MAHASHRI KARVE STREE SHIKSHAN SAMSTHA'S

SMT. BAKUL TAMBAT INSTITUTE OF NURSING EDUCATION

KARVENAGAR, PUNE

CRITICAL CARE NURSING MANNUAL

(PRESENTED BY 3RD YEAR B. B. Sc. NURSING)

2021-2022

Maharshi Karve Stree Shikshan Samstha's

Smt. Bakul Tambat Institute of Nursing Education

Karvenagar, Pune-411052.

WORKSHOP ON CRITICAL CARE NURSING.

ORGANIZED BY - 3rd Year B.B.Sc Nursing.

Date: 04/04/2022 to 08/04/2022

Time: 2.00 PM to 4.00 PM

Venue: Multipurpose Hall.

MAHASHRI KARVE STREE SHIKSHAN SAMSTHA'S

SMT. BAKUL TAMBAT INSTITUTE OF NURSING EDUCATION

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CRITICAL CARE NURSING TOPIC PRESENTATION

SCHEDULE

S.N	GROUP	ROLL NO.	TOPICS	DATE OF PRESENTATION	TIME
1.	Group 1	1-4	Monitoring of Critically ill patients.	04-04-2022	2pm-3pm
	Group 11	41-44	Infusion pump and Syringe pump	04-04-2022	3pm-4pm
2.	Group 3	9-12	Performing endotracheal suctioning	05-04-2022	2pm-3pm
	Group 2	5-8	Care of patient on ventilator.	05-04-2022	3pm-4pm
3.	Group 6	21-24	Maintaining CVP lines.	06-04-2022	2pm-3pm
	Group 8	29-32	ABP	06-04-2022	3pm-4pm
4.	Group 9	33-36	Interpretation of ABP analysis	07-04-2022	2pm-3pm
	Group 7	25-28	PAP	07-04-2022	3pm-4pm
5.	Group 5	17-20	Tracheostomy care	08-04-2022	2pm-3pm
	Group 4	13-16	Bundle Protocol	08-04-2022	3pm-4pm
	Group 10	37-40	Defibrillator	08-04-2022	4pm-5pm

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SMT. BAKUL TAMBAT INSTITUTE OF EDUCAT
KARVENAGAR PUNE – 411052

Third Year Basic B.Sc. Nursing 2021-2022

Sr. No.	Group	Name of the students	Topic
1	Group I	Ambade Janhavi	Monitoring of critically ill patients
2		Bhumkar Shraddha	
3		Bidgar Priyanka	
4		Chinchane Vanita	
5	Group II	Desai Mayuri	Care of patient on ventilator
6		Dhabale Sumitra	
7		Gavit Nikita	
8		Gawai Pranjal	
9	Group III	Jadhav Jaya	Performing endotracheal suctioning
10		Jadhav Shweta	
11		Jagdale Shweta	
12		Kadu Apeksha	
13	Group 4	Kamble Anushka	Bundle protocol
14		Kasturkar Gauri	
15		Kawde Aarti	
16		Kirve Aakansha	
17	Group 5	Kokane Vaishnavi	Tracheostomy care
18		Kuchekar Sanjana	
19		Kumbhare Puja	
20		Lamture Rutuja	
21	Group 6	Lohar Pratiksha	Maintaining CVP line
22		Matele Kshitija	
23		Morale Sonali	
24		More Rachna	
25		Mundkar Rohini	

26	Group 7	Ovhal Komal	Pulmonary Artery Pressure
27		Pakhale Mousami	
28		Pardhi Amruta	
29	Group 8	Parhad Vaishnavi	Arterial Blood Pressure
30		Patil Pallavi	
31		Raut Vaishnavi	
32		Rawool Gouri	
33	Group 9	Sarjine Gauri	Interpretation of ABG analysis
34		Sawanurkar Gayatri	
35		Shinde Diksha	
36		Shinde Neelam	
37	Group 10	Shinde Vaishnavi	Defibrillator
38		Sonawane Vaishnavi	
39		Surana Utkarsha	
40		Sutar Priyanka	
41	Group 11	Tamboli Aayushi	Infusion pump and syringe pump
42		Thakare Shraddha	
43		Veer Akshata	
44		Vitkar Supriya	

GUIDED BY:
Mrs. Nupoor Bhambid
Lecturer
M.Sc. (N) Medical Surgical Nursing

CRITICAL CARE NURSING

TOPIC PRESENTATION

MONITORING OF CRITICALLY ILL PATIENTS

Aim:

At the end of presentation, group will able to gain knowledge about monitoring of critically ill patients and able to apply the knowledge in clinical practice.

Objectives:

At the end of presentation, group will able to,

- Define critical care unit
- Define critically ill patients
- Explain about cardiovascular monitoring
- Explain about respiratory monitoring
- Explain about renal function monitoring
- Explain about central nervous system monitoring
- Explain about gastrointestinal monitoring
- Explain about hematological monitoring
- Explain about metabolism and nutrition monitoring.

Introduction:

Critical care is now beginning to be recognized as an independent subject of specialization in India. Our knowledge of the physiology of critical illness and technology available for monitoring and treating vital organ dysfunction has progressed rapidly. The intensive care specialist is a medical professional with a special understanding of the physiology of acute life-threatening illness, a familiarity with resuscitation, and the capacity to provide physiological monitoring and organ support. Patients are admitted to the intensive care unit for the treatment of vital organ failure or in anticipation of occurrence of organ failure.

Critical care unit:

The Intensive Care Unit (ICU), also known as the Critical Care Unit is defined by the Task Force of the World Federation of Societies of Intensive and Critical Care Medicine as “an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple

modalities of physiologic organ support to sustain life during a period of life-threatening organ system insufficiency."

Mainly, the ICU's goal is to prevent a progressive deterioration in the physiologic state of a patient as the underlying disease is being managed.

Critically ill patients:

The identification of at risk patient or those patients who could benefit from intensive care treatment is largely based on scoring system. A critically ill patient was defined as patient who has a life threatening multisystem process that can result in significant morbidity and mortality, and in most cases is preceded by a period of physiological deterioration.

1. CARDIOVASCULAR SYSTEM MONITORING:

ECG monitoring:

- ECG monitoring is done at the bedside using three leads electrodes- left arm, right arm and left leg.
- Upper and lower limit alarms may be set at desired heart rates, and an audible and visible signal is triggered whenever heart rate goes beyond the set limits.

Non-invasive blood pressure:

- The use of mercury sphygmomanometer to record arterial blood pressure is reliable, and simple.
- This is stimulated by an instrument with a pneumatic pump which can be programmed to periodically inflate a blood pressure cuff applied around the arm at intervals and then gradually deflate it.

Invasive vascular pressure monitoring:

- This is done using a electronic pressure transducer which is connected to the bedside monitor by the cable.
- The transducer has a pressure- sensitive diaphragm to which is connected a fluid-filled tube
- This, in turn, is connected to catheter or cannula placed at the desired vascular site like radial artery, right atrium or pulmonary artery.

- The pressure at the tip of the catheter is displayed as a waveform as well as a numeric value at the bedside monitor.
- The system may be used to measure arterial pressure, central venous pressure and pulmonary artery wedge pressure.

Cardiac output measurements:

- Cardiac output is usually measured by the Fick principle, using the thermodilution techniques.
- Apart from the opening at its tip, the Swan Ganz catheter has a thermistor near its tip.

2. RESPIRATORY MONITORING:

Clinical examination:

- Good clinical examination alone is very reliable in detecting respiratory distress and airway obstruction.
- We have to do four steps respiratory examination are inspection, palpation, percussion and auscultation of respiratory sound.
- It is however, not very accurate in detecting small change in adequacy of (O_2) & (CO_2), pulmonary compliance.
- Ex. Asymmetry of chest movement could occur in pneumothorax, atelectasis etc.

Bedside spirometry:

- It is possible to assess peak flow rate at the bedside using hand held devices.
- These are useful in assessing severity of airway obstruction.
- Spirometry measuring forced vital capacity and tidal volume in patients with respiratory muscle weakness.

Arterial blood gas analysis:

- Especially beneficial in ventilated patients
- Helps to adjust inspired oxygen and minute volume to achieve a desired PaO_2 & $PaCO_2$ Respectively.

- The blood gas analysis can be done only intermittent, gadgets to monitor these important respiratory variables continuously are being developed using arterial catheter with fiber optic electrode at its tip.

Pulse Oximetry:

- Pulse Oximetry is a non invasive device for monitoring the oxygen level in blood.
- Apply the probe to finger or ear lobule.
- It is spectrophometric analysis.
- Normal >97%
- Not effective when peripheral perfusion is reduced.
- The pulse Oximetry to finger for monitoring saturated haemoglobin by detecting the differential absorption of light of two wave length by oxygenated & deoxygenated haemoglobin when the light is passed through fingertip.

Lung mechanism:

- In mechanically ventilated patients, monitoring of lung mechanics is required to choose the optimum setting for the ventilator, and to reduce risk of barotrauma.
- Most modern ventilators monitor airway pressure, flow rate of ventilatory gases and tidal volume and use these to calculate static compliance, dynamic compliance and airway resistance.

3. RENAL FUNCTION:

- Hourly urine output is a simple and reliable parameter of renal function.
- Renal function is measure by using a simple blood test in combination with a urine test.
- The level of waste product in the blood called creatinine.
- Oliguria and azotaemia could both result from renal or prerenal causes.
- In prerenal azotaemia renal perfusion is decreased and renal tubules absorb almost all the sodium and water in the glomerular filtrate.
- Therefore urinary osmolality elevated (>500mosmol/kg), with urinary sodium <20mmol/L, urine/plasma creatinine ratio is >10.

- Creatinine clearance can be calculated from serum creatinine using the formula: **Creatinine clearance (ml/min)** = (140-age) ×weight(kg) ÷72 ×serum creatinine (me/dl).
- So that doses of drug like digoxin, aminoglycoside, beta lactams must be reduced based on the creatinine clearance so as to prevent toxicity due to decreased renal excretion.

4. CNS MONITORING:

- Repeated **clinical examination** is a simple, non-invasive method used in monitoring the CNS status in the ICU.
- The use of the **Glasgow Coma Scale** make it possible event for nurse to objectively assess clinical status.

Intracranial pressure monitoring:

- Normal intracranial pressure is less than 10 mm of Hg.
- Intracranial pressure monitoring is often required in patient with severe head injury, subarachnoid hemorrhage and some postoperative neurosurgical patients.
- Made by placing a device within a cranial vault by making small burr hole in parietal or frontal area of non – dominant hemisphere cerebral edema and hemorrhage cause a rapid rise in ICP.
- ICP above 20- 25 mm of Hg want immediate correction.

Transcranial doppler scan:

- The transcranial Doppler scan is a non -invasive techniques which can quantity blood flow in the arteries of the circle of Willis and can detect cerebral ischemia in patient with raised intracranial pressure, or also spasm following subarachnoid haemorrhage.

ECG:

- Bedside ECG monitoring may be monitored in some unconscious patient to detect and treat non-convulsive status epilepticus.

Bulb oximetry:

- Jugular Bulb oximetry is a technique which continuously monitors internal jugular venous oxygen saturation a decrease in saturation indicates a decrease in cerebral blood flow resulting in greater extraction of oxygen by the brain.

5. GASTROINTESTINAL MONITORING:

- Upper gastrointestinal hemorrhage is common and should be looked for by periodic nasogastric suction recently gastric tonometry has been used to detect early gut ischemia in patients with severe illness and sepsis.
- This technique use the PCO2 and PH of a solution of normal saline placed in a semipermeable ballon introduced in the gastric lumen.
- It is possible to calculate the gastric intramucosal PH which is proportional to the mucosal blood flow.

6. HEMATOLOGIC MONITORING:

- Hemoglobin content of blood is an important component of oxygen delivery to tissues.
- It may drop very rapidly in patients with severe falciparum malaria or patients with poly trauma, and should be monitored several times a day in these patients.
- Platelet count and coagulation tests like prothrombin time and partial thromboplastin time, fibrinogen levels and fibrin degradation products should be monitored to detect thrombocytopenia or disseminated intravascular coagulation in patients with sepsis, malaria, leptospirosis and obstetric disorders like pregnancy – induced hypertension and abruption Placentae.
- The leucocyte count could help differentiate between infective and non -infective causes of fever; fever in the presence of leukopenia needs special treatment.

7. METABOLISM AND NUTRITION:

- Metabolic status has to be monitored carefully and repeatedly.
- Arterial blood gas analysis, serum electrolytes, serum creatinine, blood urea nitrogen and blood sugar are estimated at least once daily, and more frequently if needed.

- Nutritional intake too must be monitored and is frequently neglected aspect of intensive care.
- The intake of calories, proteins, water, electrolytes and minerals must be charted and monitored daily.

Conclusion:

Finally, it is neither possible not necessary, to monitor all these variables in every ICU Patients. The choice of which variables to measure in a patient should be made judiciously. While extensive and invasive monitoring may give us a lot of accurate physiological data, one has to consider whether this information will actually influence treatment. This is because monitoring can be expensive, as well as produce complications, some of which could be life-threatening.

References:

1. Siddharath N. Shah. API TEXTBOOK OF MEDICINE. 7th Edition. Published by: the association of Physicians of India, Mumbai. Page no. 1224- 1227

CRITICAL CARE NURSING

TOPIC PRESENTATION

ON

CARE OF PATIENT ON MECHANICAL VENTILATOR

Aim:

At the end of presentation, group will able to gain knowledge about care of patient on mechanical ventilator and able to apply the knowledge in clinical practice.

Objective:

1. Define mechanical ventilator.
2. Enlist the indications of mechanical ventilator.
3. Enumerate the types of mechanical ventilator.
4. Determine modes of ventilator.
5. Describe the care of patient requiring mechanical ventilator.
6. Enumerate weaning from ventilator.
7. Enlist the compilation of mechanical ventilator.

Introduction:

A medical ventilator is a mechanical ventilator, a machine designed to move breathable air into and out of the lungs, to provide breathing for a patient who is physically unable to breathe, or breathing insufficiently.

Mechanical ventilation may be required for a variety of reasons, to control the patients respiration during surgery or during treatment of severe head injury, to oxygenate blood when the patients ventilatory efforts are inadequate, and to rest the respiratory muscles, among others.

Definition:

A ventilator is a machine that provides mechanical ventilation by moving breathable air into and out of the lungs, to deliver breaths to a patient who is physically unable to breathe, or breathing insufficiently.

OR

Mechanical ventilation can be defined as the technique through which gas is moved toward and from the lungs through an external device connected directly to the patient.

Indications:

1. Upper airway obstruction
2. Lower airway obstructions
3. CNS disease
4. CNS depression
5. High risk patient who are potential for developing respiratory failure.
6. Major postoperative surgery
7. Certain lung disease.
8. Respiratory depression to the point of

Types of ventilators:

1.Negative pressure ventilation

- This is intra airway pressure to become negative this drawing air into the lungs through the patients nose and mouth.
- Useful for respiratory neuromuscular problem or weaning from positive pressure ventilation.
- An example is iron lung ventilator.

2. Positive pressure ventilator

- Positive pressure ventilation is a form of respiratory therapy that involves the delivery of air or a mixture of oxygen combined with other gases by positive pressure into the lungs.
- Here air is actively delivered to the patients lungs under positive pressure.

3. Volume cycled ventilator:

- Designated volume of air is delivered with each breath. Usual starting volume is 6-8 ml/kg.
- Delivers the predetermined volume of airway pressure depend on lung compliance of an individual.

4.Pressure cycled ventilator:

- Deliver selected gas pressure during inspiratory phase
- Volume delivered depend on lung compliance and resistance
- Use of volume based alarm to detect obstruction.
- Positive pressure ventilator

5.Invasive ventilator:

- AC mode / CMV mode
- IMV mode
- SIMV mode
- PSV mode.

6.Non invasive ventilator:

- CPAP mode
- Bi-PAP mode

Invasive ventilation mode:

1. **Assist control ventilation (AC mode):**

- Inspiratory cycle of ventilator is activated by the patient's voluntary inspiratory effort and delivers a pre set full volume.
- Ventilator should not irritate the spontaneous breath.
- Indicated for patients who breathing spontaneously.

2. **Intermittent mandatory volume (IMV mode):**

- Allows patient to breath at their own.
- Periodically, as preselected rate and volume of pressure, cycle to give a mandated ventilator breath.
- Ensure predetermined number of breaths at a selected tidal volume are delivered.

3. **Synchronized intermittent mandatory ventilation:**

- Allows patient to breath spontaneously through ventilatory circuit.
- Periodically mandatory breaths are synchronized with patients inspiratory effort.
- Indicated for who are breathing spontaneously but Vt Or rate less than adequate for their needs. Allows patient to do some work for their breathing.

4. **Pressure support ventilator:**

- Augments inspiration to spontaneous breathing patient.
- Maintain a set positive pressure during spontaneous inspiration.
- The patient ventilates spontaneous establishing own rate, Vt and inspiratory time.

Non-invasive ventilation mode:

1. **CPAP (Continuous Positive Airway Pressure)**

   Continuous positive airway pressure (CPAP) is a type of positive airway pressure that is used to deliver a set pressure to the airways that is maintained throughout the respiratory cycle, during both inspiration and expiration.

2. **BiPAP (Bi Level Positive Airway Pressure) :**

   In a BiPAP mode, a sleep apnea machine provides 2 pressures,

   - IPAP (Higher Inspiratory Positive Airway Pressure)
   - EPAP (Lower Expiratory Positive Airway Pressure).

Care of patient requiring ventilator:

In the critically ill patient who requires mechanical ventilation the registered nurse (RN) and the respiratory therapist provides most of the care,

Role of registered nurse:

- Develop plan for communication with the patient who has a tracheotomy or an ET tube.

- Give sedatives, analgesics and paralytic drugs as needed.
- Teach patient and caregiver about mechanical ventilation and weaning procedures.
- Auscultate breath sounds and respiratory effort, assessing for decreased ventilation.
- Monitor ventilator settings and alarm.
- Determine need for ET tube Suctioning as needed. Monitor oxygenation level and signs of respiratory fatigue during the weaning procedures.

Role of other team members:

Respiratory therapist:

a) Auscultate breath sound and respiratory effort, assessing for decreased ventilation.
b) Monitor ventilator settings and alarm.
c) Change ventilator settings as needed or ordered.
d) Maintain appropriate cuff inflation on ET tube.
e) Determine the need for ET tube Suctioning.
f) Monitor oxygenation level and signs of respiratory fatigue during weaning procedures.

- **Occupational/ physical therapist**
  - Assist with range of motion exercises.
  - Assist with early and progressive ambulation as directed by the RN.
- **Dietician :**
  - Assess and monitor patient's nutritional needs/ status.
  - Recommend formulations for enteral and parenteral nutrition needed.

Weaning from ventilator:

Weaning is the process by which the patient is gradually allowed to assume responsibility for regulating and performing his own ventilation.

Respiratory parameters as criteria for weaning

- Ability to oxygenate
- Spontaneous resting ventilatory needs.
- Respiratory mechanical capability

Complications:

- Atelectasis
- Pneumothorax
- Oxygen toxicity
- Infection
- Respiratory acid base balance.
- Gastric ulceration
- Conjuctivitis
- Nasal bleed

Bibliography:

- Essential of critical care nursing, jaya kuruvilla, jaypee publications, 1st edition Page no. 224 to 228
- Critical care nursing, ghosh jarna, paras medical publisher, 1st edition, 2016.page no. 68 to 76
- ICU manual, Ashish goel, Rajnish joshi, paras medical publisher, 3rd edition 2014, page no. 73 to 79.
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CRITICAL CARE UNIT

TOPIC PRESENTATION ON

ENDOTRACHIAL SUCTIONING

OBJECTIVES:

1. Define Endotracheal suctioning
2. Know the purposes of Endotracheal suctioning
3. List down the indication of Endotracheal suctioning
4. Enlist the equipment's for Endotracheal suctioning
5. Explain the procedure of Endotracheal suctioning
6. Discuss the aftercare of the equipment.

INTRODUCTION:

Endotracheal tube (ETT) suction is necessary to clear secretions and to maintain airway patency, and to therefore optimise oxygenation and ventilation in a ventilated patient.

ETT suction is a common procedure carried out on intubated infants. The goal of ETT suction should be to maximise the amount of secretions removed with minimal adverse effects associated with the procedure.

DEFINITION:

Endotracheal Tube (ETT): An airway catheter inserted into the trachea (windpipe) via the mouth or nose in endotracheal intubation. ETT Suction: The process of applying a negative pressure to the distal ETT or trachea by introducing a suction catheter to clear excess, or abnormal, secretions.

PURPOSES:

1. To maintain a patient airway by removing accumulated tracheobronchial secretions using sterile technique.
2. To improve oxygenation and reduce the work of breathing.
3. Stimulate the cough reflex.
4. Prevent infection and atelectasis from the retained secretions.

INDICATIONS:

The need to remove accumulated pulmonary secretions as evidence by one of the following.

- Coarse breath sound by auscultation of lungs or 'noisy' breathing.

- Patient's inability to generate an effective spontaneous cough.

- Changes in monitor flow and pressure graphics.

- Deterioration of arterior blood gas values.

- Expected aspiration of gastric or upper away secretions.

- Clinically apparent increased work of breathing.

EQUIPMENT:

A clean tray containing

- Laryngoscope with curd on straight blade and working light sources.
- Endotracheal tube with low pressure cuff and adaptor to connect tube to ventilator style to guide the ETT.
- Oral airway.
- Suction sources.
- Suction catheter.
- Sterile towels
- Gloves.
- Face shield.
- End tidal, CO_2 detector.
- Resuscitation bag and mask connected to O_2 source.

TYPE OF ENDOTRACHEAL SUCTIONINGN

a) Open endotracheal suctioning
b) Closed endotracheal suctioning

COMPLICATION:

- Hypoxaemia
- Atelectasis
- Bradycardia
- Tachycardia
- Increased ETT CO_2 and transcutaneous CO_2
- Blood pressure fluctuations

- Decreased tidal volume
- Airway mucosal trauma
- ETT dislodgement
- Pneumothorax
- Pneumomediastinum
- Bacteraemia
- Pneumonia
- Fluctuations in intracranial pressure and cerebral blood flow velocity

REFERENCE :

P K Verma,Principal And Practice Of Critical Care,B I Publications Pvt Lim,2006,Page No.1 To 6

B C Bhagvan,Textbook On Operatipn Theatre Nursing,Jaypee Production,I Clement,Page No.339 To 341

■https://www.slideshare.net/manalihsolanki/et-tube-suctioning-ppt

■https://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/Endotracheal_tube_suction_of_ventilated_neonates/

■https://youtu.be/6Bj47DLY6Sk

CRITICAL CARE NURSING

TOPIC PRESENTATION

BUNDLE PROTOCOL

INTRODUCTION:

Healthcare Associated Infections (HAI) are one of the most common adverse events in delivery of care and a major public health problem with an impact on morbidity, mortality and quality of life. At any one time, up to 7% of patients in developed and 10% in developing countries will acquire at least one HAI. These Infections also present a significant economic burden for the health system. However, a large percentage of HAIs are preventable through effective **Infection Prevention and Control (IPC)** measures. Infection prevention and control Is also important to prevent the occurrence and spread of infections, thereby reducing the need for antibiotics.

Healthcare-associated infections (HAI), also referred to as "nosocomial" or "hospital" infections, occur in a patient during the process of care in a hospital or other healthcare facility and were not present or incubating at the time of admission. HAI can affect patients in any type of setting where they receive care and can also appear after discharge; and include occupational infections among staff.

The first principle of patient safety is to do no harm and prevention is best!

Infection control is key in prevention and is implemented through the infection prevention and control (IPC) committees in healthcare facilities. Preventing infections is at the core of public health and is also the best way to reduce the use of antimicrobials. Hand hygiene is the simplest cost-effective intervention for preventing the spread of infections not only in healthcare facilities but also in the community. Healthcare-associated infections (HAI) are one of the most common complications of healthcare management. These are serious health hazards as many are caused by the serious antibiotic resistant bacteria leading to increase in the length of hospital stay and the associated costs and may even lead to death. Healthcare facilities are high risk environments for the development and spread of drug resistance and frequently have the highest burden of multidrug resistant organisms (MDRO). Infection prevention and control measures and practices reduce the opportunities for resistant pathogens to spread in healthcare facilities. They are therefore important in our efforts to contain antimicrobial resistance.

INTRODUCTION TO CARE BUNDLES:

The Institute of Healthcare Improvement (IHI) developed the concept of bundles a bundle is a group of evidence-based care components for a given disease that when executed together may results in better outcomes then if implemented individually.

DEFINITION:

1. Care "bundles" are simple sets of evidence-based practices that, when implemented collectively, improve the reliability of their delivery and improve patient outcomes.
2. A care bundle is a collection of interventions that may be applied to the management of a particular collection.
3. In general, bundles are groupings of best practices for prevention or management of a specific entity that result in greater improvement when applied together than when each intervention is applied individually. Ideally, each of the components of a bundle would be based on an evidence-based intervention know clearly to have a beneficial outcome.

   A number of specific bundles are available that can be implemented at healthcare facilities in resource-limited settings. These packages of care contribute to infection prevention, reduce unnecessary antibiotic prescribing, and may limit the development of antibiotic resistance in healthcare facilities

GENERAL PRINCIPLES:

1. The implementation of care bundles can assist in enhancing compliance
2. to evidence-based quality process measures to improve patient care.
3. Care bundles include a set of evidence-based measures that when
4. implemented together have shown to produce better outcomes and
5. have a greater impact than that of the isolated implementation of
6. individual measures.
7. Bundles also help to create reliable and consistent care systems in hospital settings since they are simple, clear, and concise.
8. In addition to creating safer patient care environments, the implementation of bundles also promotes multi-disciplinary collaboration, since they should be developed collaboratively and consensus obtained with strong clinician engagement and endorsement.
9. In order for bundle implementation to be successful, each element of the bundle must be implemented collectively with complete consistency to achieve the most favorable outcomes ("all or none" approach).
10. The effective implementation of a care bundle requires that the measures be adapted to the local setting; appropriately followed; entrenched in the patient care culture and; recorded and evaluated to ensure compliance by all members of the healthcare team involved.

11. Healthcare providers are advised to follow each bundle element for every patient, always. This aims to develop and promote a positive habit- forming behavior among providers and ultimately a reliable care process.

TYPES OF CARE BUNDLES:

1. Ventilator Associated Pneumonia (VAP)
2. Catheter Associated Urinary Tract Infection (CAUTI)
3. Central line associated blood stream infection (CLABSI)
4. Hospital Acquired Pressure Ulcer (HAPU)
5. Surgical Site Infection (SSI)
6. Peripheral IV Catheter Maintenance Bundle (PVC BUNDLE)
7. Needle Stick Injury (NSI)

1. VENTILATOR ASSOCIATED PNEUMONIA (VAP):

Pneumonia is the second most common HAI reported in the world and is associated with substantial morbidity and mortality. Most patients with healthcare- associated pneumonia are those with extremes of age, severe underlying disease, immunosuppression, depressed sensorium and cardiopulmonary disease, and those who have had thoraco-abdominal surgery. Most bacterial healthcare- associated pneumonia occur by aspiration of bacteria colonizing the oropharynx or upper gastrointestinal tract of the patient. Intubation and mechanical ventilation greatly increase the risk of bacterial pneumonia because they alter first-line patient defenses.

Definition:

Pneumonia due to infective causes occurring in a patient on mechanical ventilation is termed ventilator-associated pneumonia or VAP.

THE AMERICAN THORACIC SOCIETY (ATS) and the INFECTIOUS DISEASE SOCIETY

OF AMERICA (IDSA) defined ventilator associated pneumonia (VAP) as a pneumonia developing in a patient receiving mechanical ventilation for longer than 48-72 hours after tracheal intubation.

Key elements of the ventilator associated pneumonia bundle are:

1. Head of bed elevated to 30 to 45 degrees.
2. Deep venous thrombosis prophylaxis
3. Peptic ulcer disease prophylaxis
4. Daily sedatives interruption and daily assessment of readiness to extubate.

5. Daily oral care with chlorhexidine.
6. Suctioning of the respiratory tract.
7. Maintenance of in-use respiratory therapy equipment.

1. Head of bed elevation:

   Elevation of the bed has been correlated with reduction in the rate of VAP. Recommended elevation is 30 to 45 degrees. Importance of elevation is that it reduces potential for aspiration. Including these intervention and nursing flow sheets and as a topic at multidisciplinary rounds, on order sets for initiation and weaning of mechanical ventilation, delivery of tube feedings and provision of oral care may increase the compliance.

2. Deep vein thrombosis:

   Empowering pharmacy to review orders for patients in the ICU to ensure that some form deep

   vein prophylaxis is in place at all times on ICU patients may be useful.

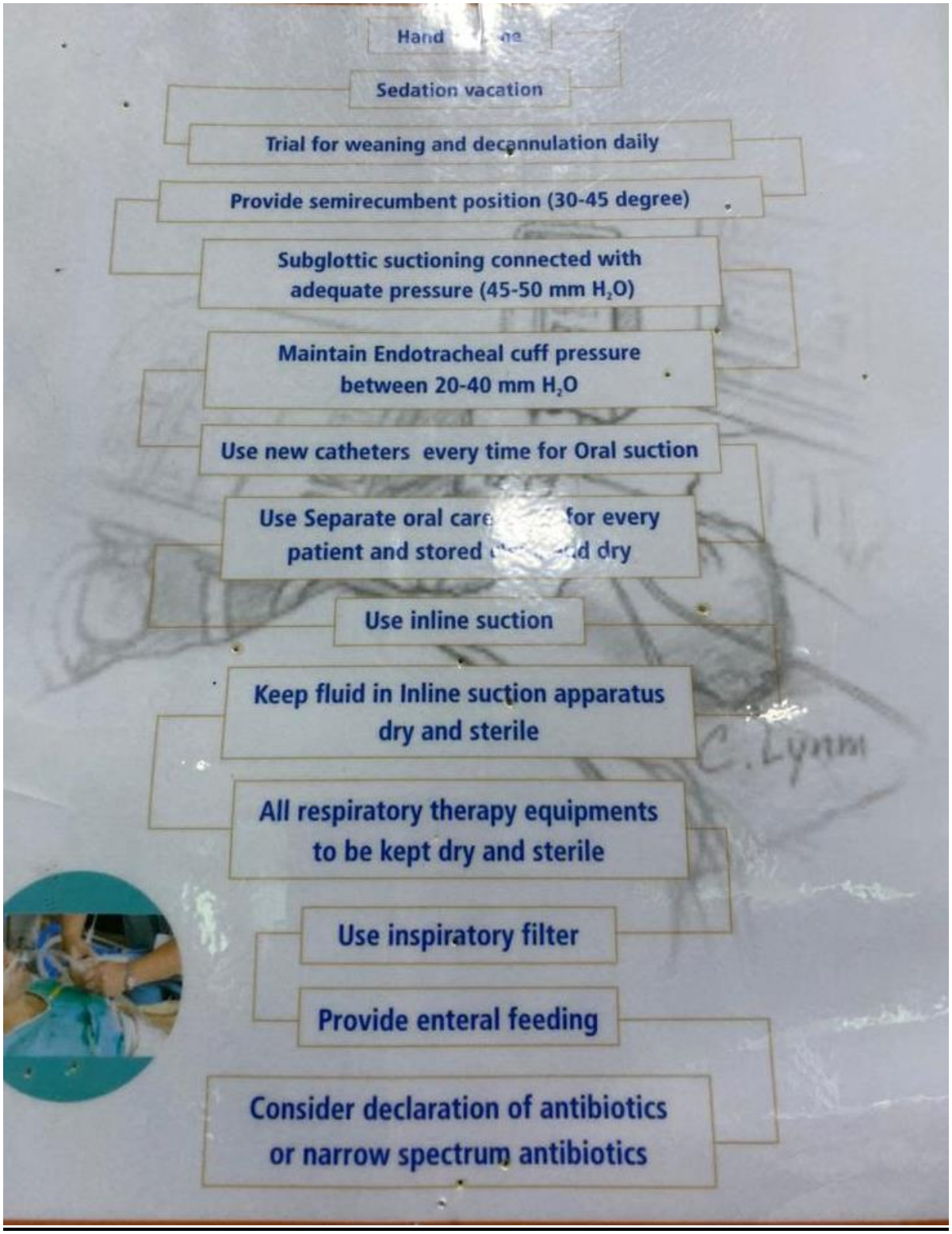
3. Gastrointestinal prophylaxis:

   Aspiration causes either pneumonitis or pneumonia and can prevented. The. Effects of aspirating acidic content may be worse than those with higher PH. Increasing the PH of gastric contents may protect against a greater pulmonary inflammatory response to aspiration of gastrointestinal (GI) contents.

4. Daily sedative interruptions and daily assessment of readiness to extubate. Daily sedative interruptions and assessing the patients readiness to extubate has been correlated with reduction in the rate of VAP. Care should be taken to prevent self extubation by increased monitoring and vigilance during the trial.

5. Daily oral care with Chlorhexidine

   Studies have shown that oral decontamination of mechanically ventilated adults using cholrhexidine is associated with a lower risk of VAP. Dental plaques developes in patients that are mechanically ventilated because of the lack of mechanically chewing and the absence of saliva. Dental plaque can be significant reservoir for potential respiratory pathogens that cause VAP. Chlorhexidine antiseptic has been approved as an inhibitor of dental plaque formation and gingivitis.


Hand [illegible]
Sedation vacation
Trial for weaning and decannulation daily
Provide semirecumbent position (30-45 degree)
Subglottic suctioning connected with adequate pressure (45-50 mm H_2O)
Maintain Endotracheal cuff pressure between 20-40 mm H_2O
Use new catheters every time for Oral suction
Use Separate oral care [illegible] for every patient and stored [illegible] dry
Use inline suction
Keep fluid in Inline suction apparatus dry and sterile
All respiratory therapy equipments to be kept dry and sterile
Use inspiratory filter
Provide enteral feeding
Consider declaration of antibiotics or narrow spectrum antibiotics

2. CATHETER ASSOCIATED URINARY TRACT INFECTION (CAUTI)

Introduction:

Urinary tract infections (UTI) are the commonest healthcare-associated infections (HAI), accounting for up to 40% of all HAIs. One to four percent of patients with bacteriuria will ultimately develop clinically significant infection, e.g., cystitis, pyelonephritis, and septcaemia. Therefore, urinary catheters must only be inserted when there are clear medical indications . They should be removed as soon as no longer needed. In suitable patients. Clean intermittent urinary catheterization or external condom catheters should be considered, as these have a lower risk of infection.

Definition:

1. Catheter-associated urinary tract infection (CAUTI) is usually defined as, a UTI (significant bacteriuria plus symptoms and signs attributable to the urinary tract with no other identifiable source) in a patient with current urinary tract catheterization or who has been catheterized in the past 48 hours.
2. **Guidelines from the Infectious Diseases Society of America (IDSA)** defined CAUTI "in patients with indwelling urethral, indwelling suprapubic, or intermittent catheterization by the presence of symptoms or signs compatible with UTI with no other identified source of infection along with 103 colony-forming units (cfu)/ ml of > 1 bacterial species in a single catheter urine specimen or in a midstream voided urine specimen from a patient whose urethral, suprapubic, or condom catheter has been removed within the previous 48 hours."

Aim:

1. To Reduce the Incidence of Urinary Catheter-associated Infection.
2. Remove catheters as soon as possible.
3. Care for catheters individually.

Bundle of care for prevention of CAUTI:

- **CAUTI insertion bundle:**

1. Verification of need prior to insertion

2. Urinary retention/obstruction

3. Severely ill/ immobility

4. Lack bladder control

5. Patient request/ end of life.

6. Perioperative – selected surgical procedure

7. Assisting with pressure ulcer healing for incontinent patients.

❖ **Insert urinary catheter using aseptic technique:**

1. Hand hygiene
2. Catheter insertion kit with sterile gloves, drape, cleaning supplies.
3. Sterile lubricant
4. Sterile urinary catheter attached to a drainage bag
5. Maintain urinary catheter based on recommended guidelines
6. Secure catheter to prevent irritation of the urethra
7. Maintain an unobstructed flow
8. Maintain the drainage bag below the level of the bladder and off the floor
9. Perform hand hygiene before and after each patient contact
10. Provide individual labelled collection container at the bedside
11. Review urinary catheter necessity daily, remove catheter promptly when not needed.

❖ **CAUTI maintenance bundle:**

1. Daily documented assessment of need
2. Catheter secured – device to secure catheter in place
3. Hand hygiene performed for patient contact
4. Daily meatal hygiene performed with soap and water
5. Drainage bag emptied using a clean container
6. Unobstructed flow maintained

❖ **Avoiding the use of urinary catheters by considering alternative :**

Methods for urine collection.

Methods include:

1. Condom catheters.
2. Intermittent catheterization.
3. Use of nappies.

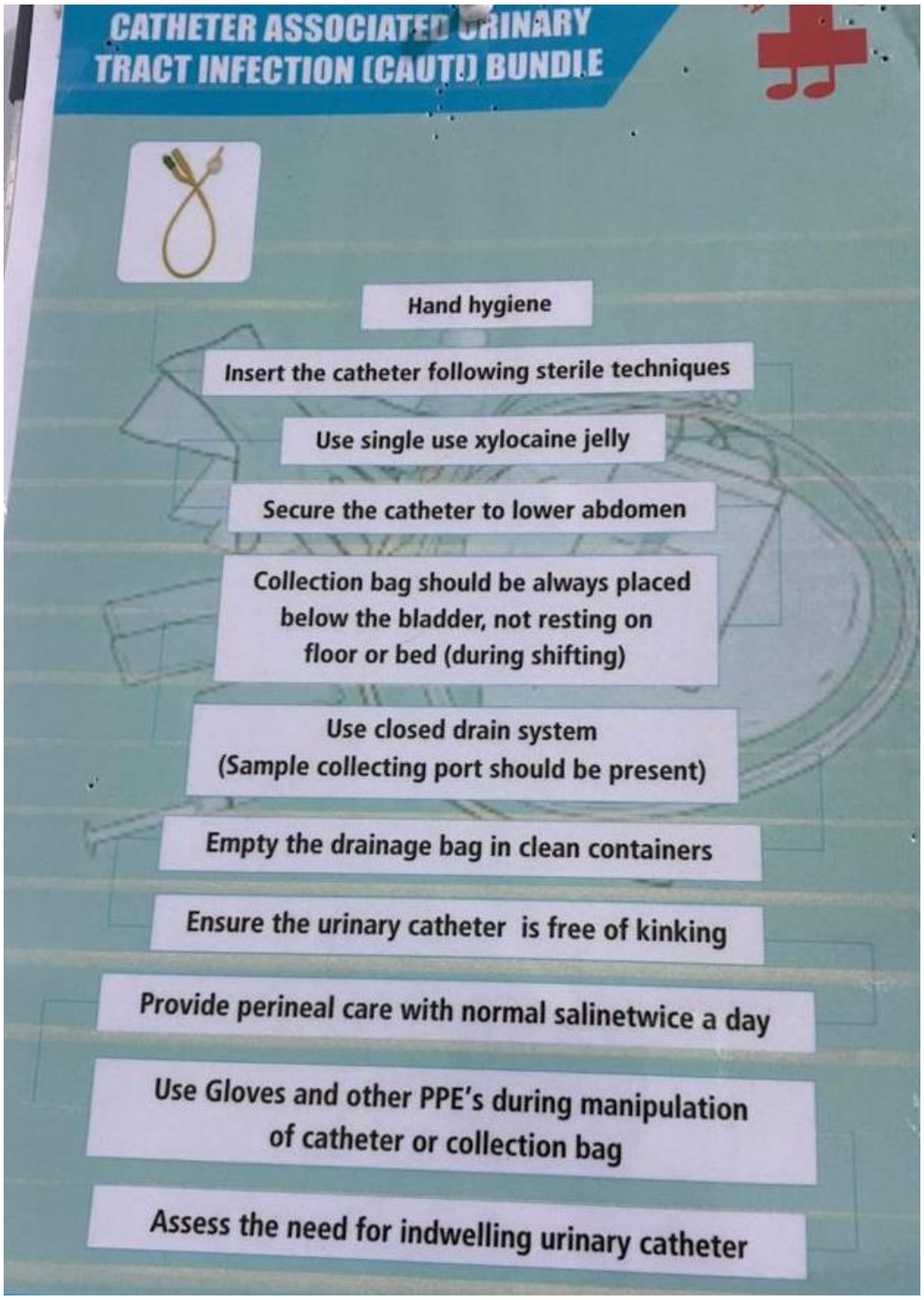
❖ **Using an aseptic technique for insertion and proper maintenance:**

After insertion: Following evidence-based guidelines and implementing catheter insertion policies at the institution.

❖ **Daily assessment of the presence and need for indwelling urinary catheters.**

Indications for urinary catheterization include:

1. Urinary retention (mechanical obstruction or neuropathic).
2. Need to closely monitor urine output in unstable patients.
3. To assist perineal wound care.



3. BUNDLE FOR THE PREVENTION OF CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS (CLABSI):

Introduction:

Central venous catheters (CVCs), often described by healthcare professionals as "central lines," refer to a broad category of invasive devices used to administer fluids, medications, blood & blood products, and parenteral nutrition. The use of these catheters is associated with an increased risk of blood stream infections (BSIs), which are potentially life threatening.

Central lines are used commonly in intensive care units (ICUs) and in non-ICU populations such as dialysis units, intra operatively, and oncology Patients most hospital-acquired bloodstream infections are associated with a central line (including peripherally-inserted central catheters, PICCs), and CLABSIs are responsible for excess mortality and morbidity, prolonged hospital stays, and increased costs.

Definition:

Central line-associated bloodstream infection (CLABSI) may be caused by cutaneous microorganisms that contaminate the catheter during insertion or migrate along the catheter track or by microorganisms from the hands of HCWs during interventions. The most frequently implicated organisms are:

Coagulase-negative staphylococci, particularly Staph. epidermidis. Other organisms are Staph. aureus, Candida sp, Enterococci and Gram-negative organisms. It is essential that the best evidence-based practices be followed for prevention of catheter related or associated bloodstream infections (BSIs).

A. Insertion Bundle:

1. Maximal sterile barrier precautions (surgical mask, sterile Gloves, cap, sterile gown, and large
2. sterile drape).
3. Skin cleaning with alcohol-based chlorhexidine (rather than Iodine).
4. Avoidance of the femoral vein for central venous access in adult patients; use of subclavian rather than jugular veins.
5. Dedicated staff for central line insertion, and competency Training/assessment.

B. Maintenance Bundle:

1. Daily review of central line necessity.

2. Prompt removal of unnecessary lines
3. Disinfection prior to manipulation of the line.
4. Daily chlorhexidine washes (in ICU, patients > 2 months).
5. Disinfect catheter hubs, ports, connectors, etc., before using the catheter.
6. Change dressings and disinfect site with alcohol-based chlorhexidine every 5-7 days (change earlier if soiled).
7. Replace administration sets within 96 hours (immediately if used for blood products or lipids).
8. Ensure appropriate nurse-to-patient ratio in 2 or 1:1).

C. Selecting the best insertion site: peripheral catheters and midline catheters:

1. Use an upper extremity instead of a lower-extremity site for catheter insertion. Replace a catheter inserted in a lower-extremity site to an upper-extremity site as soon as possible.

2. In pediatric patients, the upper or lower extremities or the scalp (in neonates or young infants) can be used as the catheter insertion site. Aseptic technique during catheter (CVC/ umbilical) insertion. Aseptic technique during CVC placement significantly reduces the risk of Infection.

3. Strict adherence to hand decontamination and aseptic technique infection practiced.

4. Maximal sterile barrier precautions shall be used, regardless of whether the placement takes place in the OT or ward. This should include the use of a sterile gown, gloves, cap, mask and a sterile full body drape for insertion of CVCs or PICCs.

5. Use sterile sleeve to protect pulmonary catheters during insertion.

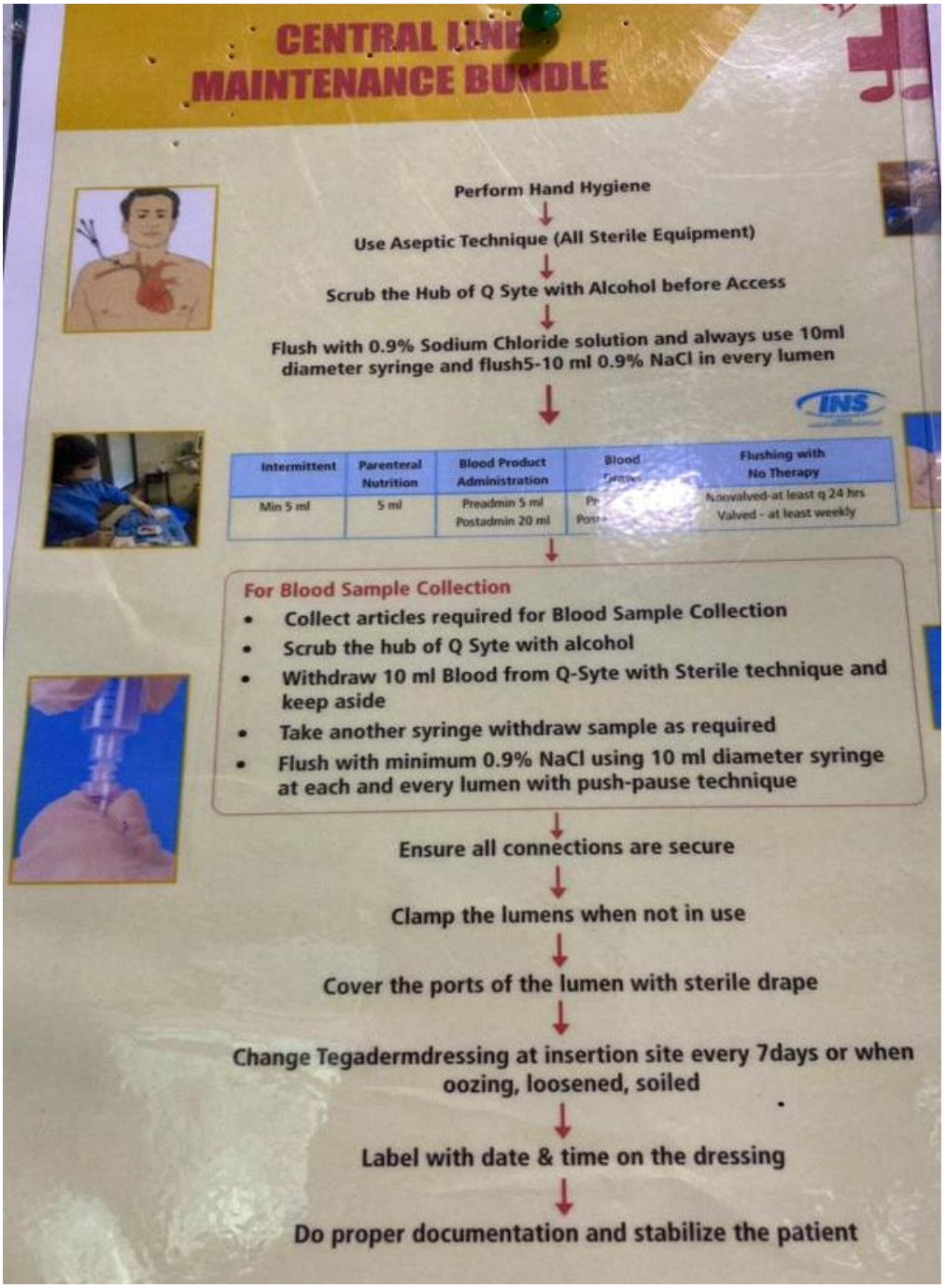
6. Skin preparation: Prepare clean skin with an antiseptic (70% alcohol, tincture of iodine, an Iodophor or chlorhexidine gluconate) before insertion of a peripheral venous catheter.

7. Prepare clean skin with a >0.5% chlorhexidine preparation with alcohol before insertion of a central venous catheter or peripheral arterial catheter and during dressing changes. If there is a contraindication to chlorhexidine, use tincture of Iodine, an iodophor or 70% alcohol.

8. Antiseptics should be allowed to dry according to the manufacturer's recommendation before placing the catheter.

D. Antibiotic prophylaxis

- Systemic antimicrobials should not be routinely administered before insertion or during use of a central venous catheter to prevent catheter colonization or CLABSI.



4. SURGICAL SITE INFECTION BUNDLE PROTOCOL

Surgical site infection (SSI) is one of the most common healthcare-associated infections and is particularly prevalent following colorectal surgery. SSIs are potential complications associated with any type of surgical procedure. Although SSIs are among the most preventable HAIs, they still represent a significant burden in terms of patient morbidity, mortality and additional costs to health systems.

Definition:

1. SSI refers to an infection that occurs after surgery in the part of the body where the surgery took place. SSIs can sometimes be superficial infections involving the skin only. Other SSIs are more serious and can involve tissues under the skin, organs, or implanted material.

2. SSI is also defined as an infection that occurs within 30 days after the operation and involves the skin and subcutaneous tissue of the incision (superficial incisional) or the deep soft tissue (for example, fascia, muscle) of the incision (deep incisional) or any part of the anatomy (for example, organs and spaces) other than the incision that was opened or manipulated during an operation (organ/ space).

According to the National Healthcare Safety Network (NHSN), 30–90 days are taken as the duration after surgical operation for the detection of deep incisional and organ space SSI. This is dependent upon the type of operative procedure.The criteria required to diagnose infection have to be uniform to accurately identify any increase or decrease in infection. Correct identification of SSI helps us to findout if an intervention to reduce the occurrence of SSI is effective. Uniformity also assists in comparing SSI rates between facilities.

- Recommendations for the prevention of SSIs:-

  The following recommendations are important for preparing SSIs and are based on WHO global guidelines on the prevention of SSIs.

Preoperative recommendations

1. Whenever possible, efforts shall be made to identify and treat all infections remote to the surgical site before elective operation and postpond elective operations on patients with remote site infections until the infection has resolved.
2. Ensure adequate control of serum blood glucose levels in all diabetic patients.
3. Preoperative bathing of patient by a plain or antimicrobial/ medicated soap.
4. Administration of **surgical antimicrobial prophylaxis (SAP)** is prior to the surgical incision when indicated (depending on the type of operation). Various antimicrobials have different

half-lives. The timing of administration should be within 120 minutes before incision, while considering the half-life of the antimicrobial.

5. Mechanical bowel preparation alone (without the administration of oral antibiotics) should **NOT** be used in adult patients undergoing elective colorectal surgery.
6. In patients undergoing any surgical procedure, hair should either NOT be removed or, if absolutely necessary, should only be removed with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the OT.
7. Patients undergoing cardiothoracic and orthopaedic surgery with known nasal carriage of Staph. aureus should receive perioperative intranasal applications of mupirocin 2% ointment with or without a combination of chlorhexidine (CHG) body wash.
8. Preparation of the surgical site: alcohol-based antiseptic solutions based on CHG for surgical site skin preparation in patients undergoing surgical procedures (CHG is a better choice than povidone-iodine because of rapid onset and persistent antimicrobial activity).
9. Antimicrobial sealants should not be used after surgical site skin preparation for reducing SSI.
10. Enhance nutritional support for underweight patients who undergo major surgical operations by administration of oral or enteral multiple nutrient-enhanced nutritional formulas.

Conclusion: SSI is difficult to monitor as it frequently presents after discharge from hospital, especially if enhanced recovery programmes are in place.

5. HOSPITAL AQUIRED PRESSURE ULCER INJURY PROTOCOL (HAPU) :

The development of pressure injury occurs too frequently in the healthcare setting and negatively affects not only the patient but also the family members, hospital staff and hospital system. Hospital-acquired pressure ulcers remain a large problem in hospitalized patients, most often developing in critically-ill patients in intensive care units. Extensive guidelines exist to assist in the prevention and care of pressure ulcers, however the individual recommendations are numerous and it is very unclear as to their relative importance.

Care bundles have been used extensively in health care to accomplish measurable improvements in multiple conditions, including, but not limited to, ventilator-acquired pneumonia, catheter-related blood stream infections and sepsis.

Pressure ulcer prevention bundle:

1.Participation in education:

Complete training on pressure ulcer care bundle content;

Pressure ulcer risk assessment, skin assessment, skin care management, nutrition management, activity management, moisture and incontinence management, support surface management.

2. Risk assessment using a valid Braden scale:

a. Upon admission or within first 8 hours.

b. Daily assessment.

c. If there is change in patient condition

3.Skin assessment

With head-to-toe skin inspection;

a. Upon admission or within first 8 hours.

b. Then every 8 hourly

c. Heat, colour, turgour, moisture, edema and redness.

d. Assessment of skin around or underneath with medical devices every 12 hourly.

4. Skin care:

a. Protect the skin with barrier products every 8 hourly.

b. Keep the skin clean and normal moisture.

c. Clean the skin with a Ph stabilizing product.

d. Do not rub strongly on the skin, do not massage

e. The sheets are kept clean, stretched and dry

5. Nutrition management

a. Establish daily nutritional goals with dietitian and nutritional nurse.

b. Provide special nutrition (Preferably first enteral and then parenteral)

c. Meet daily goals

d. Follow the weekly albumin/CRP values.

e. Evaluate the state of dehydration.

6. Activity management

a. Positioning:

b. In bed every 2 hourly, in chair every 1 hourly.

c. Give position at 30 degree angle , right side and left side respectively

d. Unless contraindicated, place in supine position.

e. Prevent skin friction and shear

f. Elevated heels off all surfaces using pillows

g. Apply barrier products to pressure area .

Do not give:

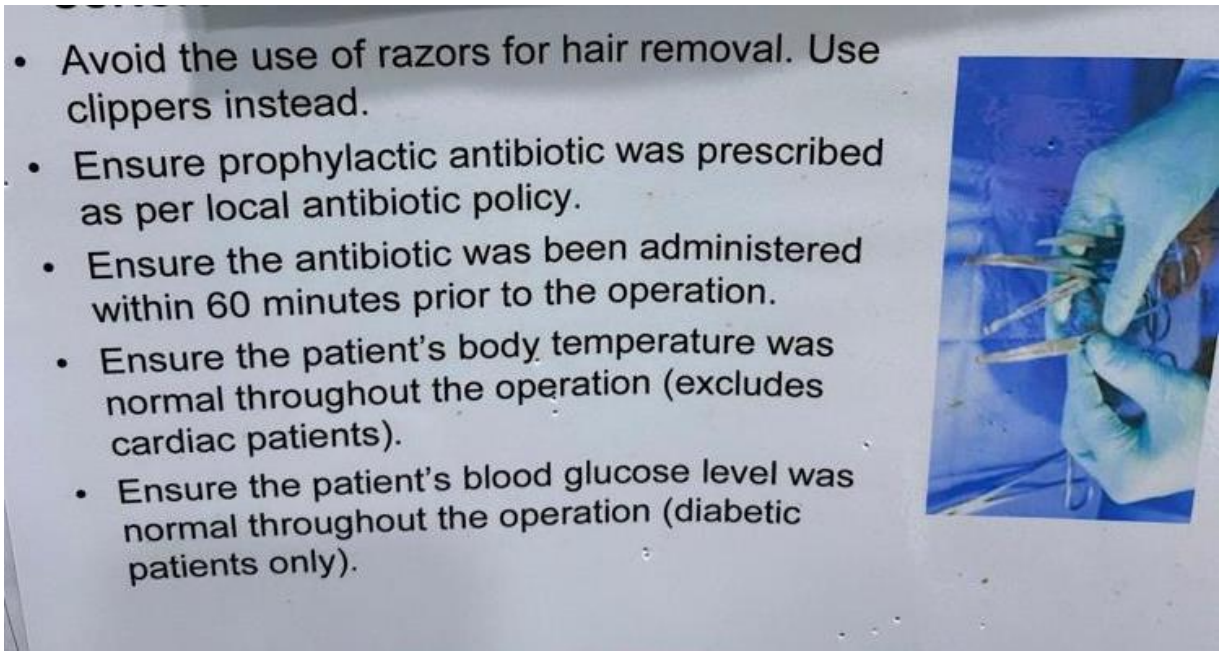
a. Do not position at 90 degree angle
b. Do not position directly on area of redness
c. Do not position directly on medical devices.

7. Moisture or incontinence management:

a. Use barrier products after every episode of urinary incontinence
b. Consider the use of fecal pouch or Texas catheter.
c. Avoid using diapers
d. Avoid plastic choux, if they must be used place them under a sheet, not directly touch to skin.
e. Minimize skin contact with urine or feces.
f. Avoid excessive skin moisture

8. Support surfaces management:

a. Use a support surface for at risk individuals
b. Use a support surface that matches the characteristics and risk factors of individual.



6. PERIPHERAL IV CATHETER MAINTENANCE BUNDLE:

1. Hand hygiene

a. It is recommended that healthcare workers perform hand hygiene with an antiseptic-containing soap solution or use an alcohol-based waterless cleanser:
b. The use of gloves does not obviate the need for hand hygiene.
c. It is recommended that the clinician educate patients and carers about the importance of hand hygiene and ask that they remind all caregivers to clean their hands.

Insertion & management requirements

1. General:

a. Solutions and medications should be considered by the clinician for potential to cause infuscate-induced vessel damage including osmolality (or tonicity), pH and chemical properties of
b. the solution or medication e.g. potassium chloride, vancomycin. (6, 8, 16) Repeated administration of chemical irritants warrants central venous access to limit peripheral venous damage.(3, 8)
c. It is recommended that clinicians make no more than two attempts at cannulation before seeking assistance from a more experienced clinician, unless it is a medical emergency or no other clinicians are available. (3, 8)
d. Assistance should be provided when inserting a PIVC to ensure asepsis and appropriate technique.
e. Adhesive labels indicating insertion details should be placed onto the dressing.

2. Catheter types and materials

a. It is recommended that the use of steel needles should be avoided due to the risk of extravasation and needlestick injury.
b. PIVC and steel-winged infusion sets (if used) should incorporate safety-engineered protection.

3. Prophylactic antibiotics

a. Prophylactic antibacterial or antifungal agents (oral, intranasal or parenteral) are not recommended at the time of insertion or during use of a PIVC to prevent catheter colonization or bloodstream infection.

4. Catheter site selection

a. Clinicians should assess specific patient factors such as pre-existing catheters, anatomic deformity, site restrictions (e.g. mastectomy, arteriovenous [AV] fistula or graft), the relative risk of mechanical complications and the risk of infection.

5.Local anesthesia:

a. Topical local anesthetic e.g. 'eutectic mixture of local anesthetics' (EMLA) - lignocaine with prilocaine, can be applied by clinicians 60 minutes prior to catheterization to reduce discomfort during insertion, (24) particularly in children.

6. Skin preparation: insertion site:

1. Hair at the insertion site should only be removed by the clinician (prior to antiseptic application), using clippers (not shaved) to improve adherence of the dressing.
2. The skin should be physically cleaned with soap and water (if necessary) prior to applying the antiseptic solution and inserting the catheter.
3. Removal of skin lipids (defatting) with alcohol, ether or acetone is not recommended.
4. Use alcohol-containing preoperative skin preparatory agents if no contraindication exists.

7.Catheter fixation

a. Poor PIVC securement has been observed to increase risk of phlebitis, infection, occlusion, infiltration and dislodgement.
b. The catheter should be stabilized by the clinician with a transparent dressing and sterile adhesive tape or sterile adhesive/wound closure strips, to prevent catheter dislodgement.

8.Dressing

a. Sterile, transparent, semi-permeable, self-adhesive, (standard or hyperpermeable) polyurethane dressings should be used by clinicians to protect the site from extrinsic contamination, allow continuous observation of the insertion site, and to help stabilize and secure the catheter.
b. The dressing (including polyurethane types) should not be immersed or submerged in water.
c. Clinicians should replace dressing on insertion site routinely every seven days or if the dressing becomes damp, loosened, no longer occlusive or adherent, soiled, or if there is excessive accumulation of fluid under the dressing

9. Catheter duration and replacement

a. Replace every 72-96 hours unless extenuating circumstance criteria is met

b. Replacement of a PIVC when clinically indicated

10. Removal of PIVC

a. Clinicians should perform hand hygiene and don non-sterile gloves and protective eyewear.

b. Digital pressure should be applied by the clinician until haemostasis is achieved.

c. Clinicians should cover site with gauze and a transparent dressing; remove the dressing in 24 hours.

d. PIVC sites should be observed for 48 hours after device removal to detect post-infusion

e. phlebitis

f. PIVC removal should be documented in the patient's medical record.


PERIPHERAL IV
CANNULATION PROCESS
Clean IV tray and arrange all required equipment
Patient identification and education
Perform hand hygiene
Vein selection and application of tourniquet
Clean and disinfectcannulation site
with antiseptic (Chlorhexidine)
Wear right size sterile gloves
Cannulate the vein and release the tourniquet
Apply sterile transparent semipermeable
membrane dressing (Tegaderm)
and label with date and time
Attach Q Syte (Closed luer access devices)
Scrub the hub of Q Syte before access with alcohol
Flush the Cannula with 0.9% Normal Saline syringe
Dispose used equipments appropriately
Document in patient's medical record
Monitor daily for IV related complications
and replace if necessary
V.I.P. Score
BD

7. NEEDLE STICK INJURY:

Introduction:

Needle stick injury (NSI) is a major cause of blood borne infections transmitted among health care personnel. Needle stick injury means the pretrial introduction into the body of a health care worker during the performance of his or her duties, of blood or other potentially infectious material.

Definition:

1. A needle stick injury (NSI) is an accidental skin -penetrating stab wound from a hollow -bore needle containing another person's blood or body fluids.
2. A needle stick injury is the percutaneous piercing wound typically set by a needle point but possibly also by another sharp instrument or object.

Worker who are at risk for blood born infection:

Health care worker with frequent blood exposures is nursing staff, nursing students, physicians, surgeons, emergency care providers, dentists, interns and medical students, labour and delivery room personnel, laboratory technicians, health facility cleaning staff and clinical waste handlers.

where do sharps injuries occur:

a. Patient Room 39% (Inpatient: Medical – ICUs)
b. Operating Room 27%
c. Outpatient 8%
d. ER 8%
e. Laboratory 5%
f. Other 13%

What devices are involved in sharps injuries?

Six devices account for 78% of all injuries

a. Disposable Syringes 30%
b. Suture Needles 20%
c. Winged-Steel Needles 12%
d. Intravenous Catheter Stylets 5%
e. Phlebotomy Needles 3%
f. Scalpels 8%

When do sharps injuries occur?

The majority of needle sticks occur when health care workers:

a. Dispose of needles
b. Administer injections
c. Draw blood
d. Recap needles
e. Handle trash and dirty linens

NURSE'S ROLE:

Reduce risk of sharp injuries

Do's :

a. Use needle cutter/destroyer
b. Separate sharps from other waste
c. Use rigid, puncture proof disposal bins
d. Empty sharps containers when they are ¾ full

Don'ts:

a. Handle, empty, or transfer used sharps between containers
b. Do not recap sharps before disposal

How to reduce NSI?

• Avoid use of needles where safe and effective alternatives are available. • Avoid recapping of the needles.

• During handling of needles, one should be very careful & it should be promptly disposed of only in sharp disposal containers.

• Take three doses of hepatitis B vaccine. It gives you lifelong protection

• Take Post Exposure Prophylaxis (PEP) in the event of any occupational exposure

MANAGEMENT OF NEEDLE STICK INJURY

• Do not panic or put finger in mouth or squeeze the wound to bleed it.

• Immediately wash the wound and surrounding skin with soap and water, and rinse it.

• Do not scrub or use bleach, chlorine, alcohol, betadine, iodine, antiseptics/detergents or any antibiotics on the wound.

"Exposure" which may place an HCP at risk of blood-borne infection is defined as:

1. Per cutaneous injury (e.g. needle-stick or cut with a sharp instrument),

2. Contact with the mucous membranes of the eye or mouth,

3. Contact with non-intact skin (particularly when the exposed skin is chapped, abraded, or afflicted with dermatitis), or

4. Contact with intact skin when the duration of contact is prolonged (e.g. several minutes or more) with blood or other potentially infectious body fluids.

LIST OF PPE:

- Shoe cover/Leggings
- Gown
- Cap
- Mask
- Goggles
- Gloves

USE PERSONAL PROTECTIVE EQUIPMENT (PPE):

DOS…..

a. Use PPE based on risk of the procedure
b. Change PPE completely after each procedure
c. Discard the used PPE in appropriate disposal bags,
d. Dispose PPE as per the policy of the hospital
e. Always wash hands after removing PPE
f. Educate and train all junior and auxiliary staff in the use of PPE

DON'TS:

a. Share PPE
b. Use same gloves between patients
c. Reuse disposable gloves, eyewear, masks
d. Use eye wear that restricts your vision
e. Use masks when wet

STEPS FOLLOWING OCCUPATIONAL EXPOSURE

1. Crisis management – Remain CALM

2. Dispose the sharp appropriately

3. First aid – Wash and irrigate the site
4. Report to the appropriate authority
5. Get evaluated for PEP and baseline testing for HIV, HCV, HbsAg
6. PEP should be started within 2 hours of exposure, and not later than 72 hours
7. PEP must be taken for 4 weeks (28 days)
8. Follow-up HIV testing (6w, 3m, 6m)
9. Follow-up counseling and care 24 Inform doctor if pregnant or breast feeding

MANAGEMENT OF EXPOSURE:

Immediate measures:

First Aid (depending on area of exposure)

a. Wound or skin: Wash with soap and water
b. Mucous membrane: Flush exposed membrane with water
c. Open wound: Irrigate with sterile saline or antiseptic solution
d. Eyes: Irrigate with clean water, saline or sterile eye irrigants • Mouth: Do not swallow! Rinse out several times with cold water and
e. Remain CALM

DO'S AND DON'T AFTER OCCUPATIONAL EXPOSURE

DO'S:

a. Remove gloves, if appropriate.
b. Wash the exposed site thoroughly with running water.
c. Irrigate with water or saline if eyes or mouth have been exposed.
d. Wash the skin with soap and water.

DON'T:

a. Do not panic.
b. Do not put the pricked finger into mouth.
c. Do not squeeze the wound.
d. Do not use bleach, chlorine, alcohol, betadine, iodine or other antiseptics/detergents on the wound.

POST EXPOSURE PROPHYLAXIS (PEP):

It refers to the use of antiretrovirals prophylactically to prevent HIV infection following an occupational exposure.

General guidelines for PEP:

- Potential benefits weighed against potential risks and informed to the staff Adherence and adverse effects be monitored Baseline HIV test of staff with counselling Follow up
- Counseling and HIV testing
- Monitor for drug toxicity

Steps for PEP:

1. Assess nature of exposure
2. Assess HIV status of source of exposure
3. PEP evaluation
4. PEP regimens - Drugs and Dosage for PEP

Nature of exposure:

Category of Exposure Definition and example Mild exposure : Mucous membrane/non-intact skin with small volumes E.g. : a superficial wound (erosion of the epidermis) with a plain or low calibre needle, or contact with the eyes or mucous membranes, subcutaneous injections following small-bore needles Moderate exposure: Mucous membrane/non intact skin with large volumes OR Percutaneous superficial exposure with solid needle E.g.: a cut or needle stick injury penetrating gloves. Severe exposure: Percutaneous with large volume e.g. : an accident with a high calibre needle (>=18 G) visibly contaminated with blood; a deep wound (haemorrhagic wound and/or very painful); transmission of a significant volume of blood; an accident with material that has previously been used intravenously or intra-arterially.

HIV STATUS & SOURCE OF EXPOSURE:

Source HIV Status Definition of risk in source HIV negative Source is not HIV infected but consider HBV and HCV Low risk HIV positive and clinically asymptomatic High risk HIV positive and clinically symptomatic (see WHO clinical staging) Unknown Status of the patient is unknown, and neither the patient nor his/her blood is available for testing (e.g. injury during medical waste management the source patient might be unknown). The risk assessment will be based only upon the exposure (HIV prevalence in the locality can be considered)

PEP evaluation:

Guidelines for PEP 34 Exposure Status Of Source HIV+ & Asymptomatic HIV+ & Clinically symptomatic HIV Status Unknown Mild Consider 2 Drug PEP Start 2 Drug PEP Usually no PEP OR Consider 2 Drug PEP Moderate Start 2 Drug PEP Start 3 Drug PEP Same As Above Severe Start 3 Drug PEP Same As Above Same As Above

Dosages of the drug for PEP:

Guidelines for PEP 35 Medication 2 Drug Regimen 3 Drug Regimen Zidovudine (AZT) 300 mg Twice a day 300 mg Twice a day Lamivudine (3 TC) 150 mg Twice a day 150 mg Twice a day Protease Inhibitors -Ist choice: Lopinavir/Ritonavir-400/100 mg twice a day OR 800/200 mg Once daily with meals -2nd choice: Nelfinavir (NLF): 1250 mg twice a day OR 750 mg three times a day with empty stomach

N 36 Medication 2 Drug Regimen 3 Drug Regimen Protease Inhibitors -3rd chioce: -Indinavir (ind) 800 mg every 8 hour and drink 6-8 litres of water every day Note: If Protease inhibitor is not available and the 3rd drug is indicated, one can consider using Efavirenz (EFV 600 mg, once daily). Monitoring should be instituted for side effects of this drug e.g. CNS toxicity such as nightmares, insomnia etc.

Follow up:

Follow up for Drug toxicity monitoring: minimally CBC and LFT at baseline and at 2 weeks. Repeat HIV testing of exposed staff as per protocol (3 weeks- 3month-6months)

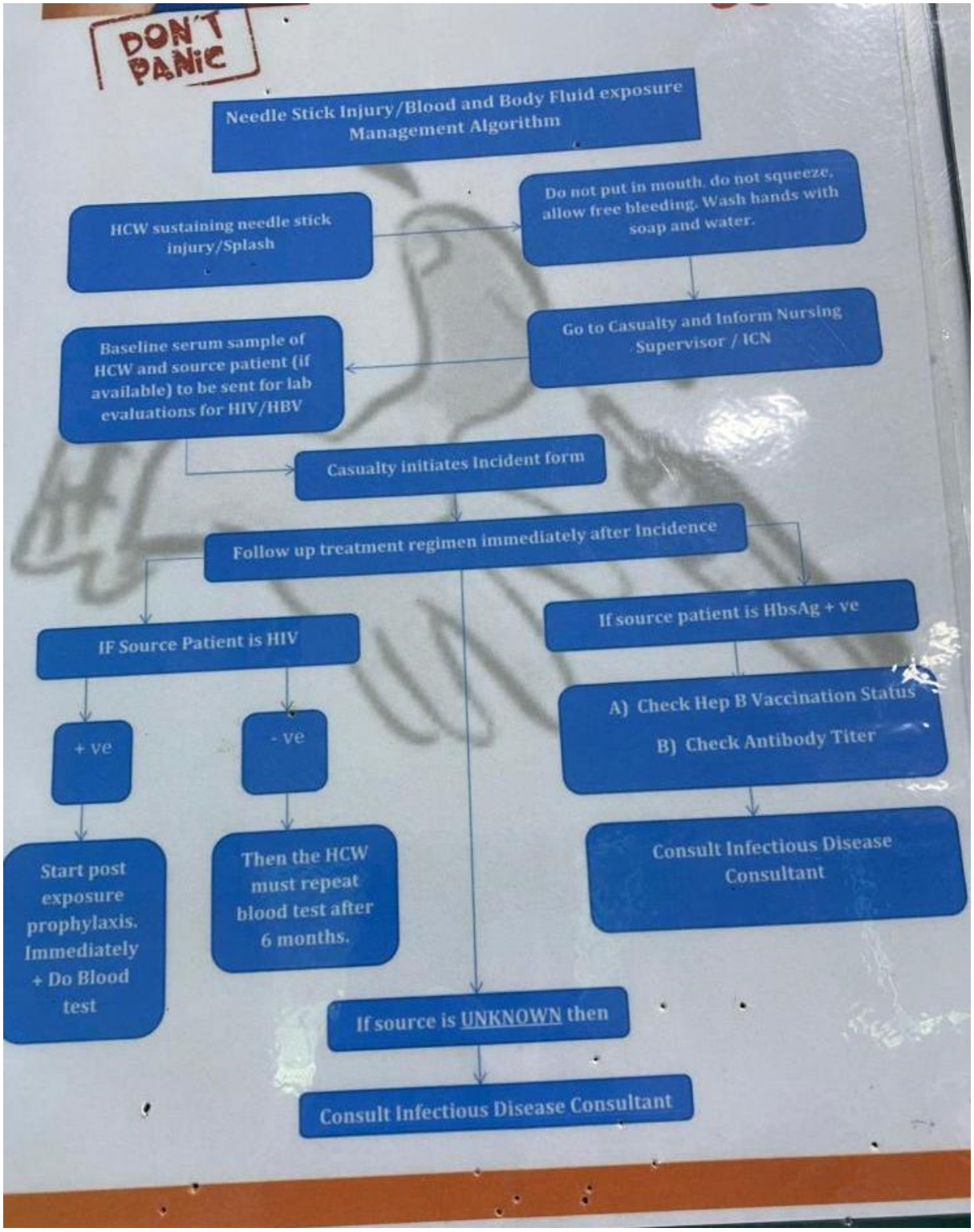
REQUIREMENTS FOR THE PEP PROGRAMME Access to clinicians during all hours Easily accessible antiretroviral agents for PEP • On-site or available within 24 hours Availability of trained personnel for counseling Display PEP protocols around clinic Conduct regular protocol trainings for all employees to keep them updated

Key points:

Standard precautions must be followed for ALL patients Use of standard precautions could reduce the risk of blood borne and airborne infections Nurse's have a key role in • Following standard precaution protocols • Educating other health care personnel • Preventing occupational exposure • Protecting self and others from blood borne pathogens including HIV

Key points PEP:

significantly reduces the risk of HIV transmission from occupational exposure Existing PEP protocols should be followed Ideally PEP should be given within 2 hours and not later than 72 hours after exposure Exposed health care providers should be monitored for side effects and adherence


DON'T PANIC
Needle Stick Injury/Blood and Body Fluid exposure Management Algorithm
HCW sustaining needle stick injury/Splash
Do not put in mouth, do not squeeze, allow free bleeding. Wash hands with soap and water.
Go to Casualty and Inform Nursing Supervisor / ICN
Baseline serum sample of HCW and source patient (if available) to be sent for lab evaluations for HIV/HBV
Casualty initiates Incident form
Follow up treatment regimen immediately after Incidence
IF Source Patient is HIV
+ ve
- ve
Start post exposure prophylaxis. Immediately + Do Blood test
Then the HCW must repeat blood test after 6 months.
If source patient is HbsAg + ve
A) Check Hep B Vaccination Status
B) Check Antibody Titer
Consult Infectious Disease Consultant
If source is UNKNOWN then
Consult Infectious Disease Consultant

CRITICAL CARE NURSING

TOPIC PRESENTATION

TRACHEOSTOMY CARE

INTRODUCTION:

Tracheostomy is a term Used to describe a surgically created an opening or hole at the front of neck going into trachea usually between the third and fourth ring of cartilage. The opening called stoma. Tracheostomy is indicated when oral nasal intubation is insufficient to manage a cute airway obstruction.

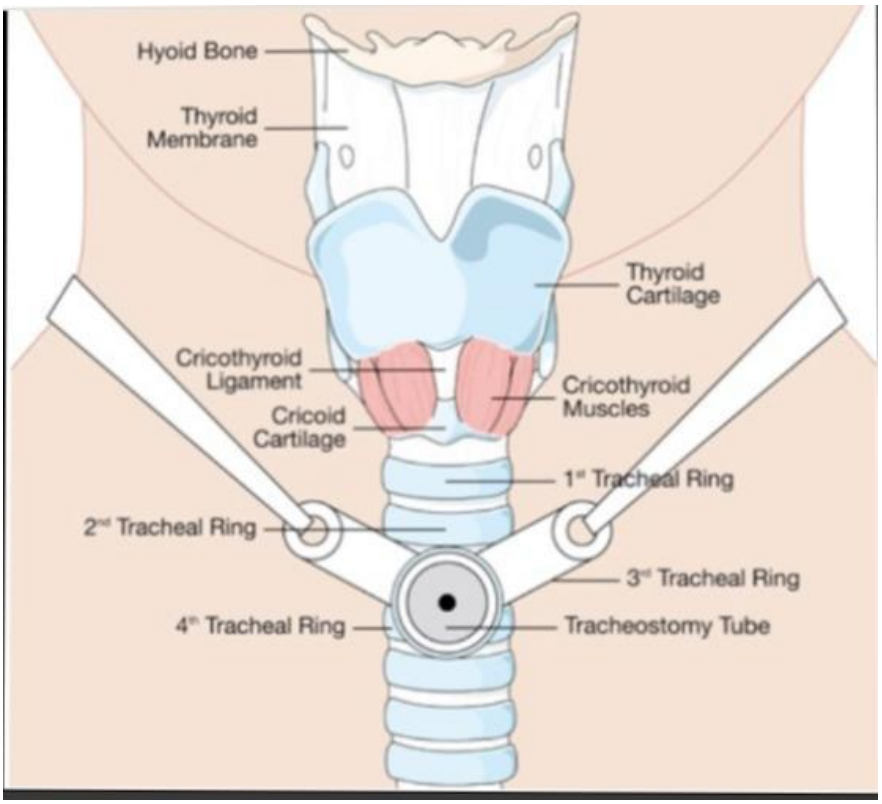
OBJECTIVES

- Definition of tracheostomy
- Explain Tracheostomy tube
- Enlist Indications and contraindications of tracheostomy
- Describe Post operative tracheostomy care
- List equipment for tracheostomy care
- Explain procedure of tracheostomy care
- Know nursing management of tracheostomy patients

SCENARIO:

46 year old patient, Mr. Shubhash Yadav is in ICU and at night had sing of respiratory distress like increased respiratory rate, tachypnea, gasping, nasal flaring and was using accessory muscle for breathe. At first he was provided with nasal mask at 5 liter, after that he was intubated, now 8 days are complete after intubation so Dr shifted on tracheostomy.

T: 97°F , P: 110 beats/min, RR: 35 breath/ min, BP : 90/60 mmHg , SpO2 : 92



DEFINITION:

A tracheostomy is an incision into trachea the 2^{nd} , 3^{rd} or 4^{th} tracheal ring.

The surgical formation of an opening into the trachea through the neck especially to allow the passage of air.

TYPES:

- Temporary tracheostomy
- Permanent tracheostomy

PARTS OF TRACHEOSTOMY TUBE:

- Valve used for cuff inflation, deflection and pressure measurement
- Face plate
- Slots for tube ties
- Obturator
- Disposable inner cannula
- Cuff(inflated)
- Outer cannula
- Pilot ballon

INDICATION:

- To relieve upper airway obstruction
- To improve respiratory function
- Respiratory paralysis.

CONTRAINDICATIONS.

- Difficult anatomy
- Morbid obesity with short neck
- Limited neck movement
- Cervical spine injury
- Aberrant blood vessel

POST – OPERATIVE CARE

1. Maintain patency of airway and tracheotomy tube
2. Frequent atraumatic suction
3. Humidification of inspired air and oxygen
4. Fowlers position to aid in breathing

5. Maintain adequate fluid intake
6. Provide frequent mouth wash
7. Mucolytic agent
8. Coughing and physiotherapy
9. Occasional bronchial lavage

Prevent infection and complications

- Aseptic tube suction, handling and tube changing
- Prophylactic antibiotics
- Deflate cuff for 5 minutes every hour
- Avoid tube impinging on posterior tracheal wall

STEPS FOR TRACHEOSTOMY CARE:

Step 1: Gather the supplies.
Tracheostomy care kit, sterile cotton, gauze, hydrogen peroxide, tracheostomy ties, scissors, sterile cup, small towel

Step 2: Wash your hands.

Step 3: Put on a clean pair of gloves.

Step 4: Make cleaning solution. Pour hydrogen peroxide and sterile water or normal saline into one of the clean containers. This makes a 1/2 strength solution. Pour sterile water or normal saline into the second container.

Step 5: Change inner cannula. Place two fingers of one hand on the neck plate of the trach. With the other hand, unlock the inner cannula by turning it counter clockwise or by unsnapping the side clips of a disposable type. Now gently pull it out.

Step 6: Insert clean inner cannula. Insert clean inner cannula. To do this, place two fingers from one hand on the neck plate while gently inserting the cannula into the trach tube. Next, turn the inner cannula clockwise to lock in place.

Step 7: Clean trach area. Soak the cotton tipped applicators in the hydrogen peroxide mixture for 10 seconds. Using the soaked cotton tipped applicators, clean around the trach tube using a sweeping motion in one direction. Use one applicator per sweep and then discard. Do not put anything dirty into this solution as it will be used for more cleaning later. Keep one or more of the applicators to clean the top of the neck plate. Now soak a gauze pad in the cleaning solution and clean around the larger parts of the neck. Or, you may use soap and water on a small white towel to clean the area. Rinse well and dry the skin.

Step 8: Change drain sponge. Change this daily but more often as it becomes wet. To avoid skin problems, do not leave a wet drain sponge in place for a long period of time

Step 9: Change trach ties.

Step 10: Clean dirty inner cannula. Place used inner cannula into the ½ strength solution of hydrogen peroxide.

Step 11: Store clean inner cannula.

Step 12: Throw out used supplies.

Step 13: Clean containers

Nursing management of tracheostomy patient:

- Maintain and open Airway section and clean the tube as indicated.
- Prevent aspiration.
- Observe the patient carefully for the indication of respiratory difficulty example noisy respiratory restlessness cyanosis intercostal and substernal retraction.
- Practice aseptic technique while suctioning cleaning and dressing wound.
- Observe for complication of tracheostomy.
- Ensure maximum humidification of inspired air and sterile weight gauze covering the tracheostomy will help in humidification.
- Main maintain maintain fluid and electrolyte balance maintain intake and output chart. Be gentle (the tracheal mucosa get easily traumatized during suction)
- Periodically inspect the tracheostomy for trauma or infection.
- Ensure the use of fresh tracheostomy tube as needed
- Change the dressing and tracheostomy tube as necessary
- Provide appropriate skin care (keep it clean and dry)
- Provide adequate nourishment
- Provide frequent mouth care (to minimize infection)
- Administered Medication as ordered
- For long term case, the patient family are thought how to take care.

Trouble shooting

1. Decreased oxygen with cuff deflation - may need to increase FIO2 (must check with RT)
2. Inadequate exhalation or phonation

Check for:

- Complete cuff deflection
- Trach tube size

- Suctioning needs
- Need for MD assessment
- Patient position
- Trach position

Management in troubleshooting:

1. If patients normally required oxygen and or on ventilator, place oxygen over tracheal stoma site.
2. Gather equipment required needed for tracheostomy tube change. An assistant can do this while the other caregiver administers oxygen

SUMMARY:

In today's topic of tracheostomy care we have learn about tracheostomy, definition of tracheostomy, parts of tracheostomy, types of tracheostomy, Its indication and contraindications, post operative care, steps of procedure, care of patient of tracheostomy.

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CRITICAL CARE UNIT

TOPIC PRESENTATION

PERFORMING & MAINTAINING CENTAL VENOUS PRESSURE (CVP)

INTRODUCTION

The Central venous pressure (CVP), is the pressure on superior vena cava or right atrium, used to access right ventricular function & venous blood return to the right side of the heart.

CVP monitoring is useful tool to guide hemodynamic therapy, particularly in the intensive care unit. It is done with central venous catheter. It can be used as an estimation of preload and right atrial pressure.

OBJECTIVE OF THE CVP

1. Define CVP
2. Know the normal values of CVP
3. Enlist the purposes of CVP
4. Explain sites of central venous catheterization
5. List down the indication and contraindications of CVP
6. Enlist the complications of CVP
7. Types of CVP catheter
8. Describe the monitoring of CVP
9. Discuss the role of nurse during monitoring of CVP

DEFINITION:

Central Venous Pressure (CVP) is the blood pressure in the superior vena cava, near the right atrium of the heart. CVP reflects the amount of blood returning to the heart & ability of the heart to pump the blood back into the arterial system.

NORMAL VALUE OF CVP

CVP is usually measured in Cm H_2O (1cm H_2O is equivalent to 0.735 mmHg)

Normal value of CVP is between 0 – 8 cmH_2O. (1 – 6 mmHg) Normally, from 2 – 6 mmHg.

PURPOSE OF CVP MONITORING:

1. Purpose of CVP monitoring is to serve as a guide for fluid replacement & to monitor pressure in the right atrium & central vein.
2. 2. CVP catheter can also be used:
   - To obtain venous access when peripheral vein sites are inadequate.
   - To obtain central venous blood samples.

• To administer blood products, total Parenteral nutrition (TPN) and some drug therapies.

CVP CHANGES:

Reasons why CVP **is increased**

1. Hypervolemia
2. Forced exhalation
3. Pneumothorax
4. Heart failure
5. Pleural effusion
6. Decreased cardiac output
7. Pulmonary embolism
8. Mechanical ventilation
9. Pulmonary embolism
10. Pulmonary hypertension

Why CVP is decreased:

1.Hypovolemia
2.Deep inhalation
3.Distributive shock

INDICATIONS:

- Major procedures involving large fluid shifts and / or blood loss.
- Intravascular volume assessment when urine output is not reliable.
- Major trauma
- Surgeries with high risk air embolism
- Venous access for vasoactive / irritating drugs and for long term drug administration.
- Inadequate IV acces.
- Rapid infusion of IV fluids.
- Transvenous spacing.
- Temporary hemodialysis.

CONTRAINDICATIONS:

- Patients undergone thrombolytic or anticoagulative therapy.
- Bleeding disorders.
- Vasculitis.
- Distorted local anatomy.
- Overlying skin infections (dermatitis).
- Burns.
- Uncooperative patients.
- Traumatized site (e.g. Clavicle fracture & subclavian line)

COMPLICATIONS:

- Pneumothorax.
- Hemothorax.
- Hydrothorax.
- Hematoma.
- Thoracic duct injury.
- Air embolism.
- Catheter blockage.
- Infection.
- Septicemia.
- Vessel stenosis.
- Osteomyelitis of classical (subclavian access)

Role of nurse in CVP monitoring:

following points must be kept in mind while doing procedure:

1. Monitor for sign of complications.
2. Assess for patency of CVP line.
3. Sterile dressing should be done to prevent infection (CVP care as per the hospital policy).
4. The length of indwelling catheter should be recorded and regularly monitored.
5. Replacement of CVL tubing every 72 hrs
6. Whole procedure must be done with strict asepsis.

MEASUREMENT OF CVP

The CVP can be measured either manually using a

1. **Manometer**
2. **Electronically using a transducer**

In either case the CVP must be 'zeroed' at the level of the right atrium. This is usually taken to be the level of the 4th intercostal space in the mid-axillary line while the patient is lying supine. Each measurement of CVP should be taken at this same zero position. Trends in the serial measurement of CVP are much more informative than single readings. However, if the CVP is measured at a different level each time then this renders the trend in measurement inaccurate.

3.Using the transducer

The transducer is fixed at the level of the right atrium and connected to the patient's CVP catheter via fluid filled extension tubing. Similar care should be taken to avoid bubbles and kinks etc as mentioned before. The transducer is then 'zeroed' to atmospheric pressure by turning its 3- way tap so that it is open to the transducer and to room air, but closed to the patient. The 3-way tap is then turned so that it is now closed to room air and open between the patient and the transducer. A continuous CVP reading, measured in mmHg rather than cmH_2O, can be obtained.

FOLLOW UP PHASE:

1.Prevent and observe for complications. Report severe shortness of breath, hypotension , rumbling cardiac murmur.

- From catheter insertion: pneumothorax, hemothorax, air embolism, hematoma, and cardiac tamponade
- From indwelling catheters: infection, air embolism, central venous thrombosis.

2. Make sure that cap is secure on the end of the CVP monitor and all clamps are closed when not in use.

3. If air embolism is suspected, immediately place patient. In left lateral Trendelenburg's position and administer oxygen.

4. Carry out ongoing nursing surveillance of insertion site and maintain aseptic technique.

- Inspect entry site twice daily for sign of local inflammation and phlebitis. Remove the catheter immediately if there are sign of infection.
- Make sure sutures are intact.
- Change dressing, as prescribed.
- Send the catheters tip for bacteriological culture when it is removed.

5. When discontinued, remove central line. Position patient flat with head down.

Remove dressing and sutures. Have patient take a deep breath and hold it while catheter is gently pulled out. Apply pressure at catheter site and apply dressing. Monitor site and vital sign for sign of bleeding or hematoma formation.

TROUBLESHOOT

Troubleshoot can be defined as, to determine the source of a systematic error and correct

The error in the transducer can cause:

Potential complications—catheter occlusion, bleeding and hematoma, catheter-tip migration, catheter rupture, phlebitis and associated pain, swelling and deep vein thrombosis (DVT), infection, and embolism. There are many problems that may cause inaccurate pressure measurements

1. the most common are improper setup and malfunctioning of the transducer system if not
2. pressure tracing is displayed potential causes include clotting in or
3. Dislodgement of the cannula kinking of the cannula this connection of the cable in proper scaling of the wave form transducer failure try aspirate in the catheter from this top cop with a syringe if there is no blood return the cannula may be occluded or may have become dislodged and may need to be replaced if there is blood return check the electrical and fluid connections of the transducer system and verify that the scale of the monitor has been set

Catheter occlusion

A catheter occlusion occurs when a blockage prevents caregivers from flushing the central line or aspirating blood. An occlusion can be thrombotic or non-thrombotic

If suspected that patient's catheter is occluded, assess the entire infusion-delivery system for obstructions and kinks. Determine if blood return is hampered by the position of the patient's arm or other body part (when either lying or standing). Evaluate the patient's medication profile for drug incompatibilities. Next, assess catheter patency: Does the catheter flush easily, or only with difficulty? Do you see a blood return? Finally, have a qualified clinician assess catheter-tip location from a recent X-ray, if available

Catheter rupture:

Pressure generated during catheter flushing can't be measured accurately. A small syringe size (less than 3 mL) may cause higher pressures within the catheter. With partial or complete occlusions, higher pressures occur within the catheter. Excessive pressure on the syringe

plunger also can cause unmanageable pressure within the catheter, leading to rupture If you encounter resistance when flushing the catheter, stop flushing and try to determine the cause. Don't keep flushing against resistance, as this may lead to catheter embolus or leakage. If catheter repair is appropriate and a healthcare provider writes an order for it, an infusion or vascular expert should repair it following the manufacturer's guidelines and using aseptic technique, with modification equipment supplied by the manufacturer.

- **Phlebitis**

Phlebitis causes erythema, pain, or swelling along the path of the vein in which the catheter is lodged. The condition is classified as chemical, mechanical, or bacterial.

- **Chemical phlebitis**

It's associated with peripheral I.V. lines but may occur with a central line if the catheter tip migrates from its central location in the superior vena cava.

- **Mechanical phlebitis**

Associated with catheter movement that irritates the vein intima. Early-stage mechanical phlebitis stems from mechanical irritation of the venous endothelium. It usually occurs several inches proximal to the insertion site. Signs and symptoms include tenderness, erythema, and edema. The most common causes of mechanical phlebitis are large-bore catheters and inadequate catheter securement. Treatment entails application of low-degree heat from a continuous, controlled source If they don't resolve, discontinue catheter use. The healthcare team should consider an ultrasound study to rule out DVT.

- **Bacterial phlebitis**

Inflammation of the vein intima associated with bacterial infection. The least common type of phlebitis, it is more serious because it predisposes the patient to systemic complications

Embolism

An embolism may involve the catheter itself, fibrin, or air entry.

Catheter embolisms:

A catheter embolism occurs with catheter rupture and may result from using too much pressure when flushing the line. If the catheter doesn't flush easily, never try to force it. Assess it for mechanical or fibrin occlusions

Fibrin embolisms:

A fibrin embolism occurs when fibrin breaks off from the catheter during flushing. Signs and symptoms depend on where the clot travels. This type of embolism must be treated immediately, but can be hard to detect due to the resources needed (such as computed tomography and angiography).The best way to prevent a fibrin embolism is to assess the catheter every shift and provide proper care and maintenance.

Air embolisms:

An air embolism can arise during catheter insertion, maintenance, or removal. Be sure to minimize air entry during insertion by positioning the patient and equipment properly all syringes and devices are the Lure Lock type, and all caps are applied securely to the central line.

- To decrease this risk, use techniques that prevent air from entering the insertion site after catheter removal.
- For a patient on a ventilator, check the manufacturer's guidelines on whether to remove the catheter on inspiration or expiration. Many of the new ventilator settings provide pressure on expiration for catheter removal.
- Applying a dressing on the catheter insertion or exit site also helps prevent air embolism.

CRITICAL CARE UNIT

TOPIC PRESENTATION

PULMONARY ARTERY PRESSURE

Pulmonary Artery Pressure (PAP)

Introduction:

Hemodynamic monitoring is assessment of the patient's circulatory status. It includes measurements of heart rates, intra-arterial pressure, pulmonary artery and capillary wedge pressure.

Measuring pulmonary Artery pressure by flow directed Balloon – tipped catheter.

The SWAN Ganz catheter is flow directed balloon-tripped catheter The catheter is 110 cm long, marked at increments of 10cm.

It permitting continuous monitoring of right and left ventricular function, pulmonary artery pressure, cardiac output and arterial venous oxygen difference.

General objectives:

At end of the presentation students will able to acquire knowledge about pulmonary artery pressure and it's monitoring and able to apply in clinical area.

Specific objectives:

1) Define pulmonary artery pressure.
2) Enlist purposes of monitoring pulmonary artery pressure.
3) Explain indications of pulmonary artery pressure
4) Discuss contraindications of the pulmonary artery pressure.
5) Enlist the equipment using monitoring pulmonary artery pressure.
6) List down complications of pulmonary artery pressure/ catheter.
7) Describe Nursing responsibilities of pulmonary artery catheter.

46 yr. old male patient Mr. Subhash Yadav came in ER with the chief complaint of shortness of breath, chest pain, excessive sweating. Weight of patient is 75kg. Under Dr. Keshv Joshi, he was recent diagnosed with heart failure. After admitted ER vital sing and ECG was checked.

Vital signs parameters are:

T – 97.6°F, P- 96 beats/min, RR-13 breaths/min, BP- 140/100 mmhg.

ECG : findings – prolong QRS duration, Left ventricular hypertrophy, ST/T –wave abnormalities.

History:-

Jeremy Swan and William Ganz developed their eponymous pulmonary artery (PA) catheter in the 1970s and, in the process, revolutionized measurement of cardiac output, pressures within the left side of the heart, and resistance in systemic and pulmonary circulations.

Definition:

Pulmonary artery catheterization is the insertion of a catheter into a pulmonary artery. The pulmonary artery catheter is frequently refered to as a Swan-Ganz catheter. It is used to measure pulmonary artery pressure.
Normal pressure of pulmonary artery pressure is 18 – 25 mmHg.

Purpose:

- To monitor pressure in right atrium, right ventricle, pulmonary artery and distal branches of the pulmonary artery
- To measure co through thermodilution.
- To obtain blood for central venous oxygen saturation.
- To continuously monitor mixed venous oxygen saturation available on special catheter.
- To provide for temporary atrial /ventricular pacing and intra-arterial ECG.

Uses:

- Assessment of volume status in patients undergoing major surgery
- Cardiac output measurements by thermodilution techniques.
- Respiratory/oxygen transport measurements – mix venous oximetry
- Various hemodynamic parameters – pulmonary artery pressure, pulmonary capillary wedge pressure, central venous pressure, systemic vascular resistance, pulmonary vascular resistance.

Pulmonary capillary wedge pressure:

Pulmonary capillary wedge pressure is an integrated measurement of the compliance of the left side of the heart and the pulmonary circulation. The measurement of PCWP can be useful in several diagnostic settings.

It is frequently used to assess left ventricular filling, represent left atrial pressure, and assess mitral valve function

Indication

Diagnostic:

1) Differential among cause of shock.
2) Differential between mechanism of pulmonary edema.
3) Evaluation of pulmonary hypertension.
4) Diagnosis of pericardial temponode.
5) Diagnosis of right to left intracardiac shuntsm
6) Unexplained dyspnea.

Therapeutic:

1) Management of perioperative patient with unstable cardiac status.
2) Management of complicated myocardial infraction.
3) Management of patients following cardiac surgery/ High risk surgery.
4) Management of severe pre-eclampsia.
5) Guide to pharmacological therapy.
6) Asses response to pulmonary hypertension specific therapy.
7) Burn /renal failure/ heart failure/ Sepsis/ Decompensated cirrhosis.

Contraindications:

Absolute:

- Infection at insertion site.
- Presence of RV assist device.
- Insertion during CPB

- Lack of constant.

Relative:

- Coagulopathy.
- Thrombocytopenia.
- Electrolyte disturbance.
- Severe pulmonary HTN.

Equipment:

A sterile tray containing:

- 2%chlorhexidine skin preparation solution
- Sterile gown, gloves, face shield and cape
- Sterile gauze pad.
- 1% lidocaine – 5cc
- Seeker needle -23G
- Introducer needle -18G
- J –tip guidewire
- Transduction tubing
- Sterile catheter (flush solution)
- Sheath.
- Pulmonary catheter.
- Sterile sleeve for catheter.
- Sterile dressing.

Complications:

- Pulmonary Artery rupture.
- Pulmonary thromboembolism.
- Pulmonary infraction.
- Dysrhythmias
- Air embolism.

- Right bundle branch block. (Complete heart block)
- Arrhythmias. (Atrial and ventricle)
- Endocardial damage.
- Cardiac valve injury.
- Infection.
- Endocarditis.

Nursing Responsibility:

- Ensure that the system is set up and maintain properly.
- Checking that the stopcock of the transducer is positioned at the level of atrium before the system is used to obtain pressure measurement.
- The nurse uses a marker to identify the level on the chest wall, which provides a stable reference point for subsequent pressure readings.
- Established the zero-reference point in order to ensure that system is properly functioning at atmospheric pressure.
- The nurse observes for sign of pneumothorax during the insertion of catheter using a CVP. Nurse's handling this equipment must demonstrate

Conclusion:

- Define pulmonary artery pressure
- Purpose of monitoring pulmonary artery pressure.
- Indication of pulmonary artery pressure
- Contraindication of pulmonary artery pressure.
- Equipment of pulmonary artery pressure
- Complications of pulmonary artery pressure.
- Nursing Responsibility of pulmonary artery catheter:

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CRITICAL CARE UNIT

TOPIC PRESENTATION ON

ARTERIAL BLOOD PRESSURE

Aim:

At the end of topic presentation student will acquire knowledge about arterial blood pressure and will able to apply it in clinical practice.

Learning objectives:

- Define arterial blood pressure.
- Understand purposes of arterial blood pressure.
- Elaborate indications for arterial blood pressure.
- Enlist the components in arterial blood pressure.
- Determine principles of arterial blood pressure.
- Describe the procedure and nursing implications for arterial blood pressure.
- Illustrate the complications of arterial blood pressure.

Introduction:

- Intra-arterial pressure monitoring is a continuous and direct method of monitoring blood pressure by passing a catheter into an artery and connecting it to an electronic pressure sensor called transducer.
- This transducer converts the mechanical pressure of the arterial pulse into electrical impulse that is transmitted to as a monitor.
- The pressure appears a wave form, rising and falling as a it sweeps across the oscilloscope.

Purposes:

- To provide continuous and more accurate intra - arterial pressure readings.
- To detect dangerously high or low blood pressure.
- To provide continuous access to arterial blood for analysis.

Indications:

- Patients with very high or very low blood pressure.
- Patients with fluctuating blood pressure eg. in shock, arrhythmias.
- Patients who are at high risk of cardiogenic shock, e.g. patients with multiple trauma, pulmonary embolism, cardiac tamponade.
- Extensive burns with limited intact skin surface.
- During the administration of drugs that alter the blood considerably. Excessive obesity that prevents accuracy of pressure reading with a blood pressure manometer.
- To obtain arterial blood for laboratory examination, such as blood gas determinations.

- Intra- aortic balloon pump support.

Components:

- Intra- arterial catheter- This is introduced into an artery, from where the pressure waves are transmitted to the manometer (transducer).
- Transducer - This is attached to the intra- arterial catheter. The transducer converts the mechanical signal (pressure) to the electrical signal (voltage).
- Bed Side monitor - This amplifies the signal coming from the transducer and displays it on the oscilloscope.
- Fluid Source - This is to flush the intra- arterial catheter to prevent clotting of blood in it.

Principles of Intra- Arterial Monitoring:

- Aseptic technique, infection control.
- Orientation about the devices and their utility and proper handling.

Zeroing:

- Ensures the transducer pressure tubing and flush solution are correctly assembled and free air bubbles.
- Place transducer at level of right atrium.
- 'Off to patient, open to air (atmosphere).
- Press 'zero' -> sets atmospheric pressure as zero reference point.
- Phlebostatic axis.

Procedure:

Preparations:

- No specific preparations needed but following steps may help to get most accurate measurement.
- Do not smoke, exercise or drink caffeinated beverages for 30 minutes to an hour before the test.
- Consider wearing short-sleeved shirt so that the blood pressure cuff can be placed more easily.
- Relax & tell your doctor about the medication you take.

Steps:

1. Choose the catheter insertion site.
    - Commonly used radial, brachial & femoral arteries.
    - Less frequently - ulnar, axillary, temporal, posteriortibial & dorsal pedis arteries.

2. Choosing the type of arterial catheter.
    - Twenty-gauge catheters have been shown to be less affected by underdamping than 18-G catheters and generally recommended by radial cannulations

3. Placement the arterial catheter.

- Different techniques can be used to place the catheter with or without the use US. Namely the separate guide wire approach, integral guidewire approach & direct puncture.

4. Leveling & Zeroing of the pressure transducer.

- The pressure transducer (Where the mechanical signal is transduced into on electrical signal.) Must be leveled & zeroed to ensure that BP measurements are accurate.

5. Checking the quality of the arterial blood pressure waveform - morphology & artifacts.

Nursing Implications:

- Always watch for haemorrhage. Keep all the connections tight. Apply immediate pressure if the catheter is accidentally pulled out.
- Prevent the possibility of clot formation in the catheter. Provide a continuous infusion with heparinized solution. Flush the catheter thoroughly after each blood specimen is withdrawn.
- Always inspect the extremity distal to the area of cannulation to detect any decrease in the circulation. Watch for cold fingers,cyanosis, poor capillary filling,etc.
- Prevent infection by maintaining strict aseptic technique and closed system, at all time.
- Never inject any medications through the arterial line.
- Keep the catheter site clean and dry to prevent skin maceration.
- Before inserting an arterial line into the upper extremity, always check for the collateral circulation (Allen test).
- Ask the patient to clench his hand tightly.
- Compress both radial and ulnar arteries.
- Ask the patient to open the hand. Released the ulnar artery. Note the flow of blood in the hand in a flush.

Complications:

- Hemorrhrage
- Infections
- Clot formation and embolism
- Damage to the artery
- Skin maceration

Conclusion:

We have completed the following points in the topics that are definition, purposes, indications, components, principles, procedure, nursing implications and complications of arterial blood pressure.

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CRITICAL CARE UNIT

TOPIC PRESENTATION ON

ARTERIAL BLOOD GAS ANALYSIS

Arterial Blood Gas Analysis

INTRODUCTION:

An Arterial Blood Gas (ABG) test measures oxygen and carbon dioxide levels in your blood. It also measures your body's acid-base (pH) level, which is usually in balance when one is healthy. Arterial Blood Gas analysis is an essential part of diagnosing and managing a patient's oxygenation status and acid-base balance.

SCENARIO:

46 year old male patient Mr Subhash Yadao admitted in ICU. He is on ventilator with CMV mode, patient having diabetic ketoacidosis. he is hemodynamically unstable. Doctor has prescribed for ABG analysis.

OBJECTIVES:

1. Define ABG analysis
2. Enlist the indication and contraindication of ABG analysis.
3. Enumerate steps of procedure with scientific estimated of ABG analysis.
4. Enlist the complication of procedure.
5. Explain the after care of article and patient.
6. Explain the interpretation of ABG.

DEFINATION:

Arterial blood gas analysis is done after collecting sample from an artery by performing an arterial puncture.

A test that analyses arterial blood for oxygen, carbon dioxide and bicarbonate content in addition to blood pH.

PURPOSE:

To know,

- Acid base status
- Degree of oxygenation of blood and adequacy of alveolar ventilation
- Continuous arterial blood pressure monitoring in emergency

INDICATION:

ABGs vary and include patients with identification of respiratory, metabolic disorder

- Respiratory failure
- Any severe illness which may lead to a metabolic acidosis - for example:
- Cardiac failure.
- Liver failure.
- Renal failure.
- Hyperglycemia state associated with diabetes mellitus.
- Multi- organ failure.
- Sepsis
- Burns.
- Poisons/toxins.
- Ventilated patients.
- Sleep studies.
- Severely unwell patients from any cause - affects prognosis.

CONTRAINDICATION:

- Local infection
- Burn
- Peripheral vascular disease
- Severe coagulopathy

ALLEN TEST:

The Allen test is a first-line standard test used to assess the arterial blood supply of the hand. This test is performed whenever intravascular access to the radial artery is planned or for selecting patients for radial artery harvesting, such as for coronary artery bypass grafting or for forearm flap elevation.

The original test proposed by Allen is performed as follows:

The patient is asked to clench both fists tightly for 1 minute at the same time. Pressure is applied over both radial arteries simultaneously so as to occlude them. The patient then opens the fingers of both hands rapidly, and the examiner compares the color of both. The initial pallor should be replaced quickly by rubor. The test may be repeated, this time occluding the

ulnar arteries. Allen's test looks for abnormal circulation. If color returns quickly as described above, Allen's test is considered to demonstrate normal circulation. If the pallor persists for some time after the patient opens their fingers, this suggests a degree of occlusion of the uncompressed artery.

ARTICLE:

- A tray
- A clean sheet or mackintosh
- A clean towel – to support patient wrist
- Clean gloves
- Alcohol swab or bowl with cotton swab and AHD 2000 (Chlorhexidine -topical antiseptic)
- 2ml syringe – pre heparinized or regular syringe
- Heparin - to flush the syringe so that blood doesn't clot
- Needle of gauge 20-25 – according to site of puncture
- Rubber stopper or recap needle – with one scoop technique
- Cap or luer lock for syringe – to seal lock the syringe
- Gauze pads – to stop bleeding
- Tape
- Crushed ice in specimen bag
- Arterial catheter for continuous pressure monitoring
- Consent or request form for lab
- SPO2 probe – for Allen's test if patient is unresponsive
- Paper bag
- Kidney tray
- If local anesthesia needs to be given
- 1% lidocaine without epinephrine or lidocaine and prilocaine cream,
- 1 ml syringe with 25-gauge needle

SITE:

- The choice of site depends on safety, accessibility and patient comfort. Following may be the site 1. Brachial artery 2. Radial artery 3. Femoral artery 4. Brachial artery.
- Arterial cannulation is considered for patients who need frequent arterial blood samples, continuous arterial pressure monitoring, or evaluation of vasoactive medication therapy.

INTERVENTION	RATIONAL
BEFORE PROCEDURE –	
1.Verify the doctors order then prepare for collecting articles.	
2. Identify the patient by asking name and seeing patient label.	to double check the patient identification.
3. If conscious take consent and explain procedure to patient.	to gain cooperation during procedure.
4. Prepare a specimen bag with crushed ice 5. Label the syringe with patient identification	the transport specimen syringe to laboratory.
6. Check for site for ABG collection – Radial, brachial, femoral or pedal artery.	If radial arterial is selected perform Allen's test for collateral circulation.
7. If patient is on ventilator record inspired oxygen concentration (fiO_2).	To know degree of hypoxemia as it cannot be assisted without knowing the fiO_2.
8. Heparinized the 2ml syringe - a. withdraw heparin into the syringe to wet the plunger and fill dead space in the needle. b. Hold the syringe in an upright position and expel excess heparin and air bubble.	a. this action coats the syringe with heparin to prevent clotting. b. air remaining in the syringe may affect measurements of PaO_2 and heparin in the syringe may affect measurements of Ph.

DURING PROCEDURE-	
9. Wash hands and don gloves, position the patient hand accordingly.	
10. Feel along the course of radial artery and palpate for maximum pulsation with middle and index fingers. Prepare the skin with alcohol swab or ADH swab.	
11. The skin and subcutaneous tissue may be infiltrated with a local anaesthesia.	
12. The needle is at 45-60 angle to the skin surface in between both index and middle finger and is advanced into the artery. Once the artery is punctured arterial pressure will push up the piston of the syringe and a pulsating flow of blood will fill the syringe.	
13. After blood is obtained, withdraw needle and apply firm pressure over the puncture site with a clean dry gauze pad for 5min.	significant bleeding can occur because of the pressure in the artery.
14. Remove air bubble from syringe and needle. Insert needle into the rubber stopper or cap the needle with one scoop technique.	immediate capping of needle prevents room air from mixing with blood specimen. Holding rubber stopper in one hand may lead to needle stick injury.
15. Remove the cap with needle and place luer lock or cap on syringe and place it in the specimen bag.	icening the syringe will prevent false results.
16. For patient requiring serial monitoring of arterial blood an arterial catheter is placed into the selected artery. If not maintain firm pressure on the puncture site for 5-10 min and then apply clean dry gauze and tape it securely.	

AFTER PROCEDURE –	
17. Send labelled iced specimen to the laboratory immediately with duly filled request form / as per hospital policy.	
18. Dispose off appropriately all used material.	
19. Palpate the pulse to distal puncture site, inspect the puncture site and assess for reduced temperature, cold, numbness, tingling or discoloration.	hematoma and arterial thrombosis are complication.
20. Document the procedure.	

MANAGEMENT:

Pharmacological:

1. Antibiotic: levofloxin
2. Aantipyretic: acetaminophen
3. Antioxiolytic: benzodiazapam
4. Ringer lactate
5. Ddiuretics
6. Administer bicarbonate

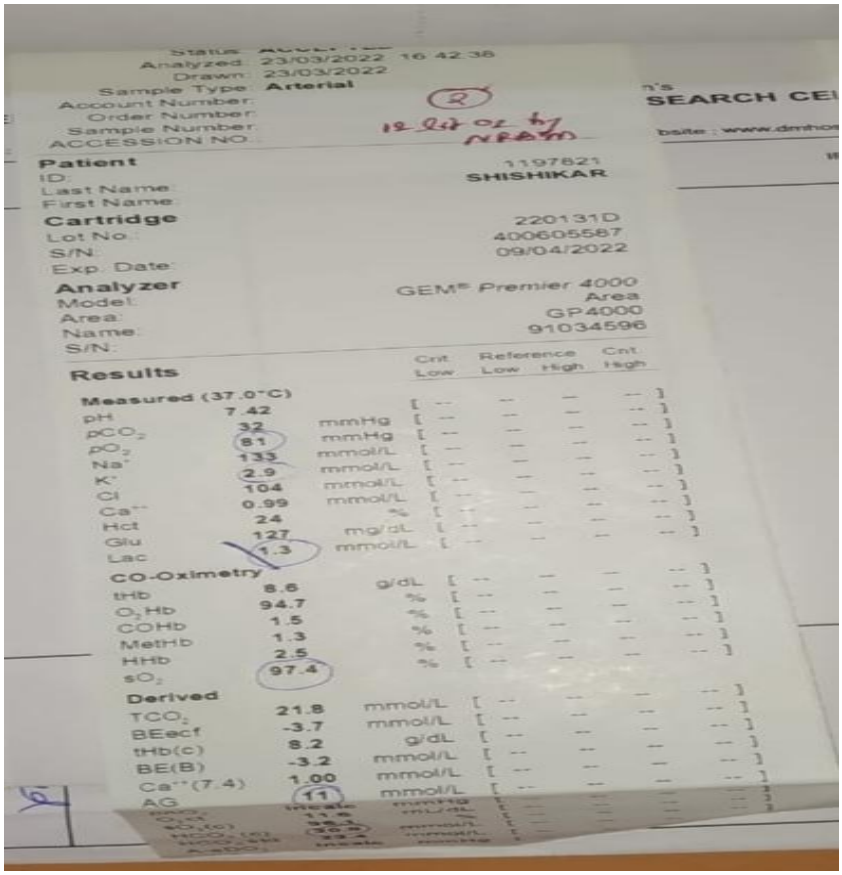
Non pharmacological:

1. To provide IV fluid.
2. Stop drinking alcohol.
3. To provide plenty of fluid.
4. Breath into a paper bag.
5. Restrict oxygen intake into the lungs.
6. Treat the underlying cause.
7. To reassure the patient who is anxious.

COMPLICATIONS:

- Hematoma
- Hemorrhage
- Arteriospasm

- Nosocomial bacteremia
- Distal ischemia
- Numbness of hand
- Sepsis
- Infection to health care worker (NSI)



INTERPRETATING THE ABG REPORT:

Goals of ABG analysis:

- With the given lab values, we need to determine if the interpretation is:
- Acidosis/ alkalosis
- Metabolic/ respiratory
- Fully compensated/ partially compensated/uncompensated

COMPOENENTS OF ARTERIAL BLOOD GAS:

- **pH:**

The pH is the concentration of hydrogen ions and determines the acidity or alkalinity of body fluids. The normal ABG level for pH is 7.35 to 7.45.

- **$PaCO_2$** (Partial Pressure of Carbon Dioxide):

Shows the adequacy of the gas exchange between the alveoli and the external environment (alveolar ventilation). The normal range For PaCO2 is 35 to 45 mmHg.

- **PaO_2** (Partial Pressure of Oxygen):

Indicates the amount of oxygen available to bind with hemoglobin. The pH plays a role in the combining power of oxygen with hemoglobin: a low pH means there is less oxygen in the hemoglobin. For PaO2, the normal range is 75 to 100 mmHg

- SPO_2 (Oxygen Saturation):

It is measured in percentage, is the amount of oxygen in the blood that combines with hemoglobin. SPO_2, the normal range is 94–100%

- HCO_3 (Bicarbonate):

Bicarbonate ion is an alkaline substance that comprises over half of the total buffer base in the blood. HCO3 the normal range is 22 to 26 mEq/L.

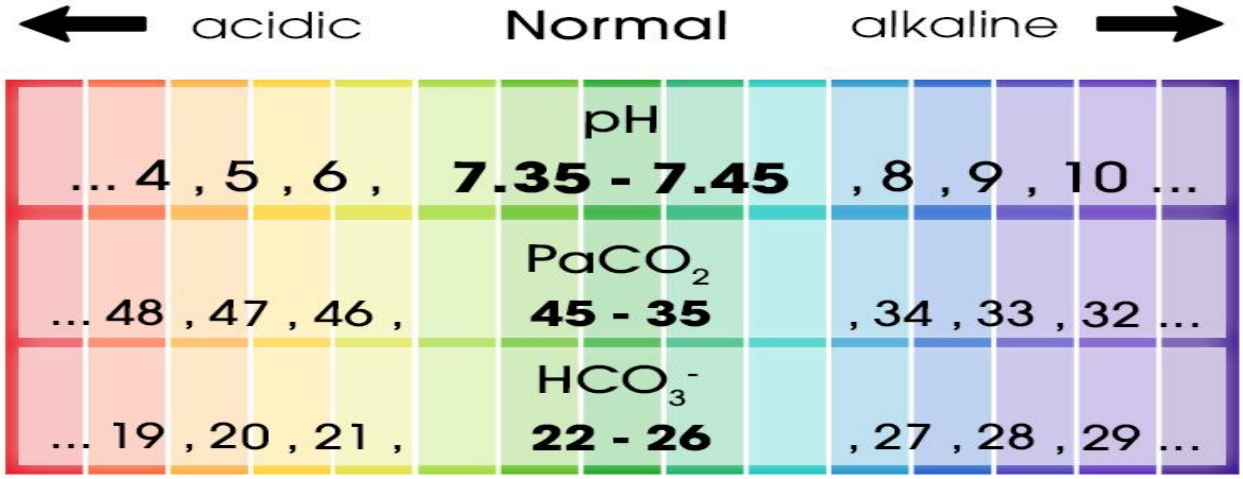
- BE (Base Excess):

BE value is routinely checked with HCO3 value. A base excess of less than –2 is acidosis and greater than +2 is alkalosis. Base excess the normal range is -2 to+2 mmol/L.

Results			Crit. Low	Reference Low	Reference High	Crit. High
Measured (37.0°C)						
pH	7.39		[7.20	7.35	7.45	7.60]
pCO_2	↑ 58	mmHg	[20	35	45	60]
pO_2	↓ 58	mmHg	[40	75	100	--]
CO-Oximetry						
tHb	↑ 19.1	g/dL	[--	11.7	17.4	--]
O_2Hb	↓ 90.1	%	[--	95.0	98.0	--]
COHb	↑ 2.4	%	[--	0.5	1.5	15.0]
MetHb	1.2	%	[--	0.0	1.5	--]
HHb	↑ 6.3	%	[--	0.0	5.0	--]
sO_2	↓ 93.5	%	[--	94.0	98.0	--]
Derived						
BE(B)	↑ 7.3	mmol/L	[--	-2.0	3.0	--]
P/F Ratio	132	mmHg	[--	--	--	--]
O_2ct	24.1	mL/dL	[--	--	--	--]
$HCO_3^-(c)$	↑ 35.1	mmol/L	[--	22.0	26.0	--]
HCO_3^-std	↑ 30.3	mmol/L	[--	22.0	26.0	--]
paO_2/pAO_2	0.24		[--	--	--	--]

↑↓ Outside Reference Range

NORMAL BLOOD PH SCALE:



DIFFENCE BETWEEN ABG AND VBG:

	ABG	VBG
Ph	7.35 - 7.45	7.33 – 7.43
PO_2	80 - 100 mmHg	35 - 40 mmHg
PCO2	35 - 45 mm Hg	42 - 51 mmHg
HCO3	22 - 26 mEq/L	24 - 28 mEq/L
O_2 SATURATION	>95%	70% – 75%
BASE EXCESS	-2 - +2	0 - +4

UNDERSTANDING OF ACID BASE BELANCE AND RELATED DISORDER:

- **Respiratory Acidosis:**

Is defined as a pH less than 7.35 with a PaCO2 greater than 45 mm Hg. Acidosis is caused by an accumulation of CO2 which combines with water in the body to produce carbonic acid, thus, lowering the pH of the blood. Any condition that results in hypoventilation can cause respiratory acidosis.

- **Respiratory Alkalosis:**

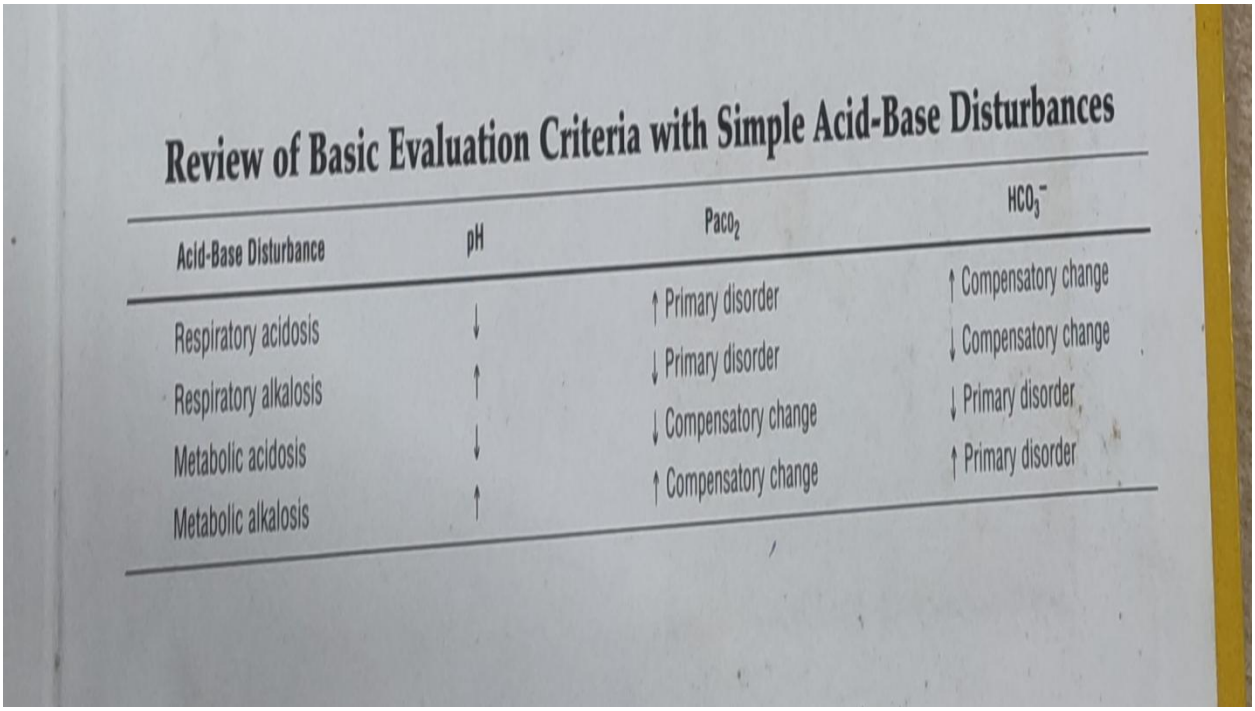
Is defined as a pH greater than 7.45 with a PaCO2 less than 35 mm Hg. Any condition that causes hyperventilation can result in respiratory alkalosis.

- **Metabolic Acidosis:**

Is defined as a bicarbonate level of less than 22 mEq/L with a pH of less than 7.35. Metabolic acidosis is caused by either a deficit of base in the bloodstream or an excess of acids, other than CO2. Diarrhea and intestinal fistulas may cause decreased levels of base.

- **Metabolic Alkalosis:**

Is defined as a bicarbonate level greater than 26 mEq/liter with a pH greater than 7.45. Either an excess of base or a loss of acid within the body can cause metabolic alkalosis. Excess base occurs from ingestion of antacids, excess use of bicarbonate, or use of lactate in dialysis.



Review of Basic Evaluation Criteria with Simple Acid-Base Disturbances

Acid-Base Disturbance	pH	$Paco_2$	HCO_3^-
Respiratory acidosis	↓	↑ Primary disorder	↑ Compensatory change
Respiratory alkalosis	↑	↓ Primary disorder	↓ Compensatory change
Metabolic acidosis	↓	↓ Compensatory change	↓ Primary disorder
Metabolic alkalosis	↑	↑ Compensatory change	↑ Primary disorder

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- Brunner and Siddhartha medical surgical nursing textbook page no 378-380
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CRITICAL CARE UNIT

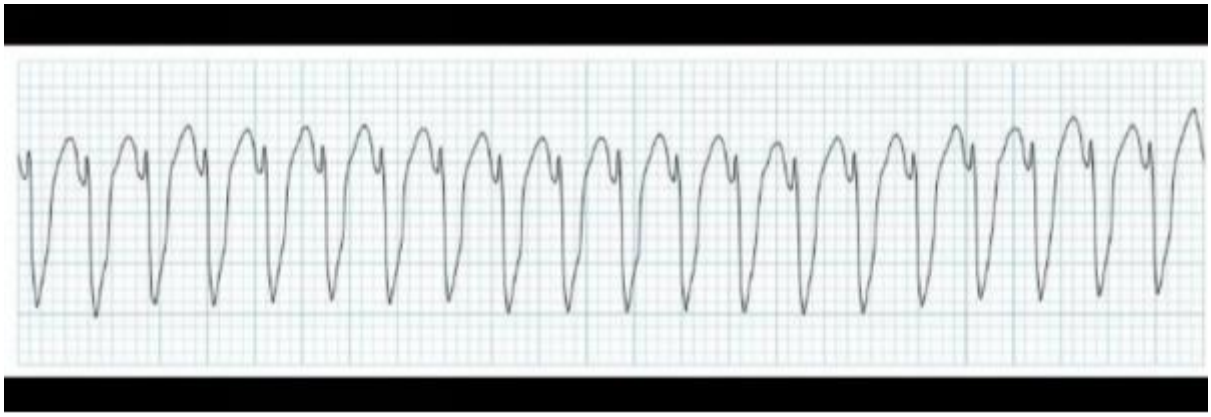
TOPIC PRESENTATION ON

DEFIBRILLATION

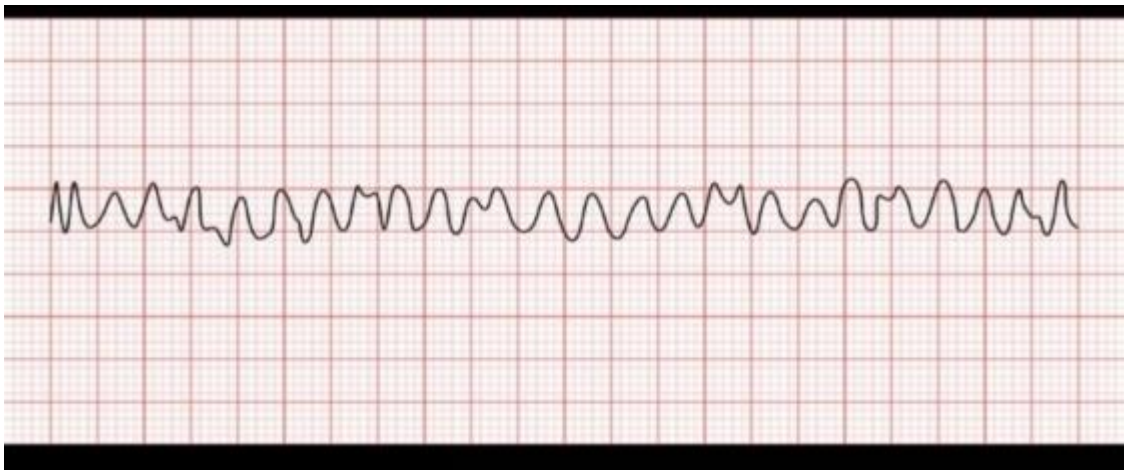
CASE SCENARIO:

Mr. Subhash Yadav was admitted in hospital for coronary artery disease suddenly patient went into pulseless ventricular tachycardia with heart rate 220 beats/min followed by ventricular fibrillation with heart rate 250 beats/ min so for the emergency we have to give DC shock for this patient doctor ordered 100 JL DC shock it is given for 3 times and now patient is reverted back with sinus rhythm.

Ventricular tachycardia:



Ventricular fibrillation:-



OBJECTIVES:

General objectives: At the end of the presentation participants are able to understand knowledge about defibrillator and its management.

Specific Objectives:

At the end of the presentation participants will able to:

1. Define defibrillation
2. Classify the types of defibrillator.
3. Discuss the indication of defibrillator.
4. Describe the contraindications and precautions of defibrillator.
5. Explain the procedure of defibrillation.
6. Illustrate the complications of defibrillation
7. Interpret the nurse's responsibility in defilation.
8. Enlist the troubleshoot in defibrillation.

DEFINITION:

Defibrillator:

Defibrillator is an apparatus used to control heart fibrillation by application of an electric current to the chest wall or heart.

Defibrillation:

Defibrillation is the stopping of the heart by administering a controlled electric shock, to allow restoration of the normal rhythm.

TYPES OF DEFIBRILLATOR:

1) Manual external defibrillator

They are used in conjunction with an electrocardiogram which can be separate or built-in .

A health care provider first diagnoses the cardiac rhythm and the manually determine the voltage and timing for the electrical shock.

Fig. Manual external defibrillator

2) Manual internal defibrillator

Internal defibrillator is often used to defibrillate the heart during or after cardiac surgery such as a heart bypass.

The manual internal defibrillators use internal paddles to send the electric shock directly to the heart. They are used on open chests, so they are only common in the operating room.

3) Automated external defibrillator

Automated external defibrillators (AEDs) are portable, life-saving devices designed to treat people experiencing sudden cardiac arrest. AEDs are used to revive someone from sudden cardiac arrest. AED often require the stopping of chest compression and rescue breathing.

Fig. Automated external defibrillator

4) Implanted cardioverter defibrillator

It is also known as automatic internal cardiac defibrillator (AICD) are implants to similar to pacemaker. An implantable cardioverter-defibrillator (ICD) is a small battery-powered device placed in the chest to detect and stop irregular heartbeats (arrhythmias). They continuously monitor the patient heart rhythm and automatically administer shock for various life threatening arrhythmias.

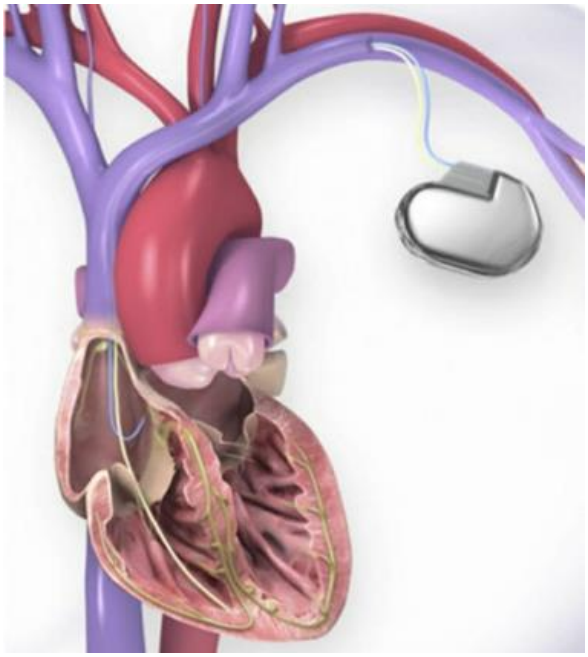


Fig. Implanted cardioverter defibrillator

INDICATIONS:

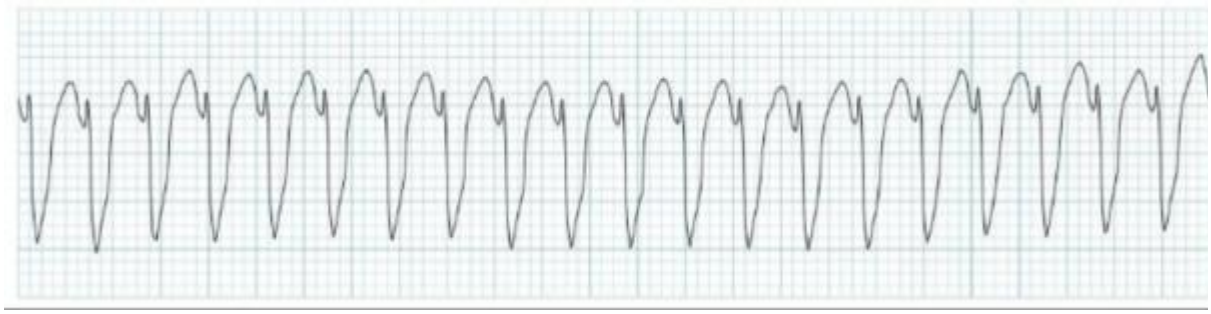
Defibrillator are used to prevent or correct an arrhythmia, an uneven heartbeat that is too slow or too fast such as-

- Atrial Flutter
- Atrial fibrillation
- Ventricular tachycardia
- Supraventricular tachycardia

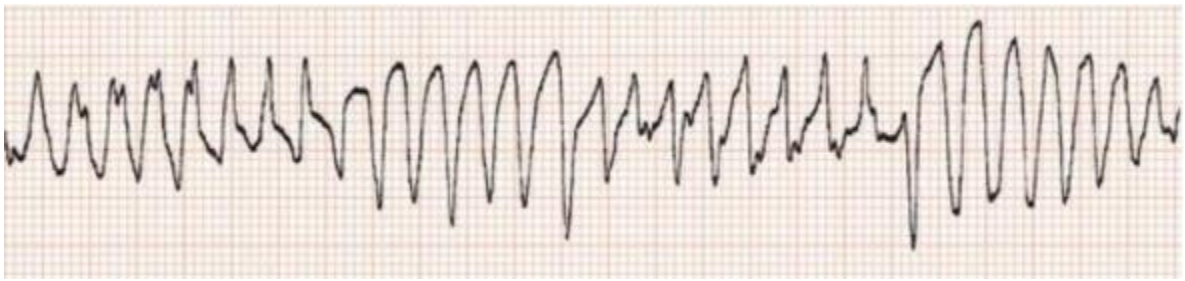
1. **Atrial flutter**

2. **Atrial fibrillation**

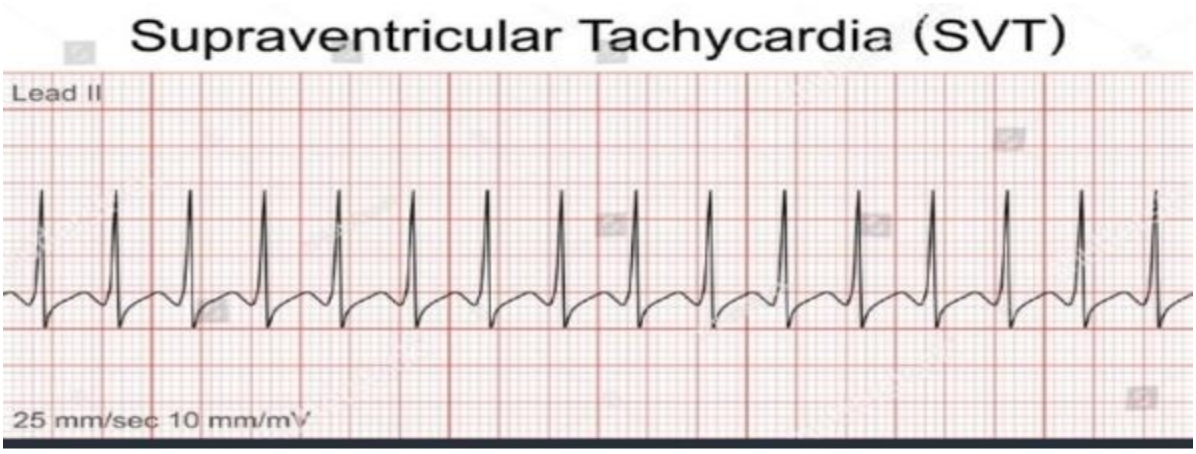
3. **Ventricular tachycardia:- monomorphic ventricular tachycardia**



4. **Ventricular tachycardia:- polymorphic ventricular tachycardia**



5. **Supraventricular tachycardia:**



CONTRAINDICATIONS:

- Multifocal atrial tachycardia
- Digitalis toxicity
- Asystole
- Valid do not resuscitate order
- Presence of pulse

PRECAUTION DURING DEFIBRILLATION:

1. Do not touch the victim while defibrillating
2. Do not use alcohol to wipe the victim's chest dry .alcohol is flammable
3. Do not use an AED (automated external Defibrillator)
4. Do not use an AED on a victim who is in contact with water
5. Do not use an AED on a victim lying on a conductive surface
6. Do not use Defibrillator on a victim who has nitroglycerin or other patch

7. Do not touch the victim while the defibrillator is analyzing
8. Do not defibrillate someone around flammable material, such as gasoline or free flowing oxygen
9. Do not use a cellular phone or radio within 6 feet of the defibrillator
10. Avoid charging the paddle in the air
11. Avoid defibrillator over ECG electrodes, nitrate patches or implanted devices such as pacemakers.

PROCEDURE:

Care before defibrillation:

- Immediately before defibrillation , assess the clients responsiveness and do the following:
  1. If the clients are not responsive, call for immediate assistant (or activate the EMS system).
  2. Call for the defibrillator and crash cart.
  3. Assess the client's airway, breathing and circulation (ABCS). Open the airway.
  4. If client is not breathing give two slow breath.
  5. Assess the clients circulation, is no pulse is there starts CPR.
  6. Perform CPR until defibrillator is in place.
  7. Check the ECG to verify the presence of ventricular fibrillation, confirm in two leads. Check for loose connection and if any nitroglycerin patch is present we should remove it. On confirmation of emergency, the physician code is announced so that,

the physician and support staff can be present to assist advanced cardiac life support measures.

Care during defibrillation:

1. When the ventricular fibrillation develops, clinicians must attempt defibrillation at the earliest priority.
2. The paddles are lubricated with gel or conducting pads to enhance conductions and prevent burning of the skin.
3. Paddles must lie flat against the body.
4. A transvers position for paddles placement is used.
5. One paddle is placed at 2nd intercostal space at the right of the sternum and other paddle is placed at 5th intercostal space on anterior axillary line.

Fig. Paddle

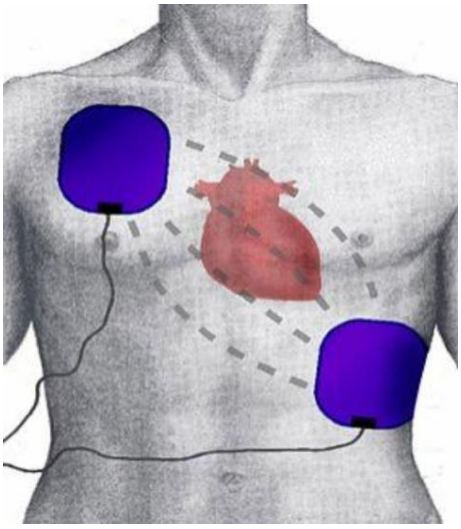


Fig. Position of paddle

Care after defibrillation:

- Assess neurological status.
- Assess respiratory status.
- Assess cardiovascular status.
- Administer or initiate IV, Antidysrhythmic therapy.
- Monitor burns.
- Documentation: include neurological, respiratory, and cardiovascular assessment before and after the defibrillation.
- Patient/Family education.

COMPLICATIONS:

1. Dysarrhythmias
2. Cardiac arrest
3. Respiratory arrest
4. Altered skin integrity.
5. Pulmonary edema.
6. Neurologic impairment

NURSES RESPONSIBILITY:

- As defibrillation is an emergency procedure, the equipment should be ready at all times.
- It should be kept functioning all the time and should be checked before each shift.
- Each staff should be aware of its functioning
- The defibrillator should be tested daily for its proper functioning .To test the defibrillator, follow the steps as described below
- Set the defibrillator at 300 joules
- Depress the charge button on the defibrillator until the display number matches the joules setting
- Leave the paddles in their resting place on the defibrillator and simultaneously press the discharge buttons on both paddles.
- When someone is getting ready for defibrillation the co-worker should begin with basic life support
- Patient should be continuously monitored after defibrillation.

- He should never be left alone for the first 24 hr.
- Vital signs are to be recorded very frequently until they are stabilized.
- Oxygen should be continuously given to the patient.
- Drugs should be administered as ordered
- Intake and output chart to be maintained.

Trouble Shooting:

- Attach the external and internal paddles if the monitor reads, No paddles.
- Check to ensure that the leads are securely attached if the monitor reads, No leads.
- Connect the unit to AC power if the message reads, low battery
- Verify that the energy select control settings are correct if the defibrillator does not charge.
- Change the electrodes and make sure that the electrodes adapter cable is properly connected if you receive a message of PACER FAILURE. Restart the pacer.
- Close the recorder door and the paper roll if the monitor message reads. Check recorder.

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A referrals manual for nurses on coronary care nursing By sister Nancy; Kumar publishing house. P: 97-101.

CRITICAL CARE UNIT

TOPIC PRESENTATION ON

SYRINGE PUMP AND INFUSION PUMP

AIM:

At the end of the presentation group will acquire knowledge on Syringe pump and infusion pump and able to apply knowledge in the clinical area.

OBJECTIVES:

At the end of presentation group are able to:

- Define infusion devices
- Explain syringe pump and infusion pump.
- List down the advantages and disadvantages of infusion devices.
- Discuss nursing responsibilities during handling syringe pump and infusion pump.

INFUSION DEVICES:

An infusion device is designed to accurately deliver measured amounts of fluid or drug over set period of time, to achieve the desired therapeutic response and to prevent complications. (Medicines & Healthcare products regulatory Authority [MHRA] 2010; Quinn 2008)

SYRINGE PUMP

A syringe pump is a small infusion pump, used to gradually administer small amounts of fluid (with or without medication) to a patient or for use in chemical & biomedical research.

It is low volume, high accuracy device designed to infuse small volumes at low flow rates.

- The volume for infusion is limited to the size of the syringe used in the device, usually 60ml syringe.
- The plunger of the syringe is driven forward by the pump at the controlled rate and is calibrates in mili liters per hour.
- Generally used for low volume, low flow rate infusions.
- Good short term accuracy.

FEATURES OF SYRINGE PUMP:

- Flow rate range 0.1-200 ml/hr. (depending on the syringe capacity up-to 1200ml/hr.).
- Syringes Capacities : 5, 10, 20, 30/35, 50/60 cc
- Bolus: manual bolus – rate 50 – 1200 ml/h (50ml/h increments).
- Pressure modes: 2 modes available: variable or 3 pre-set levels from 100 to 900 mmHg. 50mmHg increments.

CALCULATION:

1. NTG(Nitro-Glycerine) infusion to be started at 3ugm/kg/min

   wt.: 75 kg.

   Formula = 250 / wt. × 0.075

   = 250/ 75 × 0.075

   = 250/5.625

   = 44 ml

   Prepare the drug in single strength.

   NTG dose 25 mg in 5ml.

   So, 5 ml NTG + 39 ml NS **= 44 ml.**

2. Dobutamine

   Weight = 75 kg

   Formula = 250 / wt. × 0.06

   = 250/75×0.06

   = 250/5.625

   = 56 ml

   Prepare the drug in double strength

   56/2 = 28 ml

   Dobutamine available in powder form , dilute the drug in 5 ml NS

   So, 5 ml diluted dobutamine+23 ml NS. = **28 ml**

APPLICATION OF SYRINGE PUMP:

- Used in:
  1. Intensive Care Unit
  2. Cardio Surgery Unit
  3. Pediatric Units
  4. Operating Theatres
  5. Ambulances
- Simple to operate, reliable & used in general application.
- Suitable for various types of single – use syringes.
- Bolus function enables quick & repeated delivery of bolus doses to the patient, with accurately established volume within a specific infusion time.
- It can operate without connection to the mains.

- ❖ Automatically supplied by internal battery in cases e.g. . Of mains failure.
- ❖ Enables to continue the infusion when the patient is being transported.
- ❖ Simple casing, without any parts protruding from the front panel, facilities maintenance & disinfection .

IMPORTANT POINTS TO REMEMBER:

- Airways run syringes pump on mains switch whenever you can.
- Use damp cloth soaked in soap water for cleaning the panel.
- Inspect intravenous site periodically.
- Handle the clamp gently.

INFUSION PUMP:

Infusion pump is biomedical device which is capable of delivering fluid in large or small amounts & use to deliver nutrients or medications to a patient's body in a controlled manner.

- Capable of delivering fluids in large or small amounts, & are used to deliver nutrients or medications – such as or other hormones, antibiotics, chemotherapy drugs & pain relievers.
- Some infusion pumps are designed mainly for stationary use at a patient's bedside.
- Others, called ambulatory infusion pumps, designed to be portable or wearable.

STANDARD FORMULA FOR INFUSION RATE:

$$\frac{\text{Volume (mL)}}{\text{Minutes}} \times \text{Drop Factor (gtt/ml)} = \text{Flow Rate (gtt/min.)}$$

PROCESS OF USING INFUSION PUMP:

- Ensure that the machine is plugged properly into suitable electrical socket.
- switch on the machine
- Prepare the materials needed.
- Check for expiry date.
- Fluid the primary / secondary set to IV pump.
- set rate and volume
- Connect the line to the patient

- start infusion
- check safety (machine & keep lime untangled)
- Document amount of fluid given.

CAUTION:

- Do not use on anesthetic patient.
- Do not operate in high pressure oxygen room.
- Do not operate in rooms where chemicals are stored.
- Do not keep in strong sunlight or in any strong light.
- Do not expose it to dust, or in presence of corrosive gas in atmosphere.
- Do not use in area where vibration occurs.
- Do not use it at hot place or splashing water.

MAINTENANCE OF PUMPS:

- Always place pump & supplies on a clean surface.
- Keep food & drinks away from the area around the pump.
- Monitor children when in the pump area.
- Before touching the pump :
    1. Wash hands.
    2. Dry with clean paper towel.
    3. Change tubing according to pump's instructions.
    4. Change batteries or recharge the pump as directed by healthcare provider

SURROUNDINGS:

- Radio transmitters (such as cell phones , wireless hand-held computers , two way radios are sources of strong electric & magnetic interference (EMI), Such as large electric motors, could affect pump .
- Pump users, care givers & others should use caution & keep electromagnetic sources away from pump.

ADVANTAGES:

1. Ability to infuse large & small volumes of fluid with accuracy.

2. An alarm warns of problem such as air in line, high pressure required to infuse, or ultimately, occlusion.

3. Reduces nursing time in constantly readjusting flow rates.

DISADVANTAGES:

1. There may be added cost to therapy.
2. It will continue usually requires special tubing's.
3. To infuse despite the presence of infiltration (Pump alarms for mechanical problems, not physiological problems).

NURSING RESPONSIBILITY:

1. Remember that a mechanical infusion regulator is only as effective as the nurse operating it.
2. Continue to check the patient regularly for complications, such as infiltration or infection.
3. Follow the manufacturer's instructions carefully when inserting the tubing.
4. Double check the flow rate.
5. Be sure to flush all air out of the tubing before connecting it to a patient's IV catheter.
6. Explain the purpose of the device & alarm system. Added machines in the room can evoke greater anxiety in the patient & family.

SUMMARY:

- In these workshop we have seen, infusion devices. Like syringe pump and infusion pump .Definition, features, parts of syringe pump and also application, important points while handling syringe pump.
- In infusion pump, we have seen definition, parts, standard formula for calculating infusion rate, also seen caution, process of using infusion pump, maintenance of infusion pump.
- As we have also seen advantages and disadvantages of infusion devices & nursing responsibility while handling infusion devices.

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