempt to establish the point at which a person's loss of critical bodily functions alters his or her status from living to dead (Lazar et al., 2001) and therefore when, in the context of transplantation, it is morally acceptable to procure organs from the deceased. There is now widespread acceptance, especially among intensivists and the transplant community, but with much public support in many countries, of brain death criteria for diagnosing death (US President's Commission, 1981; Dossetor and Daar, 2001). Some cultures do not accept this, preferring instead the traditional definition of death as the irreversible cessation of cardiorespiratory functions. These different perspectives obviously influence the formulation of legal and medical criteria for the posthumous procurement of organs. One of the questions being debated is whether, after death, an individual's organs are a societal resource to be automatically recovered or an individual's personal property, requiring his or her approval to organ recovery (Truog, 2005). The vast majority maintain that organs belong to the potential donor and thus the most prevalent deceased donation model requires a person's consent to donate through signing a donor card while alive, or more commonly, through the agency and consent of next-of-kin, after death. This model is based on respect for individual autonomy (Veatch, 2000). The practice of obtaining consent to donation of deceased organs from a substitute decision maker raises

Law :The laws enacted to regulate organ transplantation vary with jurisdictions around the world. They generally cater to definitions of death, donor consent, and, often, the prohibition of the commercial trade in organs. The laws in most North American, Asian, and European countries permit organ removal when the patient is pronounced dead. These laws most commonly define death as the irreversible cessation of the entire brain function, although Japanese law allows the individual while living to choose between the cardiac- and brain-based definitions of death according to his or her belief.

MLC (MEDICO LEGAL CASES):

Introduction

1. Medicolegal cases (MLC) are an integral part of medical practice that is frequently encountered by Medical Officers (MO). The occurrence of MLCs is on the increase, both in the Civil as well as in the Armed Forces. Proper handling and accurate documentation of these cases is of prime importance to avoid legal complications and to ensure that the Next of Kin (NOK) receive the entitled benefits.

2. All medical officers working in hospitals / field medical units / non-medical units encounter medicolegal issues which should be handled in accordance with the law of the land and directives issued by service headquarters.

3. The purpose of this memorandum is to provide general guidelines for Medical Officers of the Armed Forces Medical Services (AFMS) while dealing with commonly encountered situations which fall within the medicolegal domain.

4. Since law and order is a state subject, there are differences in the legal procedures being followed by different states. Medical Officers should acquaint themselves with medicolegal procedures that are in vogue in the state in which they are serving. 2 MLCs in Medical Practice

5. MLC. A MLC is defined as "any case of injury or ailment where, the attending doctor after history taking and clinical examination, considers that investigations by law enforcement agencies (and also superior military authorities) are warranted to ascertain circumstances and fix responsibility regarding the said injury or ailment according to the law".

6. Labelling a case as MLC.

(a) RMO / Casualty medical officer / MO in charge of MI Room / Duty Medical Officer (DMO) / MO In charge ward who is attending to the case, may label a case as a MLC.

(b) The decision to label a case as MLC should be based on sound professional judgement, after a detailed history taking and thorough clinical examination.

7. Examples of MLCs. The following are some of the examples of MLCs and medical officers should use their professional judgement to decide any other cases not enumerated in the list: (a) Assault and battery, including domestic violence and child abuse (b) Accidents like Road Traffic Accidents (RTA), industrial accidents etc. (c) Cases of trauma with suspicion of foul play (d) Electrical injuries (e) Poisoning, Alcohol Intoxication 3 (f) Undiagnosed coma (g) Chemical injuries (h) Burns and Scalds (j) Sexual Offences (k) Criminal abortions (l) Attempted suicide (m) Cases of asphyxia as a result of hanging, strangulation, drowning, suffocation etc. (n) Custodial deaths (o) Death in the operation theatre (p) Unnatural deaths (q) Death due to Snake Bite or Animal Bite (r) Fire Arm injuries (s) Drug overdose (t) Drug abuse (u) Dead brought to the Accident and Emergency Dept / MI Room (Found dead) and deaths occurring within 24 hours of hospitalization without establishment of a diagnosis

8. General Guidelines for dealing with Medicolegal cases

(a) In emergencies, resuscitation and stabilization of the patient will be carried out first and medicolegal formalities may be completed subsequently. The consent for treatment is implied in all emergencies.

(b) Emergency medical care will be administered to all cases brought to any AFMS Health Care Establishment irrespective of their entitlement. In non-entitled cases, after the initial stabilization, the patient may be transferred to the nearest Government hospital, and if necessary by service ambulance.

(c) Cases of trauma will be labeled as MLCs, if there is a suspicion of foul play, even if the incident is not of recent origin. All cases of injury to service personnel should be reported on IAFY 2006 (Injury Report) with the appropriate classification viz., trivial, moderately severe or severe.

(d) All MI Rooms and hospitals will maintain a MLC register and the MLC will be initiated and documented in the register. Personal particulars, identification marks, finger prints of the individual will be noted. Particulars of the person accompanying the patient will also be noted.

(e) Medicolegal documents should be prepared in duplicate, with utmost care giving all necessary details, preferably written with a ball-point pen and avoiding overwriting. If any overwriting or correction is made, it should be authenticated with the full signature and stamp of the MO. Abbreviations should be avoided.

(f) The Commanding Officer (CO) / Commandant and Senior Registrar and equivalent in other hospitals should be immediately informed as and when a MLC is registered or admitted. The particulars of the patient and a short summary of the case will be mentioned in the DMO report book.

(g) The patient will be placed on SIL / DIL, when required. (h) NOK will be informed if the address is available.

(j) The police should be informed. Under Section 39 of Criminal Procedure.Code, the attending MO is legally bound to inform the police about the arrival of a MLC. Any failure to report the occurrence of a MLC may invite prosecution under Sections 176 and / or 202 of I.P.C. Simultaneously, the information should be given to ADH, Station Headquarters (HQ), Corps of Military Police (CMP) and to the unit concerned (by telephone). The verbal communication should invariably be followed by communication in writing subsequently.

(k) In case of discharge / transfer / death of such a case in the hospital, the police should be informed.

(l) Medicolegal documents should be considered as confidential records and should be stored under safe custody to avoid tampering. Medical records must be thorough, complete and should document each and every significant event in the course of care of the patient. All the documents including case sheets, X-rays and investigation reports will be preserved meticulously in the medical record section indefinitely and handed over to the concerned authorities (Police Investigating Officer / Court / Court of Inquiry) as and when required.

(m) Prompt attention, correct triage and safe transfer of a patient from one facility to another as required should be carried out in all cases and not delayed because of the medicolegal nature of the case.

(n) Opinion on severity of injuries should be given after the X-ray reports are received in cases of injury to bones / joints.

(o) Samples and specimens collected for medicolegal purposes will be properly sealed, labeled and handed over to the investigating officer detailed by the police. Commandant/CO of the hospital will ensure that the documents are kept in the custody of an appropriate officer till the case is finally decided or cleared by the police and judicial authorities.

(p) Dying Declaration. In cases where the patient wishes to make a dying declaration, the magistrate will be intimated. If the Magistrate is unable to come and record a statement or where the MO feels that he might not be able to reach the patient in time, the MO may record the dying declaration himself in presence of two independent witnesses whose signatures are also affixed in the document. The MO will certify the soundness of mind of the person making the dying declaration.

(q) Battle Casualties (BC) and Battle Accidents (BA) are not to be reported as MLCs. The medical cause of death in these cases may however be certified by the RMO. RMOs must obtain the certification of BC / BA from the unit, duly signed by the CO, before mentioning the same in the medical documents. AO 20/2001/ DV deals with details on declaration of BC / BA.

(r) Where civil police cover is not available, a military inquest will be held by the military administrative authority to decide cause and other facts pertaining to death. Normally, the service pathologist carries out clinical autopsy. Exceptionally, medico-legal autopsies may be carried out by the service pathologist (RMSAF para 58 refers). In such cases necessary clearance will be obtained from local civil police. The documentary prerequisites are: (i) Inquest report by the police / military court of inquest (ii) Requisition by the police / military court of inquest to the CO of the hospital for carrying out medico-legal autopsy in the military hospital addressed (iii) Express written orders of the CO of hospital to the service pathologist to carry out the autopsy.

(s) If a death has been reported by the hospital authorities as medicolegal and is decided otherwise by the police after investigation, a certificate to that effect is required to be obtained from the investigating officer in the format attached as Enclosure 1, along with a copy of the Panchnama when the body is returned to the hospital.

UNIT-2

Learning objective

- Hospital structure
- Radiographer job and responsibilities

Hospital structure and organization:

A hospital is a regulated organization with multiple departments. Like any other organization, it is essential to define the structure of operations at a hospital. The organizational model defines the framework, line of duty, communication roles and resource allocation. It also reflects the ethos of the organization. There are two broad forms of organizational structures that are explained below:

- **Horizontal organizations**: Horizontal or flat organizations have lesser defined hierarchy and multiple bosses. Individuals have more power at hand and are required to perform many different functions and are required to consult multiple supervisors. Although this allows for greater independence for staff members, it necessitates greater time and resources to arrive at decisions. Horizontal structures are best rated workplaces, and this delay can be done gradually over a period of time.

- **Vertical organizations**: A vertical organizational structure has a well-defined top-down hierarchy. Each staff has set roles and responsibilities and they report directly to the person above them. Vertical organizations are more rigid but more efficient as well. Decision making is faster, and accountability is greater.

A hospital deals with lives in their hands every hour of the day. This demands from them efficient and timely operations, quick decision-making, greater accountability and allows minimum margin for error. For such organizations, vertical structure is most suited. A top-down structure allows for efficient management and accountability and establishes a chain of command within the organization. This narrows down the roles and responsibility of each individual and allows the managerial team to maintain equilibrium.

Furthermore, various departments within a hospital can be grouped under key banners with a torch-bearer leading each group.

Managerial Staff: Key personnel running the business comprise of the managerial staff. The Chief of strategy, business promotion, operation, execution, finance, human resources, clinical care, etc. are part of the managerial staff. These CMOs have a flat hierarchy amongst them and work in tandem with each other. They ensure efficient decision-making to lead the hospital towards accomplishing its operations, finance and business goals. They report to the Governing Board / Chairman of the hospital. Each CMO is a leader in their line of authority and communication. Administrative staff comprising of admission, billing, accounts, human resource, marketing, patient & corporate relations, etc. work with their respective team leaders to ensure optimum efficiency and service delivery. The administrative team represents the hospital on the ground level and is the face of the organization.

RADIOGRAPHER RESPONSIBILTIES:

Clinical

- To work within radiation protection guide lines in accordance with the Local Rules and 2000 Ionising Radiation Medical Exposure Regulations (IR(ME)R) to ensure that the correct patient receives the correct x-ray examination with the minimum radiation dose.
- Act independently in the assessment of referrals for x-ray examinations, taking full responsibility for the justification of general x-ray examinations in order to reduce unnecessary ionising radiation exposure of the patient in accordance with IR(ME)R, following appropriate induction and assessment.
- Maintain a high level of expertise in the safe operation of x-ray equipment and manage faults effectively.
- Provide professional opinion to clinicians on the nature of a diagnostic image either verbally or using the "Red Dot" system (or Radiographer Commenting) to identify possible pathology – this may impact on patient management.
- Work as part of a team to ensure effective communication and delivery of care.
- Prioritise workload depending on severity of the patient's condition and direct impact on their management.
- Liaise with fellow healthcare workers and referring clinicians to provide a high-quality imagingservice to patients.
- Maintain accurate patient records by input of accurate information.
- Work independently when providing a standby/on call service to patients requiring urgent imaging due to acute trauma or illness.
- Undertake aftercare of patients following injection of contrast media with respect to intravenous cannulation removal, and awareness of possible adverse reactions e.g. nausea, anaphylaxis etc.
- Be actively involved in the training and assessment of student radiographers on clinical placement, providing direct supervision at all times. Maintain the required knowledge and skills to provide effective training, keeping up to date with current advances in technology and diagnostic techniques.

Managerial

- Be able to exercise personal responsibility and make decisions in complex and difficult circumstances e.g. imaging in A/E and theatre during a multiple trauma situation.
- Regularly participate in ongoing departmental audit and quality assurance programs which may lead to proposals of change to current working practices.
- Delegate appropriately and supervise Health Care Support Workers to achieve the desired quality of patient care.
- Comply and contribute to the implementation of departmental and professional policies and procedures such as Professional Code of Conduct.

Health and Safety including Risk Assessment, Control of Substances Hazardous To Health (COSHH) regulations, Fire Regulations, Infection Control and Clinical Effectiveness, Moving and Handling Training and Cardiac Pulmonary Resuscitation training updates. Radiation Protection Local Rules and IR(ME)R 2000 Divisional Policies regarding No Smoking Policy, Grievance Procedure and Disciplinary Procedure.

Quality Assurance Programme.

- Be responsible for coordination of initial stages of major incident procedure for the Imaging Department.
- Prioritising workloads requires diplomatic skills in discussion with referrers who all believe their patient should take priority

SYSTEMS & EQUIPMENT

For all imaging examinations radiographers must use and handle the following equipment, machinery and computer systems.

Imaging Equipment

- Ceiling suspended general x-ray tubes, floor to ceiling track x-ray tubes, rise and fall x-ray tables, static height tables, floating top tables, erect and supine buck assemblies and operator consoles.
- Mobile image intensifiers for theatre fluoroscopy
- Mobile x-ray units for ward/theatre radiography and resuscitation unit.
- OPT units for dental/maxillo-facial referrals
- Film processors
- Chemical mixers
- Computed Radiography (CR) readers-image manipulation and storage software.
- Direct Digital Radiography (Electronic image post processing/storage and retrieval)
- Fluoroscopy equipment
- Stationary grids/cassette holders

Ancillary Equipment

- Patient hoists and transfer equipment
- Immobilisation devices such as foam pads/bucky bands
- Label printers associated with Radiology Information System (RIS)
- Suction, Oxygen and emergency drug trolleys
- Lead rubber equipment for radiation protection purposes

DECISIONS & JUDGEMENT

- Be accountable for your own professional actions especially when working independently.
- Use skills to assess patient's condition and decide on appropriate method to obtain an image.
- When acting in the role of Operator and Practitioner under IR(ME) R decide whether the x-ray request is justified as the correct examination to diagnose patient's condition and ultimately decide whether to proceed with the x-ray examination
- When single-handed plan and priorities workload

- Assess and be involved in the development and implementation of radiographic procedure.

COMMUNICATIONS & RELATIONSHIPS

Patients:

- Provide information by explanation of complex procedures, listening to the patient's requirements to encourage compliance with the imaging process. Some patients will have difficulty in understanding the process or be unable to communicate e.g. those with learning difficulties, dementia, non-English speaking.
- Patients will have injuries or illness that will require the adaptation of the imaging technique, utilisation of developed motivational and persuasive skills to acquire correct position and reduced mobility to produce an acceptable diagnostic image. These patients may have severely challenging behaviour e.g.: Physically/mentally disabled, dementia – which may make them obstructive or physically aggressive. They could also be uncooperative or violent if under the influence of drugs or alcohol.
- Provide reassurance and information as to the necessity of an X-Ray examination involving the risks associated with the harmful effects of ionising radiation.

Relatives / Carers

- Provide reassurance, give and receive information
- Ask for assistance with, and instruct in methods of immobilization while maintaining radiation protection.

Radiography Staff (internal / external)

- Consult senior staff for advice
- Discuss department policies and suggest improvements
- Delegate tasks to Radiographic Assistants
- Pass on information relating to patient transfer to colleague

PHYSICAL, MENTAL, EMOTIONAL AND ENVIRONMENTAL DEMANDS OF THE JOB

Physical Skills:

- Prior to the exposure of x-ray radiation, continuously using a high degree of accuracy, manipulate and position all patients providing immobilisation when required
- Have the expertise to safely handle and operate highly specialised, high voltage, expensive and heavy equipment
- Be able to work at speed using dexterity and precision whilst performing radiographs on a critically injured patient often prior to emergency surgery
- Possess keyboard skills for the entry of data into the RIS, PACS and CR

Physical Demands

- Maintain a level of fitness to move ceiling / floor mounted X-Ray equipment for every examination throughout the shift.
- Walk long distances when pushing mobile units to carry out ward radiography throughout a shift when required. This equipment weighs up to 477 kg.
- For the positioning of every patient there is a requirement to stand, walk and bend.
- 20-90% of the working day can be spent pushing / pulling patients on trolleys/chairs, depending on the area of work. Patients weigh 40 kg – 160 kg.
- Up to 75% of patients may need transferred from trolleys, beds, and chairs onto x-ray tables using mechanical aids when available.
- Carry cassettes/grids to and from x-ray facility to processor or CR reader.
- Carry cassette/grid combinations to and from wards/theatres over distances the length of the hospital. These cassette/grid combinations weigh up to 7 kg.
- Push cart loaded with several cassettes and lead rubber aprons long distances across the hospital.
- For every examination outwith the x-ray department a lead rubber apron must be worn.

These aprons weigh up to 7 kg and are worn for approximately 5-8 theatre cases per day on average for times ranging from 20minutes to 2hours and ward radiography from 8-20 patients per work day.

Mental Demands

- Constant concentration is required when assessing and performing examinations throughout the shift with constant interruption from telephones and pagers.
- When on stand by at night take responsibility for the entire radiography service alone, managing patients and equipment. This involves maintaining concentration for up to a 16- hour period with the potential for no breaks or sleep, 9 hours of which will be worked single-handed.
- Should imaging equipment malfunction during an examination (occasionally during a theatre case) evaluate the situation and provide an immediate solution.

Emotional Demands

- Several times a day perform radiographic examinations and care to terminally ill patients.
- Provide examinations for severely injured patients in an Accident and emergency department
- Move quickly from a routine examination to an acute session due to sudden and unpredictable demand e.g. X-Ray of a painful finger with no history of trauma to a victim of a road traffic accident with severe injuries requiring multiple X-rays, independently taking responsibility for the diagnostic imaging service for that patient.
- Perform Radiographic examinations on injured, distressed and uncooperative adults, involving family members/carers where necessary

Working Conditions

- Direct contact with unpleasant odours and bodily fluids throughout all shifts.
- Be required to wear heavy lead rubber aprons during ward radiography and fluoroscopy procedures sometimes in a hot theatre environment.
- Risk of exposure to scattered Ionising Radiation particularly during fluoroscopic procedures.
- Moving from cold air-conditioned areas to hot conditions in the working areas.
- Working single handed and moving about a large geographic site in order to provide a mobile imaging service
- Working constantly in artificial lighting with little or no natural daylight.
- Exposure to verbal abuse from some patients, this could be once a week or more.
- A risk of physical abuse from patients, who may be confused, disorientated, under the influence of alcohol etc. This could be an average of 2-3 times/shift in Accident/Emergency at evening and weekends

MOST CHALLENGING / DIFFICULT PARTS OF THE JOB

- Cope with the mental and physical demands of working single-handed overnight in an acute area and having to provide images sometimes on severely injured, abusive or violent patients. This involves working a 16hour shift on site, 9 hours of which will be working single-handed, with the potential for no breaks or sleep.
- Ability to cope with clinicians demands while prioritising workload.
- It is essential that the post holder understands the departmental HIS, RIS and Computerized Radiographic Systems and the importance of correct patient identification across all these modalities especially in a PACS environment.
- As the only radiographer working overnight in the hospital meet the high work rate demands of Accident and Emergency while also covering urgent In-Patient referrals, portables in the wards
- Work in unpleasant conditions such as being in contact with body fluids and body odours.
- Directly train and supervise student radiographers while maintaining a high throughput of patients.
- The physical demands of the job due to the moving and handling requirements and the volume of mobile radiography.
- Working a cross site rotation if required which includes commitment to an out of hours roster for 1 or more sites.

UNIT-3

Learning objective

- Communicable disease
- Patient care

Communicable disease:

A communicable disease is one that is spread from one person to another through a variety of ways that include: contact with blood and bodily fluids; breathing in an airborne virus; or by being bitten by an insect.

Reporting of cases of communicable disease is important in the planning and evaluation of disease prevention and control programs, in the assurance of appropriate medical therapy, and in the detection of common-source outbreaks. California law mandates healthcare providers and laboratories to report over 80 diseases or conditions to their local health department. Some examples of the reportable communicable diseases include Hepatitis A, B & C, influenza, measles, and salmonella and other food borne illnesses.

How these diseases spread depends on the specific disease or infectious agent. Some ways in which communicable diseases spread are by:

1. physical contact with an infected person, such as through touch (staphylococcus), sexual intercourse (gonorrhea, HIV), fecal/oral transmission (hepatitis A), or droplets (influenza, TB)
2. contact with a contaminated surface or object (Norwalk virus), food (salmonella, E. coli), blood (HIV, hepatitis B), or water (cholera);
3. bites from insects or animals capable of transmitting the disease (mosquito: malaria and yellow fever; flea: plague); and
4. travel through the air, such as tuberculosis or measles.

Cross infection and prevention:

cross infection is the transfer of harmful microorganisms, usually bacteria and viruses. The spread of infections can occur between people, pieces of equipment, or within the body. These infections can cause many complications. So, medical professionals work hard to ensure equipment safety and a clean environment. the symptoms of a cross infection depend on the source of the infection. And also the part of the body that is infected. One of the first symptoms of a cross infection is a fever. This is the body's first course of action to help get rid of an infection.

Many different types of infections can occur. Some examples include:

- a urinary tract infection (UTI) from an infection caused by a catheter
- a surgical wound infection that may cause redness, swelling, and pus
- an infection related to the presence of a peripheral or central venous access line

Preventing cross infection:

- Cross infection is best treated at the source. Medical professionals follow special procedures to help prevent infections. Aseptic technique is a common process used to sterilize equipment so harmful microorganisms can't spread from patient to patient.
- Hospitals and other healthcare settings all have procedures to prevent infection. Before undergoing a procedure, you can check the facility in advance and ask about preventative measures.

Personal hygine: Good personal hygiene habits include:

- washing the body often. If possible, everybody should have a shower or a bath every day. However, there may be times when this is not possible, for example, when people are out camping or there is a shortage of water
- If this happens, a swim or a wash all over the body with a wet sponge or cloth will do
- cleaning the teeth at least once a day. Brushing the teeth after each meal is the best way of making sure that gum disease and tooth decay are avoided. It is very important to clean teeth after breakfast and immediately before going to bed
- washing the hair with soap or shampoo at least once a week
- washing hands with soap after going to the toilet
- washing hands with soap before preparing and/or eating food. During normal daily activities, such as working and playing, disease causing germs may get onto the hands and under the nails. If the germs are not washed off before preparing food or eating, they may get onto the food
- changing into clean clothes. Dirty clothes should be washed with laundry soap before wearing them again
- hanging clothes in the sun to dry. The sun's rays will kill some disease-causing germs and parasites
- turning away from other people and covering the nose and mouth with a tissue or the hand when coughing or sneezing. If this is not done, droplets of liquid containing germs from the nose and mouth will be spread in the air and other people can breathe them in, or the droplets can get onto food

Patient hygine:

- Hygiene includes care of the skin, along with the hair, hands, feet, eyes, ears, nose, mouth, back, and perineum. This includes the bath, components of the bath, bed making, and assisting the patient in the use of the bed pan, urinal, and bedside commode.
- Importance of Hygiene and Care:

  The bath stimulates circulation in the skin and underlying tissues; it cleans and refreshes, promoting health and comfort; it provides some exercise for the patient; and similar to the opportunities available in making the occupied patient's bed, it provides excellent opportunities for observation of the patient's physical and emotional condition and for patient-centered

conversation to promote good interpersonal relationships.

How to handle infectious patient:

A. Hand washing • Wash hands after touching blood, secretions, excretions and contaminated items, whether or not gloves are worn. Wash hands immediately after gloves are removed, between patient contacts. • Use a plain soap for routine hand washing. • Use an antimicrobial agent for specific circumstances.

B. Gloves • Wear gloves when touching blood, body fluids, secretions, excretions, and contaminated items. Put on clean gloves just before touching mucous membranes and non-intact skin.

C. Mask, eye protection, face shield • Wear a mask and eye protection or a face shield during procedures and patientcare activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.

D. Gown • Wear a gown during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.

E. Patient-care equipment • Ensure that reusable equipment is not used for the care of another patient until it has been cleaned and reprocessed appropriately.

F. Environmental control • Ensure that the hospital has adequate procedures for the routine care, cleaning, and disinfection of environmental surfaces.

G. Linen • Handle used linen, soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, and that avoids transfer of microorganisms to other patients and environments.

H. Occupational health and bloodborne pathogens • Take care to prevent injuries when using needles, scalpels, and other sharp instruments or devices. • Use ventilation devices as an alternative to mouth-to-mouth resuscitation methods. I. Place of care of the patient • Place a patient who contaminates

Asepsis: is a condition in which no living disease-causing microorganisms are present. Asepsis covers all those procedures designed to reduce the risk of bacterial, fungal or viral contamination, using sterile instruments, sterile draping and the gloved 'no touch' technique. They also include all of the prophylactic methods, working processes and behavioral forms by which microorganisms can be kept away from the patient's body and the surgical incision. The goal of asepsis is to prevent contamination, which can be ensured by the use of sterile devices, materials and instruments and by creating an environment that is low in microbe volume.

Aseptic technique is employed to maximize and maintain asepsis, the absence of pathogenic organisms, in the clinical setting. The goals of aseptic technique are to protect the patient from infection and to prevent the spread of pathogens. Often, practices that clean (remove dirt and other impurities), sanitize (reduce the number of microorganisms to safe levels), or disinfect (remove most microorganisms but not highly resistant ones) are not sufficient to prevent infection.

Inflammation: is a process by which the body's white blood cells and substances they produce protect us from infection with foreign organisms, such as bacteria and viruses.

However, in some diseases, like arthritis, the body's defense system -- the immune system -- triggers an inflammatory response when there are no foreign invaders to fight off. In these diseases, called autoimmune diseases, the body's normally protective immune system causes damage to its own tissues. The body responds as if normal tissues are infected or somehow abnormal.

VITAL SIGNS:

Vital signs reflect essential body functions, including your heartbeat, breathing rate, temperature, and blood pressure. Your health care provider may watch, measure, or monitor your vital signs to check your level of physical functioning. Normal vital signs change with age, sex, weight, exercise capability, and overall health. Normal vital sign ranges for the average healthy adult while resting are:

- **Blood pressure: 90/60 mm Hg to 120/80 mm Hg:**

Either an aneroid monitor, which has a dial gauge and is read by looking at a pointer, or a digital monitor, in which the blood pressure reading flashes on a small screen, can be used to measure blood pressure

Breathing: 12 to 18 breaths per minute:

- The respiration rate is the number of breaths a person takes per minute. The rate is usually measured when a person is at rest and simply involves counting the number of breaths for one minute by counting how many times the chest rises. Respiration rates may increase with fever, illness, and other medical conditions. When checking respiration, it is important to also note whether a person has any difficulty breathing.
- Normal respiration rates for an adult person at rest range from 12 to 16 breaths per minute.

Pulse: 60 to 100 beats per minute:

- Using the first and second fingertips, press firmly but gently on the arteries until you feel a pulse.
- Begin counting the pulse when the clock's second hand is on the 12.
- Count your pulse for 60 seconds (or for 15 seconds and then multiply by four to calculate beats per minute).
- When counting, do not watch the clock continuously, but concentrate on the beats of the pulse.
- If unsure about your results, ask another person to count for you

Temperature: 97.8°F to 99.1°F (36.5°C to 37.3°C); average 98.6°F (37°C):

- Rectally. Temperatures taken rectally (using a glass or digital thermometer) tend to be 0.5 to 0.7 degrees F higher than when taken by mouth.
- Axillary. Temperatures can be taken under the arm using a glass or digital thermometer. Temperatures taken by this route tend to be 0.3 to 0.4 degrees F lower than those temperatures taken by mouth.
- By ear. A special thermometer can quickly measure the temperature of the ear drum, which reflects the body's core temperature (the temperature of the internal organs).
- By skin. A special thermometer can quickly measure the temperature of the skin on the forehead.

- Orally. Temperature can be taken by mouth using either the classic glass thermometer, or the more modern digital thermometers that use an electronic probe to measure body temperature.

Medicolegal cases (MLC): are an integral part of medical practice that is frequently encountered by Medical Officers (MO). The occurrence of MLCs is on the increase, both in the Civil as well as in the Armed Forces. Proper handling and accurate documentation of these cases is of prime importance to avoid legal complications and to ensure that the Next of Kin (NOK) receive the entitled benefits.

Radiographer:

Radiographers are technicians who deals with patients and operates the equipment. Radiographers perform various functions in their effort to perfectly diagnose patients' diseases. Major duties, tasks, and responsibilities commonly assigned to the role radiographer include:

a. Evaluate patients' medical condition and history to determine most suitable radiographic technique for diagnosis.

b. Interact with patients to offer them psychological support and address their concerns regarding an imaging procedure.

c. Adjust diagnostic equipment to deliver accurate amount of radiation to patients.

d. Operate complex medical instruments such as MRIs, CT scanners, X-ray, ultrasound, and several other imaging devices.

e. Liaise with oncologists and physicians to plan treatment for cancer patients.
f. Direct and supervise the activities of radiography assistants and trainee radiographers.

g. Maintain proper records of patient details ensuring confidentiality of sensitive information.

h. Follow up on patients after treatment to track the progress of recovery and ensure patients show no signs of radiation side effect.

i. Explain to patients and their family the details of a procedure and ways to manage possible side effects.

j. Regularly inspect diagnostic equipment to ensure they are functional and operate efficiently.

k. Assist oncologists and physicians during complex radiological examinations.

l. Ensure compliance with health and safety guidelines to minimize risk of exposure to ionizing radiation.

m. Correctly position patients prior to X-ray imaging in order to obtain high quality films.

n. Use portable devices to conduct diagnostic scans on patients who can't move to the radiology unit

UNIT-4

Learning objective

- Contrast media
- First aid

CONTRAST MEDIA: BASIC PRINCIPLES:

The use of radiographic contrast agents dates almost from the discovery of X-Rays. In 1896 Becher opacified the gastrointestinal tract of the guinea pig using lead subacetate. The basic principle is that contrast agents are administered in such a way as to alter the absorption of x-rays by specific anatomic structures in relation to their surroundings. Contrast agents may be positive (iodine or barium compounds, for example), or negative (gases). Gaseous contrast agents absorb fewer x-rays than tissues because of their low density, even though the effective atomic number may be higher. On the other hand, positive contrast agents absorb more x-rays than tissues because of their high density and higher atomic number

IODINE COMPOUNDS AS CONTRAST AGENTS:

Almost all radiological examinations performed with injected contrast agents involve the administration of iodine-containing compounds. The use of iodine compounds was initially related to low toxicity and excellent radio-opacity rather than physical considerations. However, it was also fortunate that iodine compounds possess physical properties which make them better contrast agents than compounds with higher atomic number. The K-edge of iodine is 33.2 keV. At photon energies slightly above this, iodine actually has greater attenuating properties for x-rays than the same mass of lead. The location of this K-edge for iodine has practical implications. Obviously the maximum contrast in radiographic studies using iodine compounds would be obtained by using a monochromatic beam of radiation of energy just above 33.2 keV. This is not practicable, however, but what can be done is to select the peak kilovoltage (kVp) for the examination which will give a high proportion of the photons in the 33-40 keV range. This is achieved when a relatively low kVp is used. Therefore, for contrast examinations using iodine compounds, optimum technique requires a kVp in the 60-80 range.

Contrast media of this type include: • Diatrizoate (Urografin, Angiografin) • Iothalamate (Conray) • Metrizoate (Isopaque) • Iodamide

These compounds vary only in the side chains at positions 3,5. All of these agents dissociate in solution to produce two ionic particles for each three iodine atoms. They are therefore referred to as RATIO 1.5 AGENTS. Commercial preparations of these agents may be pure methylglucamine or pure sodium compounds, or a mixture of both

ADMINISTRATION:

These compounds are not absorbed in significant amounts from the normal gastrointestinal mucosa. Therefore, they are mainly administered by the intravenous or intra-arterial routes. They are not suitable for intrathecal administration. If ionic compounds are used for urography, 50ml of a 76% (w/v) diatrizoate preparation or equivalent is satisfactory for an average size patient with good renal

function. This dose, however, can reasonably be doubled for large patients. In angiography, the dose per injection varies with the vessel injected. The total dose is of some importance when multiple injections are made. Although there is no clearly recognised dose limit, with ionic agents it is wise to consider terminating the examination when 300ml of a 76% diatrizoate preparation or equivalent has been injected.

SELECTED IMPORTANT PHYSICAL PROPERTIES OSMOLALITY:

Normal serum osmolality is approximately 300 mosm/kg water. The osmolalities of some of the commoner RATIO 1.5 AGENTS and Hexabrix are:

Urografin 76% 1690
Angiografin 65% 1530
Conray 280 1220
Hexabrix 580

The RATIO 1.5 AGENTS are high osmolality preparations. The undesirable effects of injection of high osmolality compounds include:

- Pain on arterial, and sometimes venous, injection.
- Endothelial damage.
- Large fluid shifts between the intravascular and extravascular compartments.
- Red cell deformation.
- Osmotic diuresis limiting concentrating ability. A major benefit of the RATIO 3 AGENTS is reduced osmolality for the same iodine content.

VISCOSITY:

Viscosity is obviously of considerable importance in angiography, where the injection rate through a catheter can be of critical importance. Viscosity may be measured in centipoise (cP). The viscosity of water at 20 degrees Centigrade is approximately lcP. Viscosity depends on a number of factors which include the size and shape of the solute particle, as well as temperature. Contrast media are approximately twice as viscous at 20 degrees C as at body temperature. Warming the contrast agent to body temperature may be of considerable importance in angiography in achieving required flow rates within the limitations of catheter pressure tolerances. Note that sodium compounds are generally less viscous than methylglucamine compounds. On the other hand, it is generally considered that methyglucamine compounds are less irritating to vascular endothelium and end-organs such as the brain.

PLASMA CONCENTRATION & DISTRIBUTION AFTER INJECTION :

These substances are carried free in plasma, less than 5% of an injected dose is protein bound. The plasma concentration just after injection is strongly related to the dose and the injection rate. The larger the dose and faster the injection, the higher the plasma level. Immediately after injection, however, contrast: agent begins to diffuse into the extravascular space and water is drawn from the latter into the intravascular compartment by the increased osmolality due to the contrast agent. At five minutes, the concentration in the intravascular and extravascular compartments is virtually identical and 80% of the contrast agent is outside the intravascular compartment. The exceptions are

in the brain, other neural tissues and the testes, where the tight junctions of the endothelial cells do

not allow the diffusion of the contrast agent molecules outside the vascular compartment. There is a "blood-brain barrier" which confines contrast agent to the vascular compartment in neural tissues. There are important consequences of the above for the conduct of computed tomographic examinations. In scanning non-neural tissues, normal and abnormal tissues may often be differentiated by different degrees of vascularity and capillary permeability. These differences are best shown by early scanning after a bolus of contrast agent. Delayed scans, after equilibration has taken place, may show little or no abnormality. On the other hand, when scanning neural tissues, a bolus injection is often of no particular merit but delayed scans may be most helpful as they will show accumulation of contrast agent over time in areas of blood-brain barrier breakdown, eg in tumours and demyelinating plaques. Note that these agents cross the placenta as shown by studies of foetuses obtained during legal abortions after prior injection of the mother with radionuclide labelled diatrizoate. There have been reports of confirmation of renal function in the foetus by computed tomography after maternal intravenous injection of contrast agent.

EXCRETION:

In the normal patient, excretion is almost entirely via the renal route. These compounds are handled by the kidney in the same fashion as inulin, ie there is glomerular filtration and concentration by tubular resorption of water. There is an insignificant amount of tubular secretion but this is said to be somewhat greater with iodamide than with other members of this group. It is doubtful if this is of clinical importance. When the glomerular filtrate begins its course through the proximal tubule, it has the same iodine concentration as plasma. Under normal (non-urographic) conditions, 85% of the filtered water is absorbed in the proximal tubule (obligatory reabsorption). With large amounts of non-reabsorbable foreign molecules such as contrast agent present, this is no longer possible and only about half the filtered water can be reabsorbed. This reabsorption is independent of the state of hydration of the patient. The amount of water reabsorption in the collecting tubule, however, is under the influence of ADH. The level of serum ADH is related to such factors as stress and dehydration. The effect of ADH on water reabsorption is modified by the amount of osmotically active agents such as contrast medium or urea within the tubular lumen. These compounds tend to retain water within the tubule. Therefore, increasing the amount of contrast agent in the tubular lumen tends to impose a maximum on the amount of water reabsorption that occurs and therefore the concentration of contrast medium in the urine.

NON-IONIC CONTRAST AGENTS:

The search for contrast agents with good radio-opacity, low toxicity, low osmolality and suitability for intrathecal injection led to metrizamide as the first agent of this group. Metrizamide is a glucosamide derivative of metrizoic acid. It is no longer commercially available in Australia. Non-ionic contrast agents are now available; iopamidol, iohexol, ioversol, iopromide, iodixanol and iotrolan. Like Hexabrix, the first four are RATIO 3 AGENTS but they do not dissociate in solution. Iotrolan and iodixanol are non-ionic dimers and RATIO 6 AGENTS. These compounds are suitable for intrathecal use and have almost entirely replaced oily myelographic agents (note that ioversol and iopromide have not yet been approved for intrathecal use in Australia). Another advantage of these compounds is that they appear to have less toxicity than RATIO 1.5 AGENTS, although it will take many years of widespread usage to confirm this. Their principal disadvantage is that they cost approximately 4-5 times as much as RATIO 1.5 AGENTS. Some hospitals have made the decision to use non-ionic contrast agents only, because of their greater apparent safety. Other

hospitals use these agents selectively and the principal indications are: (i) Intrathecal examinations.

(ii) Examinations in which higher osmolality agents may be painful or may have a higher risk of organ damage, eg peripheral arteriography, cerebral and coronary angiography. (iii) Patients at a high risk for adverse reactions from conventional media.

ACCORDING TO THE RANZCR, THE HIGH RISK GROUP INCLUDES:

- Patients with previous reactions to contrast media.
- Patients with asthma or significant allergic disease.
- Patients with previous episodes of anaphylaxis.
- Elderly patients or those with known significant cardiac disease.
- Renal insufficiency, particularly associated with insulin-dependent diabetes.
- Patients with sickle cell disease, polycythaemia, phaeochromocytoma or myeloma.
- Excessively anxious patients. It should be noted that the non-ionic contrast agents have much less anticoagulant effect than the ionic agents. Thus, meticulous flushing techniques are required during angiography with non-ionic contrast media.

EXCRETION:

As with the ionic agents, excretion is almost entirely via the renal route in the patient with normal renal function. Because of the reduced osmolality of these agents, there is less osmotic diuresis so that there tends to be a higher urinary iodine concentration and a denser pyelogram. This is balanced to some extent by the reduction in diuresis causing less distension of the collecting systems. Because of the reduced osmotic diuretic effect, these agents produce a better pyelogram in the patient with renal impairment.

SIDE EFFECTS AND COMPLICATIONS:

ARACHNOIDITIS:

This may be caused by meningeal irritation due to contrast media and other forms of trauma such as surgery. The incidence of arachnoiditis is very much lower following water-soluble, non-ionic agents than with the oily contrast agent Myodil. In the patient who has not had previous surgery the incidence of arachnoiditis is close to zero.

SEIZURES:

The risk of grand mal seizures is low and in one series of 30,000 metrizamide examinations there were only 9 cases. It is thought that the risk of seizures increases as more contrast agent is introduced into the cranial subarachnoid space. Also, patients taking phenothiazines are more likely to fit. Seizures are controllable with I.V. diazepam.

HEADACHE AND DISTURBANCES OF CEREBRAL FUNCTION:

Disturbances such as hallucinations, psychotic symptoms, aphasia, hearing loss and motor paralysis have all been reported with metrizemide. Fortunately these are almost always temporary. The incidence of these problems with newer non-ionic agents seems to be lower. To minimise the exposure of neural tissue to the contrast agent, it is recommended that patients remain in the erect or

semi-erect position for up to 8 hours following water-soluble myelography. Hydration has also been shown to decrease the incidence of neurological side effects and headache.

METHODS OF CATEGORIZING CONTRAST REACTIONS :

There are two useful ways to approach contrast reactions. One is to categorize them according to their severity. This method has immediate clinical relevance when reactions occur and provides a framework for determining an appropriate course of treatment. The other approach is to analyze them according to the type of adverse reaction. This is important to understand the mechanisms of reactions.

A. Mild Signs and symptoms appear self-limited without evidence of progression Nausea, vomiting Altered taste Sweats Cough Itching Rash, hives Warmth (heat) Pallor Nasal stuffiness Headache Flushing Swelling: eyes, face Dizziness Chills Anxiety Shaking Treatment: Observation and reassurance. Usually no intervention or medication is required; however, these reactions may progress into a more severe category.

B. Moderate Reactions which require treatment but are not immediately life-threatening Tachycardia/bradycardia Hypotension Bronchospasm, wheezing Hypertension Dyspnea Laryngeal edema Pronounced cutaneous Pulmonary edema reaction Treatment: Prompt treatment with close observation

C. Severe Life-threatening with more severe signs or symptoms including: Laryngeal edema Profound hypotension Unresponsiveness (severe or progressive) Convulsions Cardiopulmonary arrest Clinically manifest arrhythmias

Treatment of reaction:

For the treatment of contrast reaction go throw the following table below:

Consider non-contrast study/alternate study or follow with management below as clinically indicated:

13 hours prior to procedure, **and** 7 hours prior to procedure:
- Prednisone[2] 50 mg PO **or**
- Hydrocortisone[2] 50 mg IV

In addition give, 1 hour prior to procedure:
- Prednisone[2] 50 mg PO **or**
- Hydrocortisone[2] 50 mg IV **and**
- Diphenhydramine 50 mg PO or 25 mg IV

If emergency procedure required and patient has previous history of mild to moderate reaction:
- Consider Non-contrast Study/Alternate study **or**
- Hydrocortisone[2] 50 mg IV every 4 hours until procedure is completed **and**
- Diphenhydramine 50 mg PO **or** 25 mg IV, 1 hour prior to procedure.

If allergy or contraindications to steroids or in an emergency, premedicate with diphenhydramine 50 mg PO **or** 25 mg IV, 30-60 minutes prior to procedure

Basic Emergency Care (BEC): first aid and triage

Ventilation: moves outdoor air into a building or a room, and distributes the air within the building or room. The general purpose of ventilation in buildings is to provide healthy air for breathing by both diluting the pollutants originating in the building and removing the pollutants from it.

Building ventilation has three basic elements:

- ventilation rate — the amount of outdoor air that is provided into the space, and the quality of the outdoor air
- airflow direction — the overall airflow direction in a building, which should be from clean zones to dirty zones; and
- air distribution or airflow pattern — the external air should be delivered to each part of the space in an efficient manner and the airborne pollutants generated in each part of the space should also be removed in an efficient manner.

Triage :is the process of sorting casualties in order of priority which sounds simple enough, unfortunately without an understanding of how to effectively, objectively and accurately do this we have a habit of making these decision based on the wrong criteria: We follow common heuristics such as 'going for the quiet ones' *or* 'treat unconscious casualties before conscious casualties*'*. Humans are also genetically hardwired to react to the sight of blood so we triage based on injuries; treating the most visibly traumatic – the blood guts and gore – over less obvious injuries.

1. **Casualties are not triaged based on how loud or quiet they are.**
   Someone emotionally traumatised may be laying foetal in the corner not saying a word, someone with a femoral bleed may be screaming in agony.

2. **Casualties are not triaged based on whether they are consciousness conscious or not.**
   A casualty can be unconscious but otherwise perfectly healthy (feinting) or they could be fully conscious but expected to deteriorate and die very quickly.

3. **Casualties are not triaged based on their injury**
   Injuries do not necessarily tell you if a casualty is going to die. The vital signs do. A bleeding head wound can look horrific, even though it is essentially superficial. A sucking chest wound or internal head injury can kill a casualty quickly…without producing that much blood.