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Essentials of

Critical Care Nursing

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- Covers more than **200+** Nursing Care Plans of critical conditions
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2nd Edition

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Jaya Kuruvilla

Essentials of

Critical Care Nursing

Nursing Knowledge Tree
An Initiative by CBS Nursing Division

For all Nursing Staff of ICU and HDU, UG and PG Nursing Students, PG Diploma students of Critical Care Nursing

Second Edition

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Dedicated to

My students of all time

and

Rebecca and Ivan

my grandchildren

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Preface

During the last two decades, Critical Care Nursing has reached an all-time high as far as its advances in technology and in caring based on scientific developments are concerned. The focus of Critical Care Nursing is to provide care for patients who are experiencing acute physical, physiological and psychological alterations, which occur as a result of the disease process, hospitalization and diagnostic, and therapeutic interventions.

In this book, CCU refers to critical care unit, which may be synonymous to Intensive Care Unit. Critical Care Unit is defined as specially-designed and equipped facility staffed by skilled personnel to provide effective and safe care for patients with life-threatening or potentially life-threatening problems.

Critical care nurses provide care to restore health, alleviate pain and suffering, preserve and uphold the rights and dignity of the individuals and assist those patients in whom the salvageability is impossible to a humane and dignified death.

While working in critical care unit, a nurse keeps the unit always ready, receives the patient to the unit, monitors the alterations, plans and carries out interventions that compensate for altered body functioning, and participates in all diagnostic and therapeutic interventions.

Since the publication of first edition, significant advances have taken place in Medical Science, which have directly impacted the nursing care.

The role of the Nurse has been revolutionized and in many units, autonomy and accountability have improved. Accreditation process has brought about the significance of Nursing into limelight.

The recent pandemic has put nursing profession in the forefront. Considering all the changes that are evident, author felt the need to revise the old edition to the new one. This edition is thoroughly updated and revised.

This book is intended for the students of basic and post-basic programs, Nurse practitioners in CCU and educators to serve as a reference on essential aspects of critical care nursing. Nursing care plan is incorporated into most of the conditions. Different formats of care plan are used to give an opportunity for the reader to be familiar with them.

While giving attention to holistic care of individual with critical illness, other general aspects of management of a critical care unit are also touched upon which would help nurses in taking up additional responsibilities of planning and managing the Critical Care Unit. Chapter on Pharmacology has touched upon briefly the drugs used in CCU. As these drugs undergo rapid revolutions, reader is expected to check on the latest information by the manufacturer or latest work on pharmacology. As for procedure carried out in CCU, the policy of institution, standing orders, protocol and the technical facility available are to be taken into consideration.

Last but not least, Critical Care Nurses at all-time must strive for updating their knowledge continuously through all the resources available to make themselves capable of meeting diversified challenges which they come across in their day-to-day practice.

Dr Jaya Kuruvilla

Acknowledgments

I felt the need to revise the first edition, as there are technical and medical advances happening, which are directly influencing the nursing care during the last few years. Although I anticipated a smoother journey for the 2nd edition, landed up spending much more time than what was anticipated. However the outcome justifies the efforts and I present the second edition here. There are many unique features which are incorporated as much as adding new topics to the contents. Teaching of postgraduate students specializing in Critical Care Nursing has redirected my thought process. I am indebted to the readers of the previous edition who inspired me to complete this edition. I thank the CBS Publishers and Distributors for undertaking this book. Some of the faculty members of P D Hinduja College of Nursing participated in one way or the other. The reviewers especially Dr Mrs Kasturi Adiga from out station found time to do the review and I extend my gratitude to her. Special thanks to Ms Chaithanya Valsalan for the technical assistance for editing.

I conclude by expressing the appreciation received from students and readers of 1st edition, which was the inspiration for the second edition.

I thank the CBS Publishers and Distributors for undertaking this book. I would like to thank **Mr Satish Kumar Jain** (Chairman) and **Mr Varun Jain** (Managing Director), M/s CBS Publishers and Distributors Pvt Ltd for providing me the platform in bringing out the book. I have no words to describe the role, efforts, inputs and initiatives undertaken by **Mr Bhupesh Aarora** [Sr Vice President – Publishing and Marketing (Health Sciences Division)] and I am thankful to him for his help and support.

Last but not least, I sincerely thank the entire CBS team for bringing out the book with utmost care and attractive presentation. I would like to thank Ms Nitasha Arora (Publishing Head and Content Strategist – Medical and Nursing), Dr Anju Dhir (Product Manager cum Commissioning Editor – Medical) for their editorial support. I would also extend my thanks to Mr Shivendu Bhushan Pandey (Sr Manager and Team Lead), Mr Ashutosh Pathak (Sr Proofreader cum Team Coordinator) and all the production team members for devoting laborious hours in designing and typesetting the book.

Nursing Knowledge Tree

An Initiative by CBS Nursing Division

"Coming together is a beginning. Keeping together is progress. Working together is success."

It gives us immense pleasure to share with you that Nursing Knowledge Tree—An initiative by CBS Nursing Division, has successful established itself in the field of nursing as we have been standing as a strong contender by sharing approximately 50% of market share. This growth could not have been possible without your invaluable contribution as our reader, author, reviewer, contributor and recommender, and your outstanding support for the growth of our titles as a whole. Before I enunciate in detail, I would like to thank each and every Clinical Nurse, Academician and Nursing Student for the phenomenal support during the COVID-19 pandemic. It is all your support that instilled a sense of responsibility in us and provided us with strength and motivation to survive under the worst circumstances of the pandemic.

The last two years were the most crucial phase when the entire world stood still due to adversity of COVID-19. The normal life was in turmoil, and people had no idea what would be their next step and how long this crisis would persist. In the midst of all, a few things which nobody could stop is 'Change', which is inevitable. During the last two years, we have done a lot of innovations and put our best efforts in implementing those innovations to bring quality education and make sure that every person should have access to best possible education.

It is worth mentioning that with all your support we have made some remarkable innovations in the field of nursing education, which are:

1. More quality books by the top Authors from the top institutes
2. Entered into Nursing EdTech Segment with NNL App (Nursing Next Live Application)
3. NN Social
4. Phygital Books
5. Social Media Presence
6. Built Strong Community (Faculty/Student Ambassador Program)

As a publisher, we have been contributing to the field of Medical Sciences, Nursing and Allied Sciences and have many established titles in the market. Tradition is carrying forward the legacy of the old pattern and approach in the contemporary time. We broke the boundary of being a traditional publisher through innovations and changes. As far as publishing industry is concerned, we are the first to enter the **Nursing EdTech** with the Launch of **Nursing Next Live App.**

Through Nursing Next Live, we made possible the reach of quality education from Jammu and Kashmir to Kanyakumari and from Gujarat to Arunachal Pradesh.

We started with the mission:

"We are bringing Learning to the People Instead People are going for the Learning."

When pandemic halted everything, the future seemed to be doomed, Nursing Next Live made it possible for the Nursing Professionals across the nation to keep continuing their learning and helped them to achieve their dream career.

In a step toward strengthening the Nursing Segment, we have melded the four important pillars—Print, Digital, Nursing Professionals and Social Media—to work in a homogenized manner for the better future of the nursing education through:

NN Social, a community of 20K+ professionals, is an initiative of Nursing Next Live as India's knowledge-sharing network platform for the nursing segment. Nursing Next Social is curated with the aim to bring all the nursing faculty members across the nation closer and together on a single platform. Through **NN Social**, we aim to connect the sharp minds across the nation to use their knowledge for the better future of Nursing Profession. With NN Social **India's top-notch societies, like TNAI, SOCN, NTA, KINS, etc. are associated with us**. Apart from this, NN Social has a strong network of 100+ authors, 500+ reviewers and contributors. They all are dedicated and committed as we are, toward imparting quality nursing education.

In the era of digitalization, to make study interactive and convenient, we have conceptualized the idea of **Hybrid Edition of the books**. In this series, our many bestselling titles are available in the hybrid form. This hybrid learning is a blended learning wherein printed booklets are thoughtfully integrated with the digital support to reconceptualize the learning method in a more interactive manner with added values to knowledge. Hybrid edition is an endeavor to facilitate the next level of preparation for any nursing competitive exams through quality content, flexibility, customization and engaging interactive learning experiences.

We have also increased our **social media presence** through meaningful and innovative ideas and are committed to assist the nursing professionals in gaining and sharing the knowledge. We have taken the initiative to learn from the experience of the others and started **NNL Talks**. It is a platform where every nursing professional who has done exceptionally well in his/her career, toppers of any Nursing Exams and those who manage themselves in all the odds and stand firm and determined and succeed in his/her life, can share the success journey. We aim to motivate, educate and encourage the nursing professionals through various activities and posts on our social media platform.

Whatever initiative we take, we always make sure that it is for a noble cause of promoting the quality education accessible to everyone.

Today we can say this with confidence, we "CBS Publishers and NNL" have an edge over all other Indian and International Publishers. Our Approach, Vision, Mission, Concept, Content, Reach, Ideas all have a single goal that is better nursing education can lead to a better healthcare system.

Long way to go…. Together!

Looking forward to invite more young and experienced minds who can join us as Authors, Reviewers, Contributors, and Faculties and accomplish our mission of providing quality nursing education to all.

With Best Wishes

Mr Bhupesh Aarora

Sr. Vice President – Publishing and Marketing
(Health Sciences Division)

Special Features of the Book

Learning Objectives given in the beginning of each Chapter will enable the students to know what the students will be able to learn, after reading it.

LEARNING OBJECTIVES

After going through this chapter, you will be able to:

- Review the history of critical care nursing.
- Integrate the principles of critical care nursing.
- Identify the legal and ethical aspects in critical care nursing.
- Design critical care unit.
- Identify the nosocomial infections in critical care unit.
- Implement infection control measures in critical care unit.
- Formulate nursing care plan for critically ill patients.
- Apply nursing process in critical care unit.
- Describe risk factors and related nursing measures to prevent development of pressure ulcers in critical care unit.
- Prepare a framework for understanding death and dying.

CHAPTER OUTLINE

- The Evolution of Critical Care: Historical Perspectives
- Critical Care Nursing
- Principles of Critical Care Nursing
- Scope of Nursing Practice in Critical Care Units
- Legal and Ethical Aspects in Critical Care Nursing
- Role of a Nurse in Critical Care Units
- Planning of a Critical Care Unit
- Nosocomial Infections and Their Control in Critical Care Units
- Psychosocial Components of Care in Critical Care Units
- Nursing Process in Critical Care Unit

Chapter Outline will summarize what the students will learn after studying the chapter.

Numerous **Tables** summarizing important information have been included wherever necessary for quick recall.

Table 1.5: Diseases and catheter-related factors

Underlying diseases	Catheter–related factor
Severe illness with high APACHE score	Clumsy or difficult insertion
Neutropenia	Insertion into the femoral vein or artery
Immunocompromised patient	Poor catheter care
Transplant patient	Occlusive dressing
Prolonged ICU stay	Duration of catheter >7 days
Source of sepsis, e.g., intra-abdominal suppuration	Parenteral nutrition
Massive surgery	
Mechanical ventilation	
Prolonged use of systemic antibiotics	

Important concepts and topics have been supplemented with numerous **Figures/Illustrations/Tables** for easy understanding.

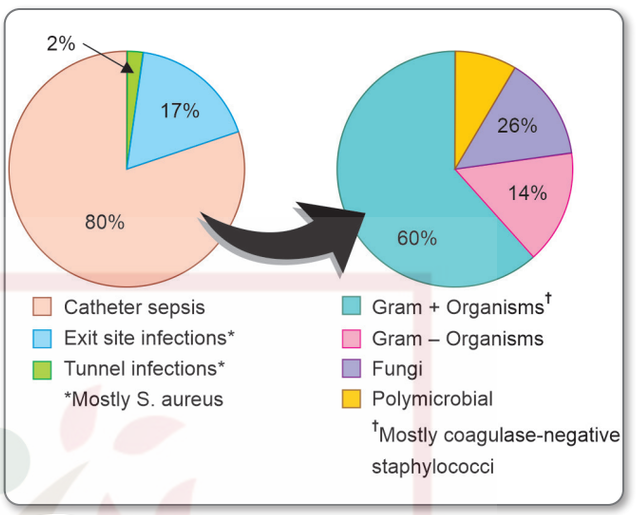

Fig. 1.13: Important risk factors for intravascular device-related bloodstream infections.

MUST KNOW

- The concept of Florence Nightingale, of recognizing the need of keeping serious patients near the nurse's station was the beginning of the 'Intensive Care'.
- Though western countries have gone far too ahead, India is also showing an upward trend in having more critical care units attached to almost all hospitals.
- The need to have specialization in critical care nursing is felt more than ever before. A number of hospitals are conducting short-term courses in critical care nursing. Continuing education in critical care nursing has become part of educational programs in the hospitals.

Must Know facts are covered throughout the book from clinical practice point of view.

ASSESS YOURSELF

1. Discuss the various pressure sore prevention strategies in critical care units.
2. Write short notes on:
   - Risk factors of pressure ulcer
   - Risk assessment
   - Scales used in assessment of pressure ulcers
   - Dressing used in management of pressure ulcers
   - Repositioning
   - Biophysical management of pressure ulcer

Important questions under **Assess Yourself** have been added at the end of every chapter to help the students assess their learning.

CRITICAL THINKING SKILLS

Following a bomb explosion there are three patients at ER. One 15-year-old with hand bruises and two pregnant women with abdominal wound and ambulance arrives with another 80-year-old man who suffered a head injury. You may expect more patients brought from bomb explosion site.

Q. 1. How would you apply the principle of anticipation in preparing to receive the patients to ICU?

This feature offers some food for thought to students and help them **Think Critically** and analytically.

200+ Critical Conditions **Nursing Care Plan** added in the tabulated format from clinical practices point of view.

Nursing Care Plan: Therapeutic management (NPO status)

Nursing diagnosis: Nutrition alteration less than body requirement related to anorexia, critical illness.
Objective: Maintains adequate nutritional status
Expected outcomes: Improves nutritional status

Assessment

- On NPO
- Expresses inability to eat

Nursing intervention

- Monitor food intake and observe the type of food patient can have
- Weigh and note the weight change, loss/gain
- Encourage fluid intake
- Maintain favorable eating environment
- If the patient is not able to eat solid, encourage fluid and nutrients
- Administer enteral feeds/intravenous fluid/ parenteral feeds as ordered
- Maintain intake and output chart

Nursing diagnosis: Sleep pattern disturbance related to anxiety, confusion, and activity, rest imbalance.
Objective: Improves sleep pattern
Expected outcome: Sleeps a minimum of 6–7 hours.

To prevent infection, the tracheostomy site should be cleaned and the inner cannula is changed using aseptic technique while disposable portex tracheostomy. Inner cannula need not be changed but whole set to be changed every 3–4 days.

High yield facts/points have been highlighted in between the text for quick glance.

Special chapter on procedures covers all Critical Condition Procedures for clinical implementation in an effective manner.

Procedures

- Position the patient supine, avoid moving the neck and use only the jaw thrust maneuver or chin lift without head tilt.
- Open the patient's mouth
- Remove dentures and clear away debris
- Insert airway so that concave portions face away from the tongue
- Rotate airway 180 degrees and slid it after inserting to the back of the pharynx.

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Chapter 1

General Aspects of Care

LEARNING OBJECTIVES

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- Coma and Brain Death
- Death and Dying

CRITICAL CARE NURSING

TERMINOLOGY

- **Critical care unit:** It is defined as the unit in which comprehensive care of a critically ill patient who is deemed recoverable is carried out. **Critical care unit** is a specially designed and equipped facility staffed by skilled personnel to provide effective and safe care for dependent patients with life-threatening or potentially life-threatening problems. And then the practical problem of defining the critically ill patient arises.
- **Critical care nurse:** A critical care nurse is a licensed professional nurse, who is responsible for ensuring that acutely and critically ill patients and their families receive optimal care.
- **Critical care nursing:** It is a specialty within nursing that deals specifically with human responses to life-threatening problems. Critical care nursing in any type of unit demands providing best care possible, which requires more than being knowledgeable, highly trained and experienced. One cannot give best care by oneself. Excellent care is possible with the help of others. Successful partnership can bring about wonders in critical care units. The essence of team spirit is the pathway to success in management of most difficult situations in any critical care unit.
- **Critical illness:** It is a life-threatening illness usually associated with cellular hypoxia as a result of cardio respiratory dysfunction leading to multiple organ failure.

THE AIM OF THE CRITICAL CARE

It is to see that one provides a care such that patient improves and survives the acute illness or tides over the acute exacerbation of the chronic illness.

CONCEPT OF CRITICAL CARE NURSING

The concept of intensive care nursing took its root from Florence Nightingale, who is the founder of modern nursing. She placed the seriously ill patients near the nurse's station for closer and better observation and care. During 1970's, the term critical care unit came into practice which covered all types of special care units. Pediatric intensive care units and special care units for babies also came up as it was necessary to have separate units with special equipment and devices for the care of the newborn and children.

Caring for acutely ill patients and their families is a privilege. Nurses have the opportunity to promote optimal outcomes during one of the most vulnerable times in patient's lives. Intensive care units came about as the outgrowth of recovery room. When the surgical techniques advanced, postoperative patients required careful monitoring, and thus came the concept of recovery room where maximum use of medical, nursing and auxiliary personnel is available along with life saving devices.

Advances in respiratory assist devices and cardiothoracic surgery brought advancements of Respiratory Intensive care units. Coronary care units could be the first of its kind available in a very small hospital where patients with coronary heart disease and arrhythmia are treated. With renal transplantation taking a full stride in many hospitals, the renal units came into existence. Then came sub specialty unit for renal dialysis. There are medical intensive care units, surgical intensive care units, burns unit and neurosurgical units in many hospitals apart from the ones mentioned before.

With all these, the concept of intensive care nursing with specially trained nurses and physicians, became well established. Thus biomedical knowledge, new technology and rising public expectation created new pressures and revolutionized the practice of nursing. Critical care unit has its advantages and disadvantages. The advantage is that it provides better and more organized care. The main disadvantage is of a hostile environment contributing to anxiety, emotional stress, loneliness and a greater risk of developing nosocomial infections.

7 C'S OF CRITICAL CARE NURSING

The 7 C's of critical care nursing are illustrated in Figure 1.3.

1. **Compassion:** Compassion is how care is delivered through relationships based on empathy, respect and dignity and can also be defined as intelligent kindness. It is central to how people perceive the care they receive.
2. **Communication:** Communication is central to successful caring relationships and for effective team working, and is the key to an efficient working environment, with benefits for service users and staff alike. Listening is as important as what is said and done.
3. **Courage:** Courage enables us to do the right thing for the service users in our care, to speak up when we have concerns and to have personal strength and vision to innovate and to embrace new ways of working.

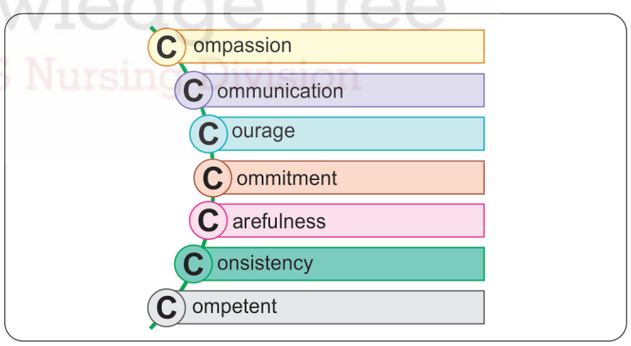


Fig. 1.3: 7 C's of critical care nursing

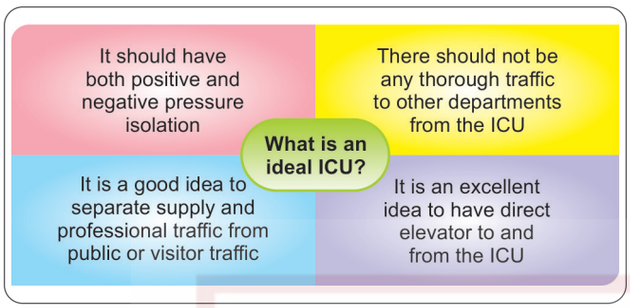


Fig. 1.9: Requisites of an ideal ICU/CCU

- There is a practical problem of restricting the traffic between the two sections. A compromise could be the use of partial cubicle.
- Beds are separated by glass partitions where the patient can be observed from the central nursing station while allowing the infection to contain within itself.

A MODEL CCU ROOM

The critical care unit can be X-shaped or U-shaped or semicircle so as to have good observation.

The design of the unit should take into consideration the integration and smooth functioning of three areas of importance, the patient area, the staff area mainly for doctors and nurses and the support area (Fig. 1.10).

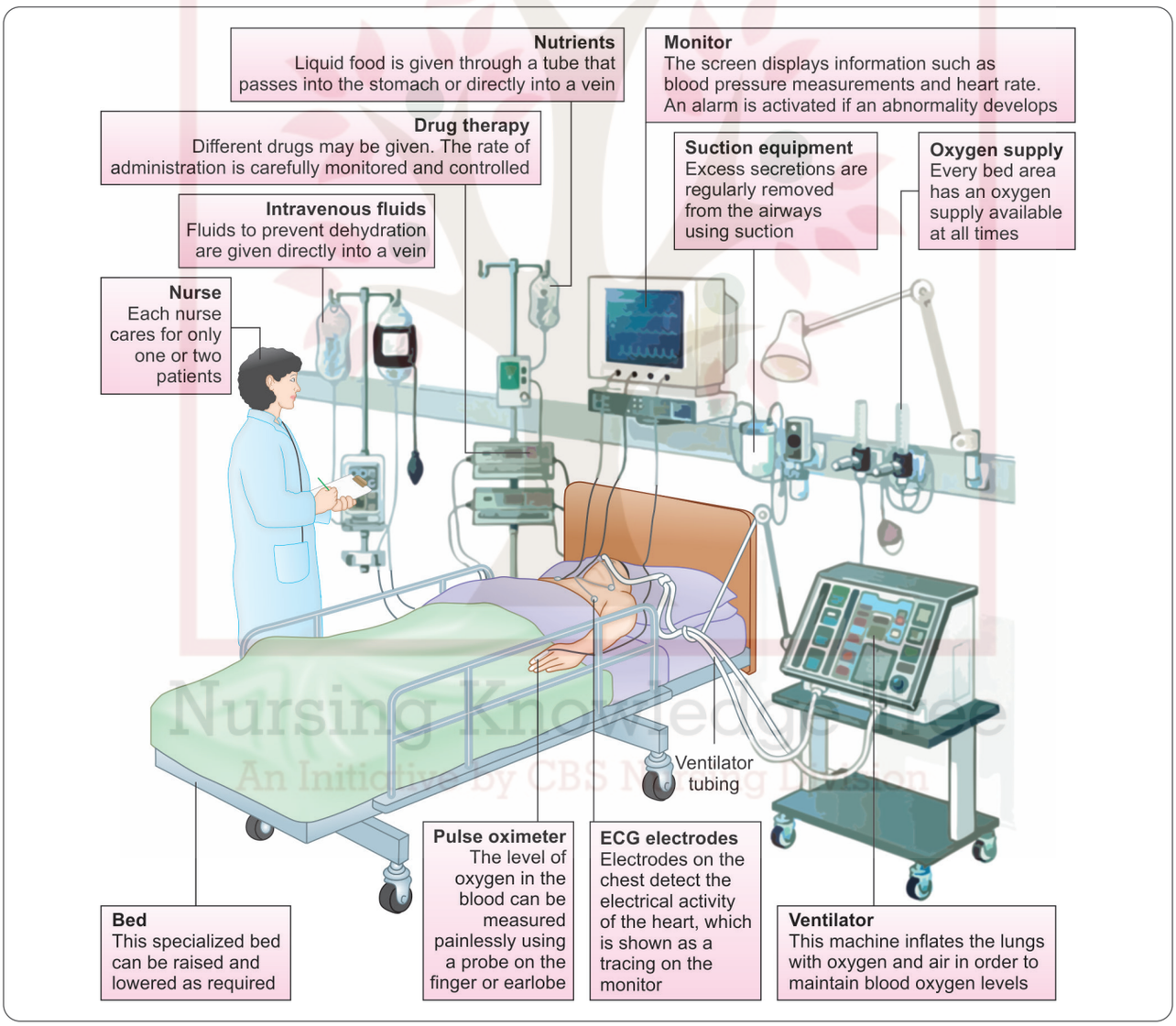


Fig. 1.10: Model CCU setup

ICU, reducing waste or saving energy may not be top of mind. To other nurses, who work hard to reduce waste, recycle, save energy, and water at home, it can be frustrating experience to come to work and recognize the amount of resources use inherent in their daily work. Learning more about the links between resources use and health can help provide guidance and support for changing the ways we practice.

HEALING ENVIRONMENT

The ICU, where you find the most vulnerable, critically ill patients in the hospital, can actually be among the areas which are least conducive to healing. It is a fast paced, noisy environment that may increase the stress for the patient and family and decrease their ability to heal. Besides increasing the health and well-being of patients and visitors, a healing environment may increase staff satisfaction and improve retention and commitment to the job.

MANAGEMENT POLICY

Management policies and procedures are essential to the effective and efficient operation of the critical care unit.

It should include the following aspects:

- The patients to be served by the critical care unit
- The type of CCU services provided
- Relationship of CCU to other units and departments
- Management of the unit
- Admission and discharge criteria
- A system of informing the physician about the changes in the condition of the patient
- Use of standing orders
- Location and storage of medication supplies and special equipment
- Method of care delivery
- Method of procurement of drugs, equipment and other supplies
- Responsibility for maintaining the emergency drug system
- Regulation regarding visitors to the unit. It should be geographically closely associated with emergency department, operating theater, recovery room and other intensive care areas. Design and the facilities depend on the size and the type of services provided.

MUST KNOW

- Critical care units are of different levels depending on the staffing and support services.
- They are either general units or specialized units depending on the type of patients catered to. Critical care services require specialized facilities and equipment especially trained nursing staff, medical staff and wide range of support services.
- Design and location and number of beds are chosen carefully to ensure safe and effective patient care.
- Environmental sustainability is yet another area where nurses can be change agents in bringing out a healing environment for the patients, significant others and the staff working in CCU.
- It is also important to offer cost effective care to the clients needing critical care.
- Nurse has to be assertive to involve herself in planning the unit, purchasing and in maintaining the Unit.
- Standard operating procedures, policies and protocol can be developed for running the unit smoothly while ensuring quality.

ASSESS YOURSELF

1. Write the role of the nurse in planning a CCU.
2. Write short notes on the following:
   - Levels of critical care units
   - Calculation of optimal number of beds for a CCU
   - Facilities required in a critical care unit
   - Monitoring equipment
   - Resuscitative equipment
   - Staffing
   - Environmental sustainability in CCU

CRITICAL THINKING SKILLS

Q. 1. What key components will you consider while designing a 40-bedded critical care unit?

transducer are ready to be connected. The IV infusion devices are set up. The patient has an altered LOC, therefore, a neuro check and potential insertion ICP monitoring, hand light is ready. Once again she checks if she has all the equipment ready for insertion of ICP catheter if Physician decides to perform after the CT.

She says to her "I think I am ready".

Along with assessment of the patient it is necessary to complete a family need assessment.

Evidence-Based Practice: Family Needs Assessment

Assessment of critically ill with different systems using correct map is given in Figure 1.23.

Assessment of respiratory system is shown in Table 1.33.
Assessment of cardiovascular system is given in Table 1.34.

Quick Assessment
a. Offer realistic hope
b. Give honest answers and information
c. Give reassurance

Comprehensive Assessment
a. Use Open ended questions and assess the communication style
b. Assess of level of anxiety
c. Assess perception of the situation
d. Assess family roles and dynamics
e. Assess coping mechanisms and resources

Compiled from Leske (2002) Raleigh et al. (1990) Roman et al. (1995) Sabo et al. (1989)

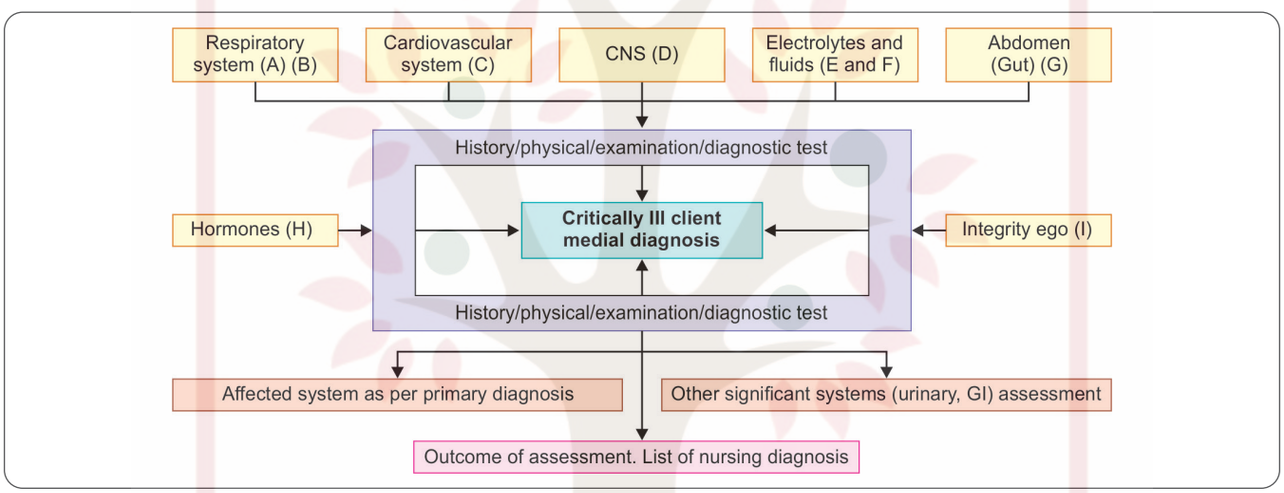


Fig. 1.23: Assessment of critically Ill—different systems using concept map

TABLE 1.33: Assessment of respiratory system

History	
• Presenting complaints • Environmental exposure • Risk factors	• Smoking • Past significant medical history • Family history, e.g., cystic fibrosis
Airway	**Breathing**
Patency obstruction partial or complete. Is airway protected? **Air entry:** Equal bilateral (MV patient) **Assessment** • Use of accessory muscles. • Complete airway obstruction results in paradoxical chest and abdominal movements. • Noisy breathing is indicative of partial airway obstruction. • Expiratory wheeze indicates lower airway dysfunction as it results from airways collapsing during expiration. • **Gurgling:** Presence of secretions • **Inspiratory:** Stridor indicates obstruction above larynx • By placing the back of your hand in front of patient's mouth you can detect presence of air flow.	• **RR:** Be concerned if >30 or <8 chest expansion equal, cyanosis yes/no • Pulse oximetry SpO_2 >90%? • Once air way management is completed, focus on life-threatening causes of respiratory deterioration. **E.g.**, Tension pneumothorax, massive hemothorax, pulmonary edema, acute severe asthma • Does the patient look distressed? Use of accessory muscles? Sternomastoid and scalene. • Can they talk? • **RR:** Important (often neglected) central and or peripheral cyanosis. • Abdominal distension.

Contd...

- **Heart size:** Identifying its location assesses the size. The apical beat is heard at the fifth intercostal space in the midclavicular line. A shift to left or right indicates left ventricular enlargement. The first heart sound (S1) is heard best over the base of the heart indicating the beginning of systole. The second heart sound is heard at the base and indicating the beginning of diastole. The abnormal heart sounds are a third heart sound known as ventricular gallop.
  - S1 and S2 together sound like the syllables LUB, DUB.
  - S1 is louder at the apex and S2 at the base.
  - S3 sound follows closely after S2.
  - The sound of S3 is produced when the blood in the ventricles hits against the noncompliant walls of damaged myocardium.
- **Cardiac rhythm:** Dysrhythmias are common after myocardial infarction. Dysrhythmias result in reduction in cardiac output, hypertension and reduction of perfusion to vital organs. Most common dysrhythmias are premature ventricular contraction, ventricular tachycardia, ventricular fibrillation and bradydysrhythmias.

A cardiac monitor is used continuously to assess heart rate, rhythm and contraction. When there is marked change in the rhythm, a 12-lead ECG is taken.

- **Peripheral pulse:** Rate, rhythm and volume are assessed. Rapid regular but weak pulse indicates reduced cardiac output. A slow pulse indicates heart block. An irregular pulse indicates dysrhythmias.
- **Fluid volume status:** Strict intake and output is maintained. Observe for edema.
- **Bowel sounds:** Reduced bowel motility may indicate mesenteric artery thrombosis.
- **Lung sounds:** Auscultation of the lung sounds is frequently done.

Nursing care plan for a patient with acute myocardial infarction has been shown Table 2.21.

TABLE 2.21: Nursing care plan for a patient with acute myocardial infarction (All medications administered as per Medication order)

Nursing diagnosis
Pain related to inadequate myocardial tissue perfusion (e.g., angina, infarction, thromboembolism), inflammation (e.g., pericarditis, chest wall myalgias, hiccuping, gastrointestinal problems) as evidenced by patient reporting of pain, guarded position, increased pulse, blood pressure and respiration **Goal:** Pain is reduced
Expected outcome
The patient notifies nurse immediately of recurrence of pain
Nursing interventions
1. Assess carefully every patient ▪ Look for the following: ◆ A change in the patient's heart rate, respirations, and blood pressure ◆ A change in the patient's temperature and color of the skin ◆ A change in the patient's mental state ▪ The development of left ventricular failure (Tachydysrhythmias shorten ventricular filling time and thus decrease the cardiac output, and coronary blood flow. Bradydysrhythmias decrease the cardiac output and they can allow dangerous tachydysrhythmias to take over). ▪ Give medications as ordered for ventricular dysrhythmias (e.g., lidocaine, quinidine, digoxin, procainamide, diphenylhydantoin, tocainide, flecainide, and bretylium). ▪ Be aware of potential toxicity if cimetidine and lidocaine are used together. ▪ Be aware of the patient's ECG pattern and be on the alert for changes in the ST segment and for dysrhythmias. (The "emergency" dysrhythmias are ventricular fibrillation, ventricular tachycardia, asystole and complete heart block. They should be treated according to the standing coronary care unit orders.) ▪ Report any significant changes or persistent dysrhythmias to the physician. **2. Evaluate patient's chest pain** • **Assess the following:** ▪ Type (squeezing, constrictive, steady, heavy, dull, intermittent, or crescendo) ▪ Location (midsternal, radiating, or left precordial) ▪ Whether relieved by meperidine hydrochloride, morphine, or small or large doses of sublingual nitroglycerin. ▪ Severity (have patient grade pain on scale of 1–10). ▪ Effects (diaphoresis, nausea and vomiting, or anxiety). • Assess all patients often to see whether they are in pain. Some patients may be reluctant to tell the nurse they are in pain. • Watch for signs and symptoms of extension of myocardial infarction with recurrence of chest pain after initial relief. • Check the patient's vital signs before giving narcotics (narcotics cause hypotension due to venous pooling of blood). • Reassure patients often and help them during periods of pain. These kinds of support may help them feel positively about recovery.

Contd...

Nursing diagnosis

Decreased cardiac output related to electrical factors (dysrhythmias), mechanical factors (infarct extension, preload, afterload, inotropic factors), and structural factors (papillary muscle dysfunction, or tear and aneurysm) evidenced by low blood pressure, rapid pulse, restlessness, cyanosis, dyspnea, angina, dysrhythmia, oliguria, fatigue, vertigo, edema (exchanging pattern)
Goal: Maintains normal cardiac output.

Expected outcome 1 (Electrical factors)

- The patient demonstrates nonelectrical heart rhythm that would alter cardiac output. The following can occur: bradyarrhythmias, dysrhythmias; bundle branch blocks; sustained ectopy; aberrancy; first, second, or third-degree heart blocks; or atrial junctional, or intraventricular conduction disturbances.
- Should electrical abnormalities occur, the patient will be diagnosed early?
- Early treatment will prevent decompensation.

Nursing interventions

- Maintain a patent IV line at all times.
- Know what antidysrhythmia drugs need to be given for specific dysrhythmias.
- Know the effects that antidysrhythmia drugs have on the patient and on the QRS complex, as shown on the ECG.
- Give medication only if essential for bradyarrhythmia and treat it with an external pacemaker if necessary.
- Give medications for ventricular dysrhythmias as ordered.
- If atrioventricular block appears first with anterior myocardial infarction, watch for first-degree heart block and Mobitz type II heart block for the development of intraventricular conduction disturbances.
- If Mobitz type II heart block appears, have available a function temporary pacemaker and an isoproterenol drip.
- Anticipate third-degree heart block if the patient has an idioventricular rhythm.
- **If a temporary pacemaker must be inserted, follow these steps:**
  1. Explain the procedure to the patient.
  2. Have the procedure permit signed by the patient or a member of the family.
  3. After the insertion of a pacemaker, evaluate the pacemaker's functioning and the patient's rhythm. Record the rate, mode, and milliampere setting of the pacemaker on the patient's chart and on the care plan as ordered by the physician.
  4. Confirm placement with X-ray.
- If cardioversion is necessary in an emergency or for a dysrhythmia not corrected by medication, prepare for cardioversion.
- **In preparing for cardioversion, follow these steps:**
  1. Explain the procedure to the patient in simple terms.
  2. Prepare the patient for sedation or anesthesia.
  3. If possible, discontinue digoxin for 1–2 days before the procedure.
  4. Give quinidine or any other antidysrhythmia drug as ordered.
  5. Have the procedure permit signed.
  6. Make sure that the patient is fasting.
  7. Have emergency drugs available.

When cardioversion is to be performed, follow these steps:

1. Place the patient in a supine position.
2. Remove the patient's dentures.
3. Secure the electrodes to the patient's chest and obtain a rhythm strip before cardioversion. (It is preferable to get a rhythm strip from a 12-lead ECG.WWWw)
4. Place conductive pads on the paddles.
5. Set the cardioverter on synchronization.
6. Set the cardioverter to the desired voltage.
7. Charge the cardioverter to the desired voltage.
8. Position the paddles, using two anterior paddles or an anterior paddle and a posterior paddle.
9. Apply firm pressure to the paddles.
10. Avoid contact with wet areas and make sure no one is in contact with the patient or bed while the physician performs the cardioversion.
11. Obtain a 12-lead ECG after the cardioversion.
12. Anticipate the possible complications—further instability and systemic or pulmonary embolism.
13. Remain until the patient is stable and fully awake.
14. Observe the patient closely for 2–3 hours after the Cardioversion.
15. Allow the patient to resume oral intake and drugs 1 hour after the cardioversion.
16. If defibrillation for ventricular dysrhythmia is necessary, follow the steps for cardioversion, except turn off the synchronizer circuit and turn on the defibrillator circuit. (Because the patients are unconscious, the procedure is not explained to them.)

Contd...

Expected outcome 2

The patient experiences no complications of antidysrhythmias, medications, cardioversion, or pacemaker when needed.

Nursing interventions

If pacemaker is required:

- Assess function.
- Continue to assess patient's vital signs, ECG, anxiety, fear.

Expected outcome 3

The patient shows mechanical function, normal vital signs; demonstrate normal and hemodynamic stability with normal preload, afterload, and myocardial contractility.

Nursing interventions

Protect ischemic myocardium to prevent infarct extension by minimizing myocardial oxygen demand by the following:

- Avoid increase in heart rate and contractility from medications, exercise, fever, pain, fluid volume deficit, tachydysrhythmias and anxiety.
- Avoid increase in ventricular wall tension, especially afterload related to hypertension, epinephrine, hypothermia and stress.
- Be prepared to initiate thrombolytic therapy if the infarct began 4 or fewer hours previously.

1. Screen for the following contraindications:

- Active internal bleeding.
- History of cerebrovascular accident.
- Intracranial or intraspinal surgery or trauma within 2 months.
- Intracranial neoplasm, atrioventricular malformation, or aneurysm.
- Known bleeding diathesis.
- Severe uncontrolled hypertension.

2. Prepare for agent administration as follows:

- Start two intravenous lines using a minimum of venous punctures.
- Draw coagulation parameters.
- Obtain a baseline ECG.

Nursing Diagnosis

Injury potential for complications, related to therapeutic procedures

Expected Outcome

1. Patient remains free of complications

Nursing Interventions

1. **Administer the following medications as per order:**
   - Administer lidocaine to prevent reperfusion arrhythmias.
   - Administer steroids and antihistamines to avoid anaphylaxis with streptokinase.
   - Administer heparin to prevent acute reocclusion.
   - Administer 1.25 mg/kg recombinant t-PA-over 3 hours.
   - Administer 10% of the total dose as an intravenous bolus over 1–2 minutes to open the occluded artery.
   - Administer 60% of total dose in first hour.
   - Administer 20% in second hour.
   - Administer remainder in third hour.
2. **Administer the intravenous streptokinase dose of 1.5 million IU over 30–60 minutes.** Intracoronary dose of 25,000–50,000 IU, bolus followed by 2000–4000 U/min infusion over 60 minutes.
3. **Administer 2–3 million units of urokinase as an intravenous bolus over 30 minutes.** If given as intracoronary dose, 4000 to 8000 U/min is the maintenance infusion.
4. **Assess for the following evidence of reperfusion:**
   - Return of elevated ST segments toward baseline (most reliable indicator)
   - Angiographic evidence of patency.
   - Resolution of chest pain.
   - Reperfusion dysrhythmias.
5. **Monitor closely for the following complications:**
   - Hypotension (in 15% of patients receiving streptokinase)
   - Anaphylaxis, which may occur with streptokinase.
   - Major and minor bleeding:
     - Assess for changes in neurologic status and level of consciousness that suggest intracerebral bleeding.
     - Assess blood pressure and heart rate frequently as measures of internal bleeding.
     - Surface bleeding from puncture and invasive sites is common and can often be controlled with pressure.

Contd...

6. Be prepared to initiate other approaches to protect ischemic myocardium:
- Nitrates optimize preload and decrease afterload.
- β-blockers decrease myocardial contractility.
- Diltiazem may prevent reinfarction.
- Glucocorticoids increase infarct size and are contraindicated in the early stages of acute MI.

Nursing diagnosis: Injury potential for complications

Expected outcome 1

The patient shows no signs of hypotension, hypoxemia, and pain, shortness of breath, dyspnea, tachycardia, orthopnea, rales, and S3 gallop, diffuse point of maximal impulse (PMI), neck vein distention, hepatic enlargement, or peripheral edema (congestive heart failure).

Nursing interventions

Watch for signs of CHF and treat it early if it occurs.
- Assess for the following:
  - Diminished first heart sound and second heart sound. The development of a third heart sound may be sign of CHF.
  - The development of a murmur or a change in an existing murmur.
  - Gallop rhythms.
  - Coughing.
  - Dyspnea.
- Provide cardiac rest for the patient: semi-Fowler's position.
- Give oxygen via a face mask or cannula.
- Give diuretics as ordered and watch for side effects.
- Anticipate further complications of CHF and the onset of pulmonary edema:
  - Check the patient's vital signs.
  - Observe the patient for an increase in dyspnea or coughing.
  - Place the patient in a high Fowler's position. (Preload is reduced quickly by pooling blood peripherally without significantly reducing the stroke volume. Assign of CHF afterload is reduced by dilating the peripheral arteries and thus reducing the left ventricular end-diastolic pressure.)
- **Anticipate the need for the following items and have them available:**
  - Vasodilators.
  - Diuretics.
  - Morphine sulfate.
  - Aminophylline.
  - Advanced life support equipment.
- **Optimize preload by administering diuretics as ordered:**
  1. **Assess effectiveness:**
     - Weigh the patient at the same each day.
     - Maintain accurate records of intake and output.
     - Monitor fluid restrictions.
  2. **Watch for side effects:**
     - Weakness and muscle cramps.
     - Hypovolemia.
     - Electrolyte depletion, especially hypokalemia.
  3. Use caution when giving digitalis due to increased risk of toxicity associated with CHF.
- **Decrease afterload by giving vasodilators (e.g., IV nitroglycerin or nitroprusside)**
  - Watch for hypotension.
  - Prepare for hemodynamic monitoring to regulate drugs.

Expected outcome 2

The patient shows no signs of hypotension, tachycardia, and urine output below 30 mL/hr, mental confusion, decreased peripheral perfusion, or abnormal blood gas analysis (cardiogenic shock).

Nursing interventions

- **Be alert to the following signs of cardiogenic shock:**
  - A systolic pressure <90 mm Hg (or unobtainable).
  - A drop of 20–40 points in systolic pressure in a patient who has been hypertensive is significant
  - Pallor or cyanosis.

Contd...

- A rapid, thready pulse or an imperceptible pulse.
- Cool, clammy skin.
- Collapsed, constricted, agitation, or confusion.
- Mental dullness, restlessness, agitation, or confusion.
- Decreased urinary output.
- Oliguria (a urinary output of <30 mL in 1 hour).
- Anuria (no urinary output).

- **If cardiogenic shock is present, follow these steps:**
  1. Establish and maintain an airway.
  2. Give oxygen by nasal cannula or face mask. Before giving oxygen, find out if the patient has a history of chronic respiratory disease. If the history is positive, give oxygen at low-flow rates (2–3 L/min) to maintain the hypoxic drive to breathe.
  3. Coordinate and maintain mechanical ventilation if needed.
  4. Obtain filling pressures hourly.
  5. Maintain the patient's arterial blood pressure with vasopressors (E.g., dobutamine, dopamine) as ordered.
  6. Establish and maintain a fluid and electrolyte balance, using a crystalloid solution, volume expanders, or an electrolyte infusion.
  7. Administer medications to correct rhythm disturbances as needed.
  8. Anticipate the patient's needs by providing quiet and efficient care, by relieving anxiety, and by positioning the patient comfortably.
  9. Anticipate the need for IABP
- **Evaluate the effectiveness of treatments given for CHF and cardiogenic shock by systematically assessing the patient as follows:**
  - Listen to the lungs for air movement, crackles and rhonchi.
  - Assess arterial blood gases.
  - Assess cardiac output.
  - Assess urinary output.

Expected outcome 3

The patient shows no signs of tachycardia, hypotension, muffled heart sounds, pulsus paradoxus, or ECG evidence of electrical alternans tachycardia, or decreased QRS complex voltage (cardiac tamponade).

Nursing interventions

- **Be alert to the possibility of cardiac tamponade.**
  - If cardiac tamponade is suspected, check for Kussmaul's sign, distention of the neck veins on inspiration.
  - Check for pulses paradoxus. If it is >10 mm Hg, pericardial tamponade should be suspected.
  - If pericardial effusion develops rapidly, watch for signs of a decrease cardiac output.
  - Watch for ECG changes (electrical alternans, tachycardia, or decrease in QRS complex voltage).
  - Watch for muffled heart sounds, hypotension and orthopnea.
  - Have emergency equipment at hand.

Expected outcome 4

The patient maintains structural integrity without sudden signs of heart failure.

Nursing interventions

Assess for signs of Heart Failure (Hypotension,Hypoxemia, Pain, shortness of breath, dyspnea, tachycardia,orthopnea, rales, S3 Gallop, diffuse PMI, Neck vein distention, hepatic enlargement, or peripheral edema)

Expected outcome 5

The patient demonstrates no systolic murmur, left-sided heart failure, or pulmonary edema (papillary muscle rupture or dysfunction).

Nursing interventions

Assess for the following signs of papillary muscle dysfunction or papillary muscle rupture:

- Transient systolic murmur at apex (papillary muscle dysfunction).
- Sudden onset of pulmonary edema with sudden loud holosystolic murmur (papillary muscle rupture) and hypotension.
- Prepare for hemodynamic monitoring and administration of vasodilators.
- Prepare for intra-aortic balloon counterpulsation and cardiac surgery, if necessary.

Expected outcome 6

The patient demonstrates no pansystolic murmur, hypotension, or heart failure (ventricular septal rupture).

Contd...

Nursing interventions

Assess for the following signs of ventricular septal rupture:

- Loud holosystolic murmur at lower left sternal border with palpable thrill.
- Varying degrees of CHF to extreme of pulmonary edema.
- Hypotension.
- Prepare for cardiac catheterization and intra-aortic balloon counterpulsation.

Expected outcome 7

The patient demonstrates no persistent ST-segment elevation in precordial leads, no outward systolic impulse medial or superior to PMI, or no activity intolerance (ventricular aneurysm)

Assess for the following signs of ventricular ST-segment elevation in precordial leads, aneurysm:

- Persistent ST-segment elevation in precordial leads.
- Prolonged palpable outward systolic impulse medial to PMI.
- Persistent ventricular dysrhythmias.
- Persistent asymptomatic or symptomatic heart failure.
- Prepare for cardiac catheterization or cardiac surgery, if indicated.

Nursing diagnosis: Potential for complications, pericarditis, thromboembolism
Goal: Develops no complications

Expected outcome 1

The patient verbalizes absence of pericardial pain.

Nursing interventions

Assess for pericarditis during acute hospitalization as follows:

- Listen with diaphragm of the stethoscope for a friction rub.
- **Be aware of the following persistent clinical symptoms:**
  - Pain in the precordial area (mild to sharp or severe). The pain may be relieved when the patient leans forward and may increase with deep breathing or chest rotation.
  - Dyspnea or tachypnea.
  - Fever, chills, sweating (which may be masked by salicylates).
  - Four stages of ECG changes.

Expected outcome 2

The patient is free of pain caused by thromboembolism.

Nursing interventions

Watch for the following signs of thromboembolism:

- Loss of pulses in the lower extremities (if pulses were present when the patient was admitted).
- Cold, mottled, painful extremities.

Expected outcome 3

The patient demonstrates no signs and symptoms of pericarditis.

Nursing interventions

Watch for signs and symptoms of chest pain related to pericarditis or pericardial friction rub, fever, pleuritis, pneumonitis, chest wall tenderness.

Nursing diagnosis: Anxiety (mild, moderate, severe) related to CCU regimen, acute illness, or fear of death as evidenced by stated feelings of apprehension, helplessness, nervousness, fear, tension, irritability, angry outbursts, crying, criticism, withdrawal, inability to concentrate, ruminating, insomnia, and restlessness (feeling pattern).
Goal: Reduces anxiety.

Expected outcome 4

The patient and family verbalize feelings, learn relaxation and imagery techniques to reduce anxiety, and show a reduction in anxiety.

Nursing interventions

- **Prevent and treat potential anxiety by doing the following:**
  - Establish rapport with the patient.
  - Explain the CCU regimen.

Contd...

- Evaluate the patient's emotional response to the illness.
- Evaluate the patient's understanding of the information given.
- Allow time for questions and feedback.
- Beware of any distress or depression that the patient shows, and respond to these feelings.
- Allow 60- to 90-minute periods of uninterrupted sleep to decrease sleep deprivation and facilitate coping. Encourage naps in the morning so that afternoon naps with predominately stage 4 deep sleep do not interfere with night-time sleep.
- When explaining physical limitations, avoid being overly cautious and frightening patients.
- Explain the CCU regimen (e.g., bed rest, monitoring, IV lines, light diet) to decrease the unknown.
- Talk freely with the patient about anxieties.

- Allow time for the patient to give the nurse information about routines and daily activities.
- Ask open-ended questions about the patient's feelings and knowledge of MI.
- Beware of the patient's mental state as concerns are expressed. The patient may reveal one of the following states:
  - **Denial:** Ignores symptoms (e.g., avoids discussing the MI).
  - **Isolation or repression:** Seems unafraid or unconcerned about the illness.
  - **Displacement:** Complains about relatively unimportant matters (e.g., noise, food, or air conditioning).
  - **Projection:** Talks about the anxieties of relatives but not about his own anxieties.
  - **Rationalization:** Blames the MI on hard-work rather than on smoking, obesity, high blood pressure or cholesterol levels, or other risk factors.
  - **Hallucinatory or delusional behavior:** Shows symptoms of delirium, agitation, hallucination, delusion, or mania (accuses the staff of trying to poison him or her).
- Help the patient to develop trust in the nursing staff.
  - Include the patient in routine decisions when appropriate.
  - Give frequent explanations to the patient about progress and give specific information about present condition. Do not make polite, evasive remarks (e.g., "You're okay").
  - Spend some time alone with the patient each day so that he or she can express thoughts and feelings as soon as they occur. The extra time allows the nurse to learn more about the patient's concerns, whether verbalized or expressed without words.
  - Allow time to receive feedback from the patient.
  - Allow the patient's spouse or significant others to help the patient with some daily activities or to give special instructions. Beaware of family hierarchies and allow family and significant others to be helpful.
  - Make sure that the patient understands the rehabilitation program.
- Help the patient work though the common responses to MI: anxiety, denial, withdrawal or depression, aggressive sexual behavior.
- Teach relaxation and imagery techniques. Use music tapes, relaxation tapes, and drawing materials to enhance the experience.

Nursing diagnosis: Activity intolerance related to myocardial ischemia, illness, physical deconditioning from rest evidenced by dyspnea on exertion, shortness of breath, excessive increase or decrease heart rate, blood pressure, and respiratory rate with activity that fails to return to normal after 3 minutes, rhythm change, weakness, pallor or cyanosis, confusion, vertigo (moving pattern).
Goal: Maintains normal activities

Expected outcome 1

The patient experiences minimal activity intolerance.

Nursing interventions

- **Encourage patients to perform the following activities of daily living as tolerated:**
  - Allow men to stand to void unless specifically contraindicated by physical condition or femoral support lines.
  - Allow patients to use bedside commode or the bathroom rather than the bedpan. Using the bedpan puts more strain and workload on the heart than getting out of bed to use the commode or bathroom.
  - Explain the need to avoid sudden physical effort and isometrics.
  - Teach the patient how to turn from side to side in bed without overexerting.
  - Adhere to principles of progressive activity. Explain the need for graduated supervised levels of activity.

Expected outcome 2

The patient experiences no adverse effects of early mobilization (infarct extension)

Nursing interventions

Note factors influencing the ability to be active, the following Nursing Care Plan Summary, such as the following:

- Medications.
- Body weight.
- Time on bed rest.
- Size of the infarct (note maximum CK level and MB-CK percentage).

Contd...

- Age.
- Time since a meal or procedure.

Evaluate the patient's tolerance of activity by monitoring the following:

- Blood pressure response.
- Dysrhythmias.
- Pain.
- ECG changes.
- Dyspnea

Nursing diagnosis: Knowledge deficit related to acute and chronic illness as evidenced by a verbalized in knowledge or skill, expressions indicating inaccurate perceptions of health status, performance of a health behavior, and noncompliance with prescribed health behavior pattern.

Goal: Gains adequate knowledge.

Expected outcome 3

Patient and family demonstrate care knowledge and skills of risk assessment how to take pulse, medications, progressive activity schedule, and compliance with medical regimen and care.

Nursing interventions

- Assess readiness to learn by evaluating stress responses and ability to retain information given.
- Evaluate present knowledge level and adjust instructional level to meet needs of the individual.
- Encourage experiential input from patient and family during instruction.
- Teach the patient and family about the following:
  - Basic anatomy and physiology of the heart.
  - Risk factors and reduction.
  - Activity schedule and pulse record.
  - Return to sexual activity.
  - Diet.
  - Stress management and stress reduction techniques.
  - Medications (name, dosage, frequency, action, side effects).
  - Symptoms requiring immediate attention.
  - Follow-up information.
- Evaluate potential compliance problems.
- Implement a system of follow-up.

MUST KNOW

The knowledge of anatomy and physiology helps in assessment and understanding the pathophysiology of disease conditions. The investigations are blood studies, ECG, echocardiography and many more. Hemodynamic monitoring can be invasive and noninvasive. The use of electrophysiological studies and estimation of cardiac markers have come a long way to diagnose cardiac events with more precision at an early stage. The knowledge of risk factors especially modifiable ones can be used as a base for prevention of cardiac events and can be included into the Teaching plan for patients at risk and general population.

ASSESS YOURSELF

1. Distinguish between modifiable and nonmodifiable risk factors of myocardial infarction.
2. List the treatment guidelines for acute myocardial infarction.
3. Briefly discuss the pathology of acute myocardial infarction.
4. Monitoring of patients with myocardial infarction.
5. Discuss the thrombolytic therapy.
6. Prepare a care plan for a patient aged 48 who is an executive in a company admitted with myocardial infarction.
7. Explain the acute coronary syndrome (ACS).

CRITICAL THINKING SKILLS

Below you will find a case study and several practice questions to test your knowledge after reviewing this chapter.

- Mr Mohammed Ahmed is a 59-year-old male, who has presented to his local hospital with severe central, crushing chest pain. He has a past medical history of diabetes, hypertension and a high body mass index. On admission to hospital, Mr Ahmed's ECG, clinical presentation and blood results confirm a diagnosis of an inferior ST elevation myocardial infarction (STEMI), then proceeds to the cardiac catheterization lab for primary percutaneous coronary intervention (PPCI). During the procedure, the cardiac catheterization lab team notes a cardiac rhythm change:

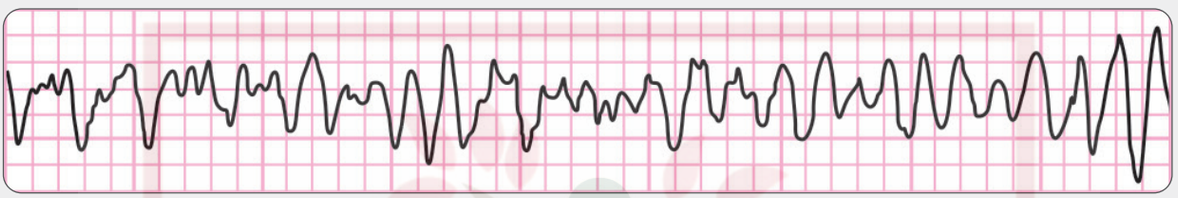


Fig. 9.35: Third degree heart block

This rhythm change is treated immediately and the patient returns to normal sinus rhythm (NSR) at a rate of 90 beats/min. Following the procedure, Mr Ahmed is transferred to the cardiac care unit (Figs 9.35 and 9.36). He recovers well following his STEMI and PPCI, however the following day a further rhythm change is noted by the nursing team:

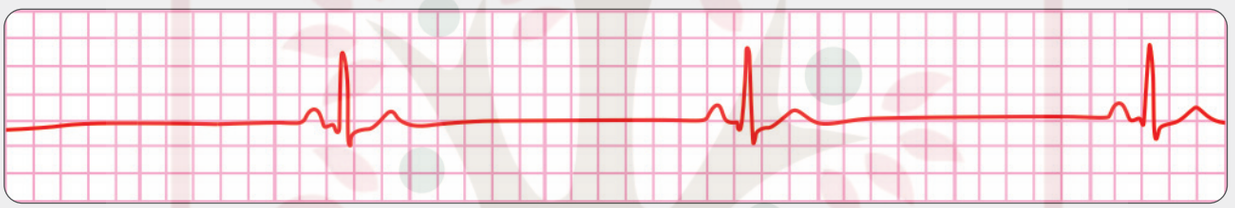


Fig. 9.36: Third degree heart block

Mr Ahmed becomes symptomatic with this new cardiac rhythm, with profound hypotension (BP of 68/45 mm Hg) and a reduced level of consciousness. The physician attends and requests emergency interventions.

AIRWAY MANAGEMENT

AIRWAY MANAGEMENT WITH MASK AND BAG

Control of airway with bag and mask is the most important technique in hospital resuscitation to ensure proper patient oxygenation.

Indications

- Cardiopulmonary failure.
- Respiratory failure.
- Stridor or partial obstruction of the upper respiratory tract.

Equipment

- Bag and Mask
- Oxygen with flowmeter
- Oxygen tubing
- Suction apparatus

Position

Head to be positioned in such a way to relieve obstruction. Advancement of the mandible downward and outward translocates the temporal mandibular joint.

Procedures

- Clear the airway of dentures and debris.
- Turn the head to one side and remove manually.
- Select the appropriate size mask. A comfortable fit is to be achieved.
- Position the head correctly, place the mask over the nose and mouth and form a firm seal with the left hand.
- Connect to 100% oxygenation concentration *via* cylinder or wall unit.

- Ventilate with the right hand at a rate of 10–15/min with an inspiratory ratio of 0:5.
- Observe chest movement.
- Repeat until adequate oxygenation is achieved.

Complication

Insufflation of the stomach can occur with excessive positive bag pressure resulting in regurgitation and aspiration of gastric contents.

ORAL AIRWAY INSERTION

Oral airway assists in facilitating an unobstructed airway.

Indications

- Cardiorespiratory arrest.
- Partial or total upper airway obstruction.

Contraindications

- Vincent's angina
- Croup
- Oral trauma
- Totally conscious patient

Equipment

Airway of correct size 2–3 for adult female and no. 5 for adult male. Do not use too small size as it does keep the tongue forward and obstruct rather than open airway.

Procedures

- Position the patient supine, avoid moving the neck and use only the jaw thrust maneuver or chin lift without head tilt.
- Open the patient's mouth
- Remove dentures and clear away debris
- Insert airway so that concave portions face away from the tongue
- Rotate airway 180 degrees and slid it after inserting to the back of the pharynx.

Complications

- Aspiration of vomitus can occur in conscious patients and in improper positioning.
- Breaking of teeth can occur withn forceful placement.

NASAL AIRWAY INSERTION

A nasal airway can be used to facilitate clear airway and it can be used for patients with oral trauma and it has the advantage of not inducing vomiting.

Indications

- Cardiorespiratory arrest
- Partial or complete upper respiratory obstruction with or without oral trauma.

Contraindications

- Nasal trauma
- Infections of nasopharynx
- Enlarged adenoids

Equipment

- Nasal airway of appropriate size, measure from the tip of the nose to the tip of the earlobe
- Water soluble lubricant – K 'Y' jelly
- Gauze
- Kidney basin

Procedures

- Examine nose for obstruction, foreign bodies and deviated nasal septum
- Clear the mouth of dentures and secretions.
- Lubricate the anterior nostril using gauze and K Y jelly or any other water-soluble lubricant
- Lubricate the nasal airway
- Insert the lubricated airway

Complication

Epistaxis.

ENDOTRACHEAL INTUBATION

Endotracheal intubation is the definite way of providing airway maintenance. It protects the airway from aspiration and allows spontaneous assisted or controlled ventilation. It provides an excellent means for suctioning secretions from the pulmonary tree.

Indications

- Airway maintenance
- Cardiorespiratory failure
- Severe airway obstruction
- Potential obstruction as in head and neck injuries superficial air way burns
- Aspiration of gastric contents
- Potential aspiration as in unconscious patients.

Contraindications

- Hypoxia should be corrected before intubation
- Cervical spine injury

Equipment

- Intravenous access
- Suction apparatus with catheters ready to be used
- Resuscitation trolley
- Oxygen ready for administration
- Laryngoscope with different size blades
- Endotracheal tube of appropriate size (8–9 mm for males and 7.5–8 mm for females)
- Stylet
- Water soluble lubricant
- 10 mL syringe
- Oral pharyngeal airway
- Adhesive tape and scissors
- Adequate light source
- Capnography to measure end tidal volume
- Stethoscope/gloves
- Bag mask
- Ventilator setting ready
- Medications: Sedatives, muscle relaxant, atropine, adrenaline

Positions

- Patient in supine with neck extended on the small pillow
- Medical personal carry out procedure unless in emergency and if permitted by hospital policy by a specialized skilled nurse/clinical nurse specialists.
- Check the cuff of the endotracheal tube.

Assisting with Endotracheal Intubation

Endotracheal intubation is a respiratory therapy technique wherein an endotracheal tube is used as an artificial airway by either the orotracheal or the nasotracheal route.

Indications

Apnea.
Unconsciousness
Severe inspiratory muscle weakness.

- Respiratory failure– ARDS, pneumonia. (To provide mechanical ventilation)
- Airway protection – Unconsciousness, trauma, aspiration risk, poison
- Airway obstruction – Trauma, laryngeal edema head and neck tumor, burns. (Maintain airway patency)
- Hemodynamic instability – Shock, cardiac arrest. (Facilitate mechanical ventilation)

Assessment

Sr. no.	Steps	Rationale
1.	Assess the patient's respiratory status, SpO_2. Assess mood restless, anxious or agitated. Assess for exaggerated thoracic retraction.	Gives information about need to ventilate the patient by other means and patient's inability to protect his or her own airway and need for prolonged ventilation.
2.	Check the suction apparatus and have it close at hand.	To prevent aspiration.
3.	Select the appropriate size of Endotracheal tube.	To ensure adequate oxygenation.
4.	Assess the neck of patient.	Curved blade is appropriate for patients with short neck, whereas straight blade has advantage of minimal contact with incisors.
5.	Check the oxygen source, AMBU bag reservoir.	Needed for 100% oxygen delivery.
6.	Check the laryngoscope key by snapping the appropriate sized blade into place.	To make sure that the blades are appropriate and bulb is tightly seated and bright.
7.	Note the patient's last feed timing.	Stomach is usually empty 2–3 hours after last liquid has been ingested, and 4–6 hours after last solid food has been ingested. If NG tube is in place, empty the stomach contents prior to intubation to prevent aspiration.

Nursing Diagnosis

- Impaired gas exchange
- Unconsciousness
- Infection
- Immobility
- Anxiety
- Pain
- Disturbed sleep pattern

Planning

Goal

Patient maintains normal gas exchange (Tables 9.25 and 9.26)

TABLE 9.25: Expected outcomes

Possible Error	Prevention
Patient breathes effectively through Endotracheal tube with assistance as evidenced by • Normal respiration • Pink mucous membrane of nail bed • SaO_2 maintaining between 90 and 100% • Decreased thoracic retraction • Decrease in restlessness and agitation	For better outcome of procedure Find out complication at an early stage

TABLE 9.26: Implementation

Sr. no.	Steps	Rationale
1.	Assemble all the necessary equipment within easy reach.	For effective time management.
2.	Using sterile technique open the package containing the ET tube. Open the other supplies on an emergency table.	For prevention of infection.
3.	Insert a malleable stylet until the end is just short of the murphy's eye (side hole) and bend the tube to resemble a hockey stick.	To ensure ease in insertion.
4.	Test the cuff by inflating it with 7 mL of air and removing the syringe. If cuff is patent, remove the air and leave syringe in place.	To check patency of the cuff.
5.	Choose laryngoscope blade appropriate for patient.	A curved blade provides better visualization of the vocal cords is also a best choice in case of patient with short neck. Straight blade decreases scraping of enamel or breaking of teeth.
6.	Check the bulb of laryngoscope to ensure it is tightly seated and bright.	Bulb, if loose may fall into trachea during the procedure. Brightness of bulb is necessary to visualize the parts properly.
7.	Provide an appropriate size oropharyngeal airway.	It is used as a bite block.
8.	Position the patient in sniffing position, neck is slightly hyper extended with the head forward. For blind intubation, place head and neck in neutral position. A pillow is placed under the shoulder.	Sniffing position opens the airway for intubation as the mouth, pharynx and trachea are extended to maintain the position.
9.	Administer Injection Atropine 0.5 mg IV and Injection Lidocaine (1.5) mg of body weight IV push and wait for 90 seconds.	To block parasympathetic responses and block sympathetic response respectively. These drugs prevent tachyarrhythmia secondary to possible hypoxia, vagal stimulation or increased intracranial pressure.
10.	Preoxygenation the patient with 100% oxygen.	To maintain oxygen saturation.
11.	Put on gloves.	To provide barrier against infection.
12.	For oral intubation spray a local anesthetic such as lidocaine deep into the posterior pharynx or nasal intubation spray, a local anesthetic and mucosal vasoconstrictor into nasal passage to anesthetize the nasal turbinates and reduce the chances of bleeding.	To diminish the gag reflex and reduce patient discomfort.

Contd...

Sr. no.	Steps	Rationale
13.	If necessary, suction the patient's pharynx just before tube insertion.	Suctioning improves visualization of patient's pharynx and vocal cords.
14.	Limit each intubation attempt to less than 30 seconds.	To prevent hypoxia.
15.	**Intubation with direct visualization** Using right hand hold the patient's mouth open by crossing your index finger over your thumb, placing your thumb on the patient's upper teeth and your index finger on his lower teeth.	The technique provides better access.
16.	Grasp the laryngoscope handle in your left hand and gently slide the blade into the right side of the patient's mouth. Center the blade and push the patient's tongue to the left. Hold patient's lower lip away from his teeth.	To prevent the lip from being traumatized.
17.	Advance the blade to expose the epiglottis. When using a straight blade insert the tip under the epiglottis. When using a curved blade insert the tip between the base of tongue and epiglottis.	For better visualization of epiglottis.
18.	Shift the laryngoscope handle upward and away from your body at 45 degree angle. Avoid pivoting the laryngoscope against the patient's teeth damaging them.	To reveal the vocal cords.
19.	If desired, have an assistant apply pressure to the cricoid ring.	To occlude the esophagus and minimize gastric stimulation.
20.	**Oral intubation** Insert the ET tube into the right side of patient's mouth. **Nasotracheal intubation (Fig. 9.37)** Insert the ET tube through the nostril into the pharynx. The nurse uses Magill forceps to guide tube through the vocal cords.	
21.	Guide the tube into the vertical opening of the larynx between the vocal cords, being careful not to mistake the horizontal opening of the esophagus for the larynx. If vocal cords are closed because of spasm wait a few seconds for them to relax then gently pass the tube past them.	Helps in avoiding trauma.
22.	Advance the tube until the cuff disappears beyond the vocal cords. Avoid advancing the tube further.	To avoid trauma to carina.
23.	Holding the ET in place, quickly remove the stylet, if present.	To prevent moving of ET tube.

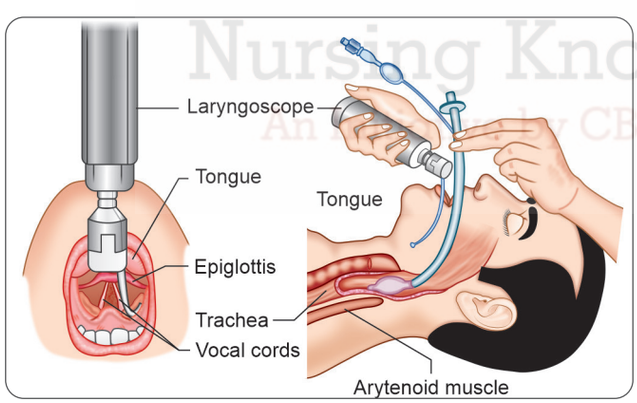


Fig. 9.37: Blind nasotracheal intubation

Recording and Reportings

- Reason for intubation
- Pre medication administered
- Procedure performed by
- Size of endotracheal tube used
- Events during procedure
- Patient's tolerance
- Length of Endotracheal tube fixed
- Hemodynamic status

Special Considerations

- If a difficult intubation is predicted, it shouldn't be performed by an inexperienced operator, e.g., small

mouth, high arched palate, large upper incisors, hypognathia, large tongue, short neck, anterior larynx, immobile temporomandibular joints, immobile cervical joints, morbid obesity (Tables 9.27 and 9.28).

- Do not persist for long as patient can go into hypoxia due to the prolonged attempt. Instead revert to bag and mask ventilation to ensure oxygenation.
- Cervical spine injury is a contra indicator for oropharyngeal intubation. In such case, nasotracheal route should be used.

Variations

Pediatric Variations

- It is important to include the family in caring for the child, especially if the child is in the intensive care unit.
- Research has shown that although children respond to pain the same way that adults do, they are often under medicated. It is important to assess the child for pain discomfort and medicate accordingly.
- The pediatric client will need to have a means of communicating. If the client is too young to read and write, possibly a board with symbols can be used to assist in communication.

TABLE 9.27: Unexpected outcomes

Sr. no.	Steps	Rationale
1.	Trauma, e.g., hemorrhage, mediastinal perforation.	
2.	Hemodynamic collapse, positive pressure ventilation, vasodilation	
3.	Tube malposition, failed intubation and endobronchial intubation	
4.	Infection including maxillary sinusitis, if nasally intubated	
5.	Cuff pressure trauma (maintain cuff pressure < 25 cm H_2O)	
6.	Mouth/Lip trauma	

TABLE 9.28: Common errors

Sr. no.	Possible error	Prevention
1.	Water in the tubing is not emptied before turning the client, thus it enters the client's airway as the client is repositioned.	Check tubing carefully before moving a client.
2.	The high pressure alarm is not audible or is not functioning.	The alarm is often triggered when the client needs to be suctioned. Never disable the alarm.

Home Care Variations

- If the client is stable, very often he or she will be discharged to home on a ventilator.
- Extensive planning and education is required for this to be successful and a teaching plan should be established. The client as well as a caregiver needs to be taught how to use the ventilator, and how to provide oxygen *via* the Ambubag, if the ventilator breaks down.
- It is important that a home care nurse establish a relationship with the client and family and assess the client and caregiver's knowledge level and ability to use the ventilator.
- Make sure the home caregiver and any professional staff in the home know whom to call for emergencies or if the ventilator breaks down.

Long-Term Care Variations

- If a client is to be mechanically ventilated for a long period of time and is unable to be at home, possibly a facility that specializes in this type of care would be beneficial.
- If the client is to be on a positive pressure mechanical ventilator for long-term, a tracheostomy should be performed.
- If the client is to be on negative-pressure mechanical ventilation, the client should be encouraged to care for the ventilator by self.

Make sure the tube position by checking bilateral chest expansion, auscultation on both sides near mid axillary line, and absence of breath sounds over the gastric area.

Secure the endotracheal tube by placing on airway between the patient's teeth. Tape the tube at the level of exit from the mouth and to the sides of the cheeks.

Extubations

- Suction the pharynx and the endotracheal tube limiting to 10 seconds only at a time.
- Hyper oxygenate with 100% oxygen and ventilate.
- Deflate the cuff completely and remove the tube after a deep inspiration.
- Administer oxygen-using mask.

NASOTRACHEAL INTUBATION

Indications

- Patients with oral trauma.
- Patients requiring long-term care.

Contraindications

Nasal and upper facial trauma.

Equipment

Same as orotracheal intubation.
1% phenylephrine, 2% lignocaine or 5% cocaine.

Position

Semi sitting position with head in neutral position (Tables 9.29 and 9.30).

Complications

- Vomiting during suctioning which can result in aspiration.
- Inadequate visualization of the cord resulting esophageal intubation.
- Bronchial intubation can occur, if the tube is advanced too far.
- Injury to the nasal mucosa and epistaxis can result.

TABLE 9.29: Blind nasotracheal intubation

Sr. no.	Steps	Rationale
1.	Pass the ET tube along the floor of the nasal cavity. If necessary, use gentle force to pass the tube through the nasopharynx into the pharynx.	To ensure correct placement.
2.	Listen and feel for air movement through the tube as it is advanced.	To ensure that the tube is properly placed in the airway.
3.	Slip the tube between the vocal cords when the patient inhales.	Vocal cords separate on inhalation.
4.	When the tube is past the vocal cords, the breath sounds should become louder. If at any time during tube advancement, breath sounds disappear, withdraw the tube until they reappear.	For equal air entry bilaterally into the lungs.
5.	After intubation inflate the tube with air until you feel resistance. (Refer the manufacturer's guidance).	When the patient is mechanically ventilated, you will use the minimal leak technique or the minimal occlusive volume technique to establish correct inflation of the cuff.
6.	Remove the laryngoscope. If the patient was intubated orally, insert an oral airway or a bite block.	Prevents the patient from obstructing airflow or puncturing the tube with teeth.
7.	Observe for chest expansion and auscultate for breath sounds. If the patient is unconscious or uncooperative use a hand held resuscitation bag while observing for upper chest movement and auscultate for breath sounds. Feel the tube tip for warm exhalation and listen for air movement. Observe for condensation forming inside the tube.	To ensure correct tube placement.
8.	If you don't hear any breath sounds, auscultate over the stomach while ventilating with bag.	Stomach distension, belching sound, esophageal sound indicate esophageal intubation. Immediately deflate the cuff and remove the tube.
9.	Reoxygenate the patient. Repeat insertion using a sterile tube.	To prevent hypoxia.
10.	Auscultate bilaterally.	To exclude the possibility of endobronchial intubation.
11.	If you fail to hear breath sounds on both sides of the chest, you may have inserted the tube into one of the main stem bronchi (Usually right one because of its wider angle at the bifurcation).	Such insertion occludes the other bronchus and lung and results in atelectasis on the obstructed side.
12.	Ensure that the tube is not resting on carina. In case it is positioned so, deflate the cuff, withdraw the tube 1–2 mm. Auscultate for bilateral breath sounds and re-inflate the cuff.	This results in irritation of carina leading to patient coughing and bucking the ventilator.

Contd...

Sr. no.	Steps	Rationale
13.	When you have confirmed correct tube placement, administer oxygen or initiate mechanical ventilation and suction if needed. Secure the tube.	For proper oxygenation.
14.	Length at which to secure the endotracheal tube: endotracheal tube size x 3. Note the endotracheal tube measurement at lip level.	By periodically monitoring this mark you can detect tube displacement.
15.	Ensure that X-ray chest is taken immediately.	For confirmation of ET tube placement.

TABLE 9.30: Evaluation

Sr. no.	Steps
1.	Presence of effective respiratory rate and pattern.
2.	Pink mucous membranes and nail beds, SpO_2 improved.

ASSISTING WITH TRACHEOSTOMY INSERTION

Tracheostomy is usually performed when the need for an artificial airway is protracted (usually greater than 14 days). Tracheostomy may also be performed when the surgical interruption of the airway is necessary (i.e., laryngectomy).

Equipment

- Tracheostomy tube (sizes 6.0–9.0 mm for most adults).
- Sterile instrument: Hemostat, scalpel and blade, forceps, suture material, scissors
- Sterile gown and drapes, gloves
- Cap and mask
- Antiseptic solution
- Gauze sponges
- Shaver
- Sedation
- Local anesthetic and syringe
- Resuscitation bag and mask with oxygen source
- Suction source and catheters
- Syringe for cuff inflation
- Respiratory support available for post-tracheostomy (mechanical ventilation, tracheal oxygen mask, CPAP, T-piece).

Nursing Action

Monitor vital signs (heart rate, respiration, blood pressure, and temperature) before insertion.

Planning/Implementation

- Explain the procedure to the patient. Discuss a communication system with the patient.
- Obtain consent for operative procedure.
- Shave neck region.
- Assemble equipment. Using aseptic technique, inflate tracheostomy cuff and evaluate for symmetry and volume leakage. Deflate maximally.
- Position the patient (supine with head extended, with a support under shoulders). Apply soft wrist restraints, if the patient is confused.
- Give medication as per physician's request.
- Position light source.
- Assist with antiseptic prep.
- Assist physician with gowning and gloving.
- Assist with sterile draping.
- The physician performs the procedure with the nurse circulating. He or she or another designated nurse also monitors the patient's vital signs, suctions as necessary, gives medication as prescribed, or administers emergency care.
- Immediately after the tube is inserted, inflate the cuff. The chest should be auscultated for the presence of bilateral breath sounds.

Follow-up Phase

- Apply respiratory assistive devices (mechanical ventilation, tracheostomy oxygen mask, CPAP, T-piece adapter)
- Check the tracheostomy tube cuff with the pressure manometer.
- "Tie Sutures" or "Stay Sutures" of 1–0 silk may have been placed through either side of the tracheal cartilage at the incision and brought out through the wound. Each is to be taped to the skin at a 45 degree angle laterally to the sternum.

Evaluation/Outcome

- Assess vital signs and ventilatory status; note tube size used, physician performing procedure, type, dose and route of medications given.
- Obtain chest X-ray.
- Assess and chart condition of stoma:
  - Bleeding
  - Swelling
  - Subcutaneous air.
- An extra tube, obturator, and hemostat should be kept at the bedside. In the event of tube dislodgment, reinsertion of a new tube may be necessary.

For Emergency Tube Insertion

- Spread the wound with a hemostat or stay sutures.
- Insert replacement tube (containing the obturator) at an angle.
- Point cannula downward and insert the tube maximally.
- Remove the obturator.

Tracheostomy Care

Keep the area clean and dry, preventing skin irritation and infection. Secretions collected above the tracheostomy tube cuff ooze out of the surgical incision. The resultant wetness promotes irritation of the skin, and the wetness, coupled with the transmission of bacterial *via* the secretions, sets up a medium for infection to occur.

Equipment

Assemble the following equipment or obtain a prepackaged tracheostomy care kit:

- Sterile towel
- Sterile gauze sponges (12)
- Sterile cotton swabs
- Sterile gloves
- Hydrogen peroxide
- Sterile water
- Antiseptic solution and ointment (optional)
- Tracheostomy tie tapes

Nursing Action

Assess condition of stoma prior to tracheostomy care (redness, swelling, character of secretions, and presence of purulence or bleeding).

Planning/Implementation

- Suction the trachea and pharynx thoroughly prior to tracheostomy care.
- Explain procedure to the patient.
- Wash hands thoroughly.
- **Assemble equipment:**
  - Place sterile towel on patient's chest under tracheostomy site.
  - Open 4 gauze sponges and pour hydrogen peroxide on them.
  - Open 2 gauze sponges and pour antiseptic solution on them.
  - Open 2 gauze sponges, keep dry.
  - Open 2 gauze sponges and pour sterile water on them.
  - Place tracheostomy tube tapes on field.
  - Put on sterile gloves.

Procedure

- Clean the external end of the tracheostomy tube with 2 gauze sponges with hydrogen peroxide; discard sponges.
- Clean the stoma area with hydrogen peroxide-soaked gauze sponges. Make only a single sweep with each gauze sponge before discarding.
- Loosen and remove any crust with sterile cotton swabs.
- Repeat step 2 using the sterile water-soaked gauze sponges.
- Repeat two using dry sponges.
- (Optional) An infected wound may be cleaned with gauze saturated with an antiseptic solution, then dried. A thin layer of antibiotic ointment may be applied to the stoma with a cotton swab.
- **Change the tracheostomy tie tapes:**
  - Cut soiled tape while holding tube securely with other hand.
  - Remove old tapes carefully.
  - Grasp slit end of clean tape and pull it through opening on side of the tracheostomy tube.
  - Pull other end of tape securely through the slit end of the tape.
  - Repeat on the other side.
  - Tie the tapes at the side of the neck in a square knot. Alternate knot from side to side each time tapes is changed.
  - Tape should be tight enough to keep tube securely in the stoma but loose enough to permit two fingers to fit between the tapes and the neck.
- Some clinicians prefer to place a gauze pad between the stoma site and the tracheostomy tube to absorb secretions and prevent irritation of the stoma. Other clinicians feel that this is unnecessary. Many clinicians feel that gauze should not be used around the stoma. In their opinion, the dressing keeps the air moist and dark, promoting stomal infection. They believe the stoma should be left open to the air and the surrounding area kept dry. A dressing is used only, if secretions are draining onto subclavian or neck IV sites or chest incisions.

TABLE 9.31: Evaluation/Outcome

Document, procedure, performance, observations of stoma (irritation redness, edema, subcutaneous air) and character of secretions (color, purulence).	Provides a baseline. Notify physician, of changes in stoma appearance or secretions.

Follow-up Phase

Cleaning of the fresh stoma should be performed every 8 hours or more frequently, if indicated by accumulation of secretions. Ties should be changed every 24 hours or more frequently, if soiled or wet (Table 9.31).

The cuffs of endotracheal and tracheostomy tubes must be inflated continuously when the patient is on mechanical ventilation or CPAP. The cuff is then deflated only for tube removal or repositioning. The cuffs of spontaneously breathing tracheostomized patients may require inflation at all times if the patient has a sufficiently depressed level of consciousness. **Tracheostomized patients not on mechanical ventilation or CPAP may be deflated (Figs 9.38A and B).**

- At a time when the patient can adequately protect the airway (Table 9.32).
- Between meals, if the patient is at aspiration risk only during feeding. The cuff may be inflated prior to feeding and for 1 hour after feeding.

Equipment

- Suction catheter
- Tonsil suction
- Suction source
- 10 mL syringe
- Pressure manometer (mercury or aneroid)
- Manual resuscitation bag with reservoir connected to 100% oxygen at 10–15 L/min.

Nursing Action

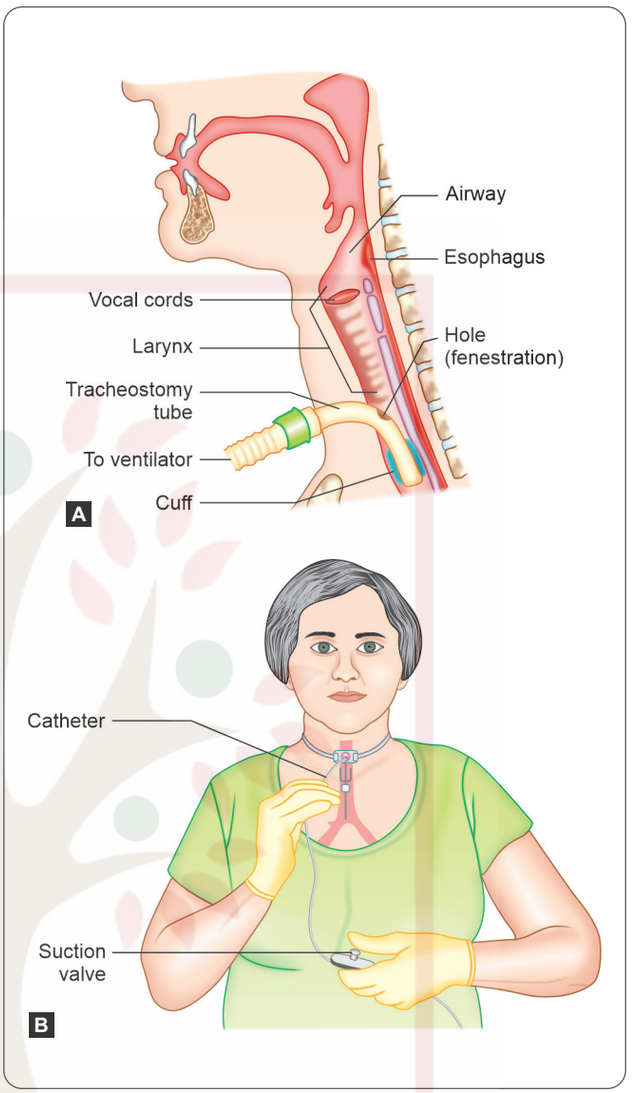
Note degree of air leakage around cuff by listening over the cuff area with stethoscope. Note and report excessive bleeding from tube (or around stoma of tracheostomized patient).

Planning/Implementation

Explain procedure to the patient.

Deflating the Cuff

- Suction the trachea, then the oral and nasal pharynx. Then replace the suction catheter with a stent catheter.
- Deflate the cuff slowly.



Figs 9.38A and B: Airway cuff inflation/tracheostomy self-suction

TABLE 9.32: Implication of excessive cuff pressure

Tracheal swelling	Tracheal arterial fistula
Tracheal ulceration	Tracheal necrosis
Tracheo esophageal fistula	Tracheal malacia fistula

- (Concomitant with step 2). Have the patient cough, or manually inflate the lungs with the resuscitation bag. Be ready to receive secretions in a tissue, or aspirate with suction.
- Suction through the tracheostomy or endotracheal tube.
- Provide adequate ventilation while the cuff is deflated.
  - If the patient does not require assisted ventilation, maintain humidified oxygen as directed.

- If the patient requires assisted ventilation, provide manual ventilation *via* a resuscitation bag. Leave cuff deflated for as long as the tube repositioning, requires; then re inflate.

Inflating the Cuff

- No leak technique:
  - Attach air-filled syringe to cuff injection port.
  - Slowly inject air until no air escapes from the patient's lungs around the cuff.
  - Note amount of air injected to provide the seal.
- Minimal leak technique (for mechanical ventilation):
  - Attach air-filled syringe to cuff injection port.
  - Slowly remove air form cuff until a small air leak is heard at maximum peak airway pressure.
  - Note amount of air injected.
- **Inflation using intra cuff pressure measurement:**
  - Insert male port of three-way stopcock into cuff injection port. One female port of stopcock holds the air-filled syringe, and one port holds the pressure manometer.
  - Inject air into cuff until desired pressure is reached at maximum peak airway pressure.
  - Note amount of air needed to achieve the desired intra cuff pressure.
- While the cuff is inflated, assess inflation every 2 hours. The cuff pressure manometer is useful for this.

Inability to Maintain a Seal

- Assess the degree of leakage and length of time elapsed since cuff volume was replenished.
- Inflate the cuff to desired level.
- Disconnect syringe (and manometer, if used).
- Assess for leakage.
- If leakage recurs, place three-way stopcock syringe and in injection port, inflate cuff, close stopcock. Remove syringe (and manometer if used) leaving closed stopcock in injection port.
- If air leak persists, tube repositioning or replacement may be necessary. Consult with appropriate personnel.

Follow-up Phase

Assess cuff inflation status at least every 2 hours.
Suctioning Nasotracheal suctioning

Equipment

Assemble the following equipment or obtain prepackaged kit:

- Disposable curved
- Sterile towel
- Sterile disposable gloves
- Sterile water
- Water soluble lubricant jelly
- Suction source at — 80–120 mm Hg.
- Resuscitation bag with face mask — connect 100% 02 source with flow 10 L/min.

Nursing Action

Assessment

- Monitor hear rate, respiratory rate, color, and ease of respiration.
- If the patient is on monitor, continue monitoring heart rate or arterial blood pressure.
- Discontinue the suctioning and apply oxygen, if heart rate decreases by 20 beats/min or increases by 40 beats/min, if blood pressure decreases, or if cardiac dysrhythmia occurs.

Planning/Implementation

- Ascertain that the suction apparatus is functional. Place suction tubing within easy reach.
- Inform and instruct the patient regarding procedure.
  - At a certain interval the patient will be requested to cough to open the lung passage so that the catheter will go into the lungs and not into the stomach. He will also be encouraged to try not to swallow, as this will also cause the catheter to enter the stomach.
  - The postoperative patient can splint his wound to make the coughing produced by suctioning less painful.
- Place the patient in a semi-Fowler's or sitting position, if possible.

Procedure

- Place sterile towel across the patient's chest. Squeeze small amount of sterile anesthetic water-soluble lubricant jelly onto the towel.
- Open sterile pack containing curved-tipped suction catheter.
- Aseptically glove both hands. Designate one hand (usually the dominant one) as **"sterile"** and the other hand as "contaminated".
- Grasp sterile catheter with sterile hand.
- Lubricate catheter and insert into the nostril and back into the pharynx.
  - Pass the catheter into the trachea. To do this, ask the patient to cough or say "ahh". If he is incapable of either, try to advance the catheter on inspiration. Asking the patient to stick out his tongue, or hold his tongue extended with a gauze sponge may also help to

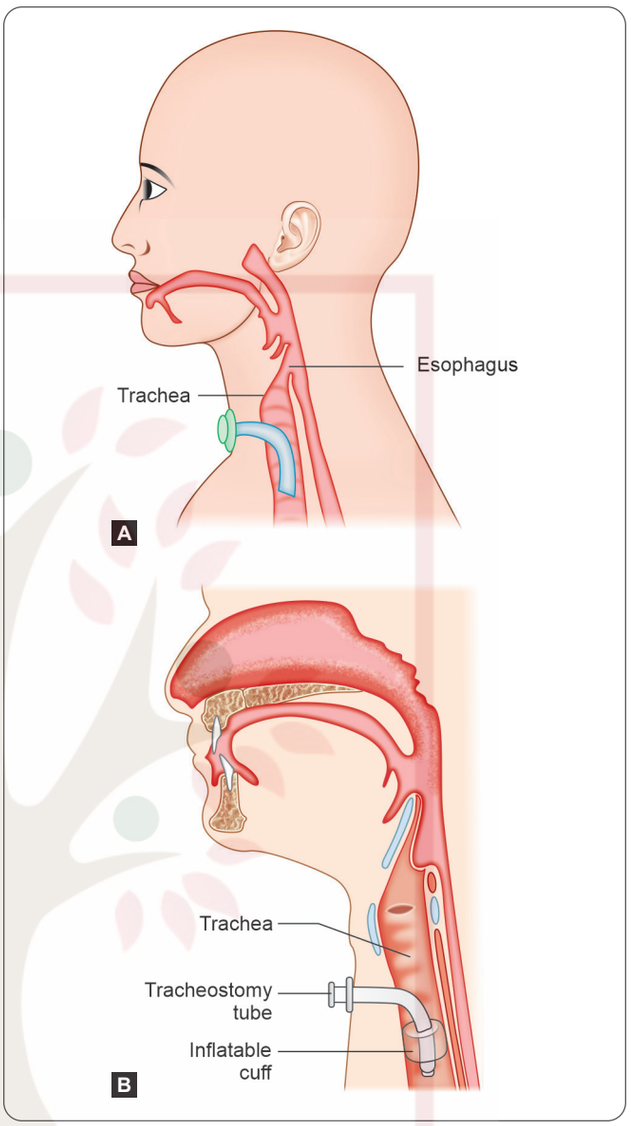
open the airway. Suctioning of the tracheobronchial tree in a patient without an artificial airway is possible by inserting a suction catheter through the nares into the nasal passage, down through the oropharynx, past the glottis and into the trachea.

In addition to direct removal of secretions, nasotracheal suctioning stimulates strong paroxysms of coughing, enabling mobilization of secretions.

Nasotracheal suctioning may be indicated in patients who are mechanically capable of coughing but do not so because of central nervous system (CNS) depression, in those who have an inadequate cough secondary to "splinting" as a result of pain, or in patients whose cough is ineffective.

Contraindications

- Bleeding disorder (disseminated intravascular coagulation (DIC), thrombocytopenia, leukemia, etc.)
- Laryngeal edema, laryngeal spasm
- Esophageal varices
- Tracheal surgery
- Gastric surgery with high anastomosis
- Myocardial infarction (check with physician)
- Trauma to the nasal passages may occur. Do not attempt to force the catheter, if resistance is met. Trauma to nasal membranes or polyps may occur. If significant bleeding occurs, notify the physician.
- Repeated suctioning may produce irritation of the nasal passages, resulting in pain and swelling. Insertion of a nasal airway may help to protect the nasal passages from trauma (Figs 9.39A and B).
- Repeated NT suctioning may promote laryngeal edema due to irritation and trauma. Stop if suctioning becomes difficult or if the patient develops new upper airway noise or obstruction. Trans tracheal aspiration involves passing a needle and then a catheter through a percutaneous puncture of the cricothyroid membrane. Transtracheal aspiration bypasses the oropharynx and avoids specimen contamination by mouth flora.



Figs 9.39A and B: Tracheostomy tube

TRANSTRACHEAL SUCTIONING

Purposes

- To obtain an uncontaminated sputum specimen for culture and sensitivity studies.
- To promote coughing in the patient with an absent cough reflex.

Equipment

Sterile tracheal set:

- No. 14, No. 16, and No. 18 gauge needles
- Polyethylene catheter
- Syringe, 10cc
- Skin antiseptic
- Local anesthetic
- Sterile gloves

Nursing Action

- Explain the procedure and give reassurance by skilled and empathetic attention to the patient's needs.
- Administer supplemental oxygen as directed during the procedure, if the patient's arterial oxygen tension is below normal while the patient is breathing room air.
- Extend the patient's neck and place a pillow under its shoulders.

Procedure (Fig. 9.40)

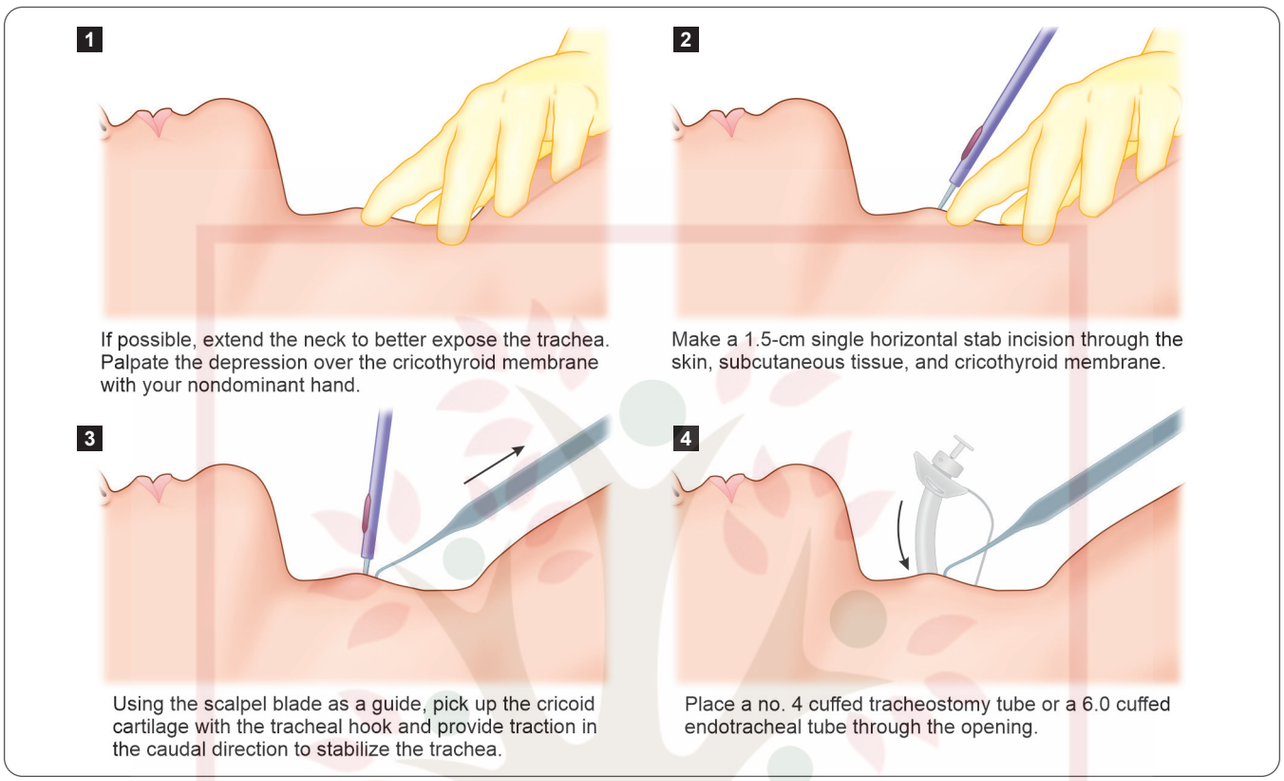


Fig. 9.40: Surgical cricothyrotomy: rapid four step technique

The cricothyroid membrane is identified by palpation.

- The skin over the cricothyroid area is cleansed and the area infiltrated with local anesthetic.
- No. 14, 16 or 18-gauge needle is inserted through the cricothyroid membrane into the trachea and a polyethylene catheter is inserted through the needle into the trachea.
- The needle is withdrawn leaving the catheter in place.
- A small amount of sterile saline (2–5 mL) is injected into the trachea through the catheter.
- The secretions and exudates are aspiration back into the syringe as the patient coughs.
- Air is removed from the syringe and the syringe is capped or the sample is injected into an anaerobic transfer vial. The specimen is sent to the laboratory immediately.
- The catheter is withdrawn and pressure applied over the puncture site.

Follow-up Care

- Instruct the patient to rest quietly for an hour or so.
- **Observe for the following complications:** Bleeding, pneumomediastinum, subcutaneous emphysema, and cardiac arrhythmias.

The patient with an ineffective cough cannot clear his secretions and requires mechanical aspiration (suctioning). It is a sterile procedure. Secretion collection in the artificial airway or tracheobronchial tree may result in narrowing of the airway, respiratory insufficiency, increased work of breathing, and stasis of secretions.

Indications

- When secretions can be seen or sounds resulting from secretions are heard with or without the use of a stethoscope.
- Following postural drainage or chest physiotherapy.
- Following respiratory treatments aimed at liquefying secretions (i.e., ultrasonic nebulization).
- Following a sudden rise or the "popping off" of the peak airway pressure in mechanically ventilated patients that is not due to kinking of the artificial airway or ventilator tube, patient biting the tube, the patient coughing or struggling against the ventilator, or pneumothorax.

Equipment

Assemble the following equipment or obtain a prepackaged suctioning kit:

Sterile suction catheters — No. 14 or 16 (adult), No. 8 or 10 (child). The outer diameter of the suction catheter should be no greater than two thirds of the inner diameter of the artificial airway.

- Two sterile gloves
- Sterile towel
- Suction source set at — 80–20 mm Hg.
- Sterile water
- Resuscitation bag with a reservoir connected to 100% oxygen source
- If patient is on PEEP or CPAP, add positive end-expiratory pressure (PEEP) valve to exhalation valve on resuscitation bag in an amount equal to the ventilator or CPAP device.
- Normal saline solution (in syringe or single-dose packet)
- Sterile cup or water
- Alcohol swabs
- Sterile water-soluble lubricant jelly.

Nursing Action

Assessment

Monitor heart rate, color, and ease of respiration. If the patient is monitored continuously, monitor heart rate and arterial blood pressure. If arterial blood gases are done routinely, known baseline values. (It is important to establish a baseline, since suctioning should be discontinued and oxygen applied or manual ventilation reinstituted, if during the suction procedure, the heart rate decreases by 20 beats/min or increases by 40 beats/min, blood pressure drops, or cardiac dysrhythmia is noted).

Planning/Implementation

Procedure

- Instruct the patient how to "splint" surgical incision, as coughing will be induced during the procedure. Explain the importance of performing the suction procedure in an aseptic manner.
- Assemble equipment. Check function of suction and manual resuscitation bag connected to 100% O_2 source.
- Wash hands thoroughly.
- Open sterile towel – place in a bib-like fashion on patient's chest. Open alcohol wipes and place on corner of towel. Place small amount of sterile water-soluble jelly on towel.
- Open sterile gloves — place on towel.
- Open suction catheter package.
- If the patient is on mechanical ventilation, test to make sure that disconnection of ventilator attachment may be made with one hand.
  - Don sterile gloves, designate one hand as contaminated for disconnecting, bagging, and working the suctioning control. Usually the dominant hand is kept sterile and will be used to thread the suction catheter.
  - Use the sterile hand to remove carefully the suction catheter from the package, curling the catheter around the gloved fingers.
  - Connect suction source to the suction fitting of the catheter with the contaminated hand.
  - Using the contaminated hand, disconnect the patient from the ventilator, CAP device, or other oxygen source. (Place the ventilator connector on the sterile towel and flip a corner of the towel over the connection to prevent fluid from spraying into the area).
  - Ventilate and oxygenate the patient with the resuscitator bag, compressing firmly and as completely as possible approximately 5–6 times (try to approximate the patient's tidal volume). This procedure is called "bagging" the patient. In the spontaneously breathing patient, coordinate manual ventilations with the patient's own inspiratory effort.
  - Lubricate the tip of the suction catheter. Gently insert suction catheter as far as possible into the artificial airway without applying suction. Most patients will cough when the catheter touches the trachea.
  - Apply suction and quickly rotate the catheter while it being withdrawn.
  - Limit suction time to 10–15 seconds. Discontinue if heart rate decreases by 20 beats/min or increases by 40 beats/min, or if cardiac ectopy is observed.
  - Bag patient between suction passes with approximately 4–5 manual ventilations.
  - At this point, sterile saline may be instilled into the trachea *via* the artificial airway, if secretions are tenacious.
  - Remove needle from syringe and inject 3–5 mL saline into the artificial airway during spontaneous inspiration. Alternately, a saline "bullet" or small-prepackaged container of saline may be used.
  - Bag vigorously and then suction.
  - Rinse catheter between suction passes by inserting tip in cup of sterile water and applying suction.
  - Continue making suction passes, bagging the patient between passes, until the airways are clear of accumulated secretions. No more than 4 suction passes should be made per suctioning episode.
  - Give the patient 6–8 "sigh" breaths with the bag.
  - Return the patient to the ventilator or apply CPAP or other oxygen-delivery device.
  - Suction oral secretions from the oropharynx above the artificial airway cuff.

- The hand designated as sterile must remain uncontaminated so that, organisms are not introduced into the lungs. The contaminated hand must also be gloved to prevent sputum from contacting the nurse's hand, possible resulting in an infection of the nurse.
- Prevents contamination of the connection.
- Ventilation prior to suctioning helps to prevent hypoxemia. When possible, two nurses work as a team to suction. Attempting to ventilate against the patient's own respiratory efforts may result in high airway pressure predisposing the patient to barotrauma (lung injury due to pressure).
- Suctioning on insertion would unnecessarily decrease oxygen in the airway.
- Failure to rotate catheter may result in damage to tracheal mucosa. Release suction, if a pulling sensation is felt.
- Suctioning removes oxygen as well as secretions and may also cause vagal stimulation.
- The oxygen removed by suctioning must be replenished before suctioning is attempted again.
- Some clinicians feel that secretion removal may be facilitated with saline instillation. Others feel that saline does not mix with mucus and that suctioning of the saline just instilled is the only effect produced by performing this step.
  - Removal of the needle will prevent accidental loss of the needle into the airway. Instillation of the saline during inspiration will prevent the saline from being blown back out of the tube.
  - Bagging stimulates cough and distributes saline to loosen secretions.
- Repeated suctioning of a patient in a short time interval predisposes to hypoxemia, as well as being tiring and traumatic to the patient.
- Sighing is accomplished by depressing the bag slowly and completely with 2 hands to deliver approximately 1½ times the normal tidal volume to the patient allowing for maximal lung expansion and prevention of atelectasis.

Follow-up Phase

Clean elbow fitting of resuscitation bag with alcohol; wipe before storing.

Assess need for further suctioning at least every 2 hours, or more frequently, if secretions are copious.

Evaluation/Outcome

Note any change in vital signs or patient's intolerance to the procedure. Record amount and consistency of secretions.

MUST KNOW

- Patients with ineffective cough mechanisms do not require "routine" suctioning.
- The need for suctioning may be assessed by pulmonary physical examination (especially auscultation) and chest X-ray findings.
- To aid in assessing for the need of suctioning, the patient may be ventilated with a resuscitation bag to increase ventilation and facilitate auscultation.
- Bagging may also stimulate the cough reflex, decreasing the need for suctioning.

ASSESS YOURSELF

1. Describe about airway management.
2. What are the nurses role in endotracheal intubation?
3. Enlist precautions taken during suctioning.
4. Define extubation.

CRITICAL THINKING SKILLS

Q. 1. Differentiate the rapid four steps of cricothyrotomy.
Q. 2. Justify the contraindications for nasotracheal suctioning.

INTRODUCTION

Novel Coronavirus is Called COVID-19

- **CO-Corona**
- **VI-Virus**
- **D-Disease**

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. (Fig. 10.1)

Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness.

COVID-19 disease is zoonotic, transmitted between animals and humans.

Coronaviruses cause diseases such as Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) and more mild illnesses including the common cold.

However, globally, around 20% of people who contract COVID-19 become more seriously ill and have trouble in breathing. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death.

Figure 10.2 shows the structure of coronavirus.

In India, 9,606,810 million COVID-19 cases had been confirmed and over 139,700 deaths had been reported as of 4 December 2020. While strong measures were adopted and some progress was made in containing the spread through better public health interventions, diagnostics and treatments, scientists across the world accelerated the process to develop a safe and effective vaccine which would break the chain of transmission.

COVID-19 affects people in different ways varying from mild to moderate and many recovers without hospitalization or treatment. Coronaviruses are a family of viruses that can cause illnesses ranging from common cold to severe acute respiratory syndrome and Middle East respiratory syndrome.

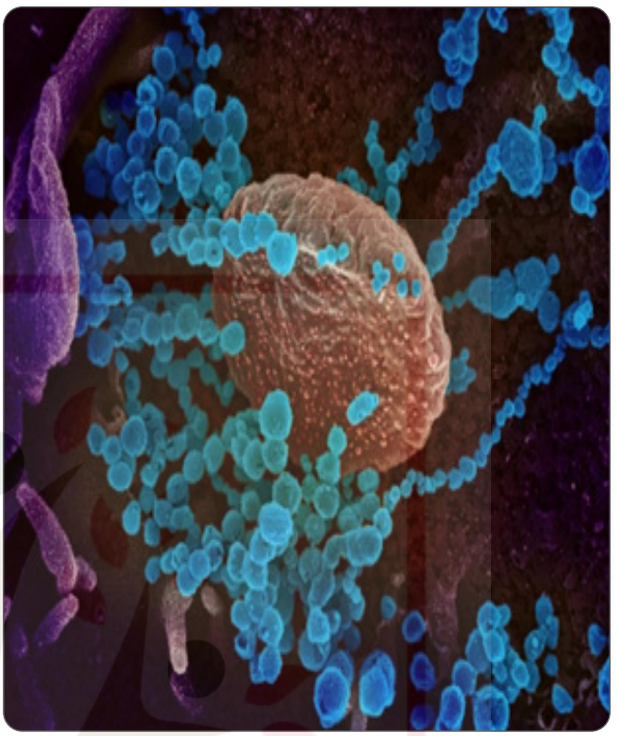


Fig. 10.1: Morphology of COVID-19 Virus

ETIOPATHOGENESIS

- Coronavirus disease (COVID-19) represents a global public health concern and WHO declared it a public health emergency.
- The phylogenetic analysis revealed that COVID-19 is potentially a zoonotic virus.

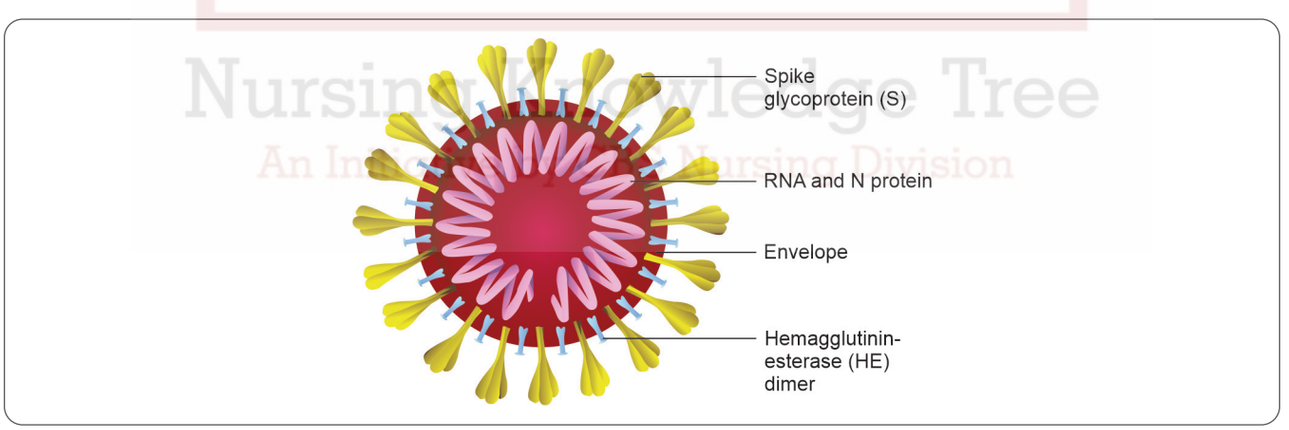


Fig. 10.2: Coronavirus structure

- Special attention is necessary to protect or reduce transmission in susceptible populations.
- COVID-19 leads to the development of intestinal symptoms like diarrhea, while a low percentage of MERS-CoV or SARS-CoV patients had diarrhea.
- Identification of novel chemotherapeutic drugs for treating COVID-19 infections is urgently warranted.

Symptoms of COVID-19

Coronavirus disease (COVID-19) is caused by SARS-CoV-2 and represents the causative agent of a potentially fatal disease that is of great global public health concern (Fig. 10.2). Based on the large number of infected people that were exposed to the wet animal market in Wuhan City, China, it is suggested that this is likely the zoonotic origin of COVID-19. Person-to-person transmission of COVID-19 infection led to the isolation of patients who were subsequently administered a variety of treatments. Extensive measures to reduce person-to-person transmission of COVID-19 have been implemented to control the current outbreak. Special attention and efforts to prevent or reduce transmission should be applied in susceptible populations including children, health care providers, and elderly people. In this review, we highlight the symptoms, epidemiology, transmission, pathogenesis, phylogenetic analysis and future directions to control the spread of this fatal disease.

COVID-19 infected people may manifest their symptoms within 2–14 days but sometimes, in some cases, this disease prevails after 27 days. However, a group of Chinese researchers revealed that the average incubation time is approximately 5.2 days.

During this period, there is no significant change in peripheral blood leukocytes (PBL) and lymphocytes. Generally, the viruses spread out in the lungs, heart, GIT, and through the bloodstream. Primary lesions become noticeably worse around 7–14 days and PBL reduces significantly, including both T and B-lymphocytes.

The time frame for COVID-19 patients' symptoms to death has been observed from 6–41 days where the median period is 14 days.

Although this period depends on two crucial factors, namely, the patient's age and immune function. It is important to note that the number of cases is higher in people aged above 70 years in comparison with the people aged below 70 years. Several symptoms, including fever, dry cough, fatigue, muscle pain, sneezing, headache, hemoptysis, dyspnea, sputum production, lymphopenia, sore throat, and respiratory problems are developed after getting infected with COVID-19.

To be more specific, these symptoms are divided into three categories: (Fig. 10.3)

- Most common symptoms (i.e., fever, dry cough, and tiredness)

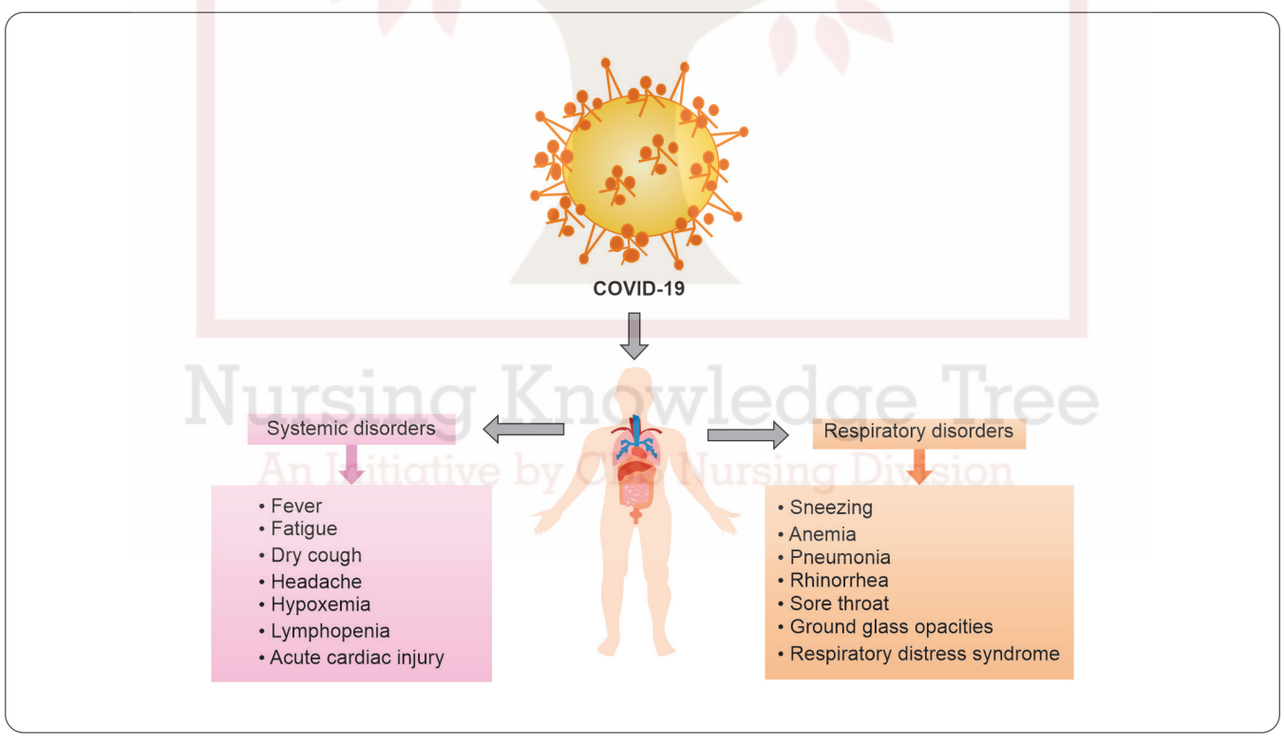


Fig. 10.3: Clinical features of COVID-19

- Less common symptoms (i.e., aches and pains, conjunctivitis, sore throat, diarrhea, headache, loss of taste or smell, a rash on the skin, and discoloration of fingers and toes)
- Serious symptoms (i.e., difficulty during breathing or shortness of breath, chest pain or pressure, and loss of speech or movement).

The risk of COVID-19 is higher in children, older people, and some patients who are suffering from diabetes, cancer, heart diseases, and lung diseases.

COVID-19 patients experience gastrointestinal (GI) symptoms including diarrhea, whereas a small portion of either SARS-CoV or MERS-CoV patients develop similar GI symptoms. As a result, it is urgent to analyze urine and fecal symptoms to exclude an effective transmission route, through doctors, nurses, and patients. Some patients are reported with respiratory distress syndrome, while critical patients require intensive care because of respiratory failure, septic shock, and organ failure.

Additionally, the chances of COVID-19 are greater if there is a loss of breath, cough, and some individuals who come in contact with a COVID-19 infected person or traveled to the COVID-19 affected zone. Under this circumstance, the clinical test should be applied among those people; and infected zones must be locked down. However, some COVID-19 infected patients recover easily because of their high immunity power and come back to normal conditions, while others may need extra time due to health conditions or age limitations (i.e., early age or late age).

Transmission of COVID-19

A variety of measures have been adopted to find out a specific reservoir host or carriers from Hubei province, China where COVID-infected people were first found. The initial investigation confirmed two snake species as a possible reservoir of novel COVID-19. However, until now, there is no exact evidence of CoV reservoirs other than birds or mammals. The genomic sequence of COVID-19 exhibited 88% identity with bird-derived SARS-like CoV. establishing a link between humans and COVID (Fig. 10.4).

Suspended respiratory droplet generated from coughing and sneezing is one of the recognized media of transmission of COVID-19 from human-to-human. Intra-human spreading has been recorded in different countries around the world. The pattern of transmission known through the established cases has generated mass panic and fear among people across the globe. Moreover, the possibility of transmission through the oral-fecal route has still not been ruled out.

The current practice to prevent the disease is supportive and palliative care while isolating the affected and keeping the suspected corona patients to whom he/she contacted in quarantine. There is no way to keep away from the virus if

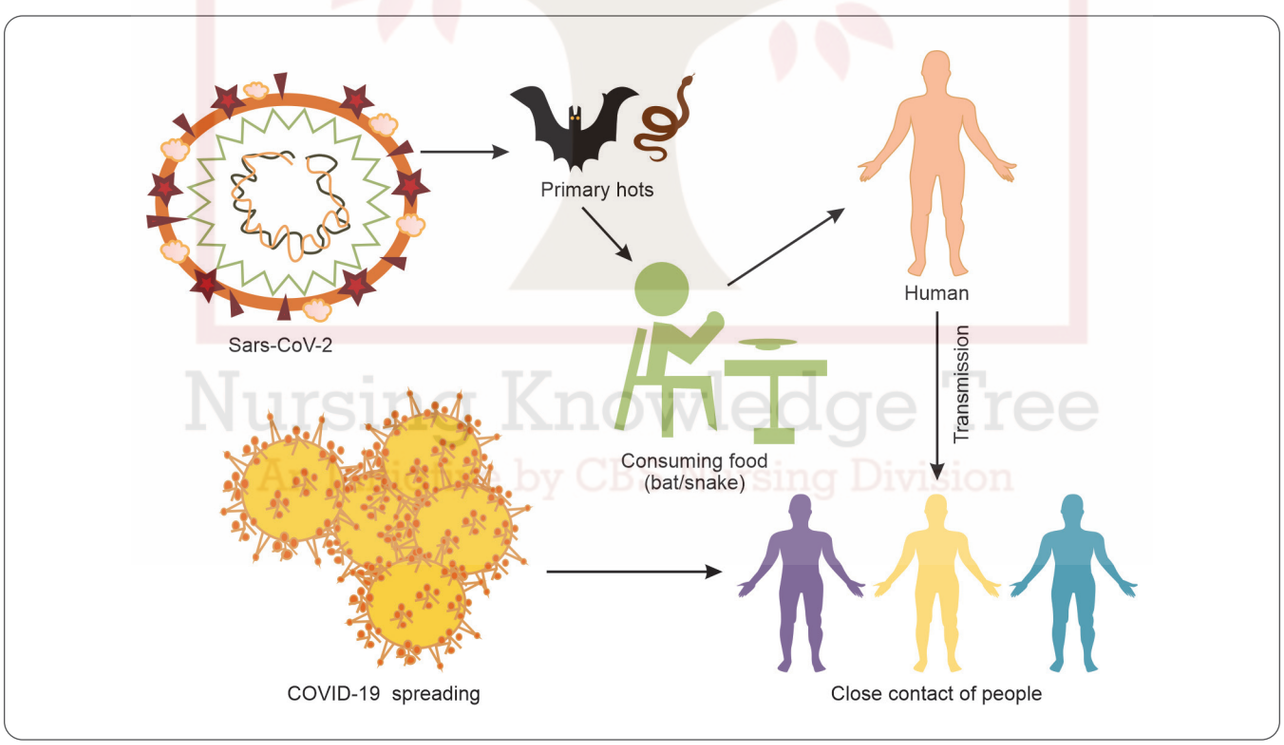


Fig. 10.4: Transmission of COVID-19

Essentials of

Critical Care Nursing

Salient Features

- This book is intended for the educators enrolled in CCU units and students doing superspecialists studies on Critical Care Nursing.
- It serves as a reference on essential aspects of critical care nursing. Nursing care plan is incorporated into most of the conditions with detailed diagnosis and interventions.
- It aims to enhance the knowledge, skills, and understanding necessary to deliver effective and compassionate care in this challenging and specialized field.
- This book provides a comprehensive overview of critical care nursing, focusing on the care of adult patients with life-threatening or potentially life-threatening conditions.
- It covers a wide range of common conditions encountered in critical care units, offering detailed discussions and management.
- Applications of the nursing process in critical care settings have been highlighted throughout the book under the headings systematic assessment, diagnosis, planning, implementation, and evaluation of nursing interventions, ensuring effective and evidence-based care delivery.
- Chapter on Pharmacology has touched upon briefly the drugs used in CCU. It acknowledges the rapid advancements in pharmacology and advises readers to seek the latest information from manufacturers or authoritative sources.
- The book emphasizes the need to consider institution-specific policies, standing orders, protocols, and available technical facilities when performing procedures in critical care units to ensure their adherence to best practices and promote patient safety.

About the Author

Jaya Kuruvilla PhD, MSc (N), has been serving as the Principal/Professor in P D Hinduja Hospital & MRC College of Nursing, Mumbai for last 17 years. She received her Bachelor of Science and Master of Science degrees in Nursing with Medical Surgical Nursing specialty from College of Nursing, Christian Medical College Hospital, Vellore, and Doctorate from IBAM Kolkata.

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She is Founder and Former President of CCNS, India & RFCCN, SAARC countries. Her remarkable achievements include receiving the "Best Principal Award" from International Institute of Education and Management in 2011, "Best Teacher Award" from TNAI, Maharashtra State Branch conferred by Mr Eknath Shinde (Cabinet Minister) in 2019 and Service Excellence Award at Ebek Conference in 2021. She is also a co-author of Genetics for Nursing and Allied Health Professionals and has also contributed a Chapter to Textbooks of Medical Surgical Nursing published by TNAI.

Last but not least, she has organized, attended and presented papers in National and International Conferences in India, Kuwait, Jordan, Sultanate of Oman, New Orleans, New York (USA), Rome, Dubai (ECCC), Nepal, Sri Lanka and Australia.

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