



# COURSE UNIT



## BACHELOR OF SCIENCE IN NURSING: NCMB 418: CARE OF THE CLIENT WITH LIFE- THREATENING CONDITIONS, ACUTELY ILL / MULTI- ORGAN PROBLEMS, HIGH ACUITY AND EMERGENCY SITUATION (ACUTE AND CHRONIC)

COURSE MODULE	COURSE UNIT	WEEK
1	1	1
Scope of Critical Care Nursing		

### CHECK LIST

- ✓ Comprehend the course and unit objectives.
- ✓ Peruse through the study guide prior to class attendance.
- ✓ Analyze the required learning resources; refer to unit terminologies for jargons.
- ✓ Proactively participate in classroom discussions
- ✓ Participate in weekly discussion board (Canvas).
- ✓ Answer and submit course unit tasks on time.



### UNIT EXPECTED OUTCOMES (UEOs)

At the end of this unit, the students are expected to:

1. Integrate relevant principles of social, physical, natural and health sciences and humanities in a given health and nursing situations based on epidemiologic profile
2. Apply appropriate nursing concepts and actions holistically and comprehensively.
3. Participate in the development and improvement of policies and standards regarding safe nursing practice and relevant to human resource management
4. Manage Resources (human, physical, time) efficiently and effectively.

## **REQUIRED READINGS**

Burns, S. and Delgado, S. (2019). *Essentials of Critical Care Nursing*, 4th ed. USA: McGraw-Hill

Schumacher, L., & Chernecky, C. C. (2010). *Saunders nursing survival guide: critical care & emergency nursing*. St. Louis, Mo.: Elsevier Saunders.

## **STUDY GUIDE**

### **CRITICAL CARE NURSING CONCEPTS**

According to the AACN (2019), the assessment of critically ill patients and their families is an essential competency for critical care practitioners. Information obtained from assessment identifies the immediate and future needs of the patient and family so a plan of care can be initiated to address or resolve these problems.

- Critical: Crucial – Crisis – Emergency – Serious
- Critical Care Nursing – care of the seriously-ill clients from point of injury/illness until discharge from intensive care
  - Deals with human responses to life-threatening problems
  - Comprehensive, specialized, and individualized nursing services which are rendered to patients with life-threatening conditions
- Goals
  - ✓ Survival of the critically-ill patients and restoring QUALITY of LIFE
  - ✓ Helping families of critically-ill patients in coping with stress

### Roles of a Critical Care Nurse:

1. Care provider
2. Educator
3. Manager
4. Advocate

### Tasks:

- Care for clients who are very ill
- Provide one-to-one care
- Responsible of making life and death decision
- At risk of injury and illness
- COMMUNICATION SKILL is of optimum importance
- At risk for actual or potential life-threatening health problems



Critically ill patient:

- Post-operative clients with major surgery
- Illness involving vital organs
- Stable clients with signs of impending doom

### Classification of Critical Care Clients

Level 0: normal ward care

Level I: at risk of deteriorating

Level II: needs more observation or intervention

Level III: multisystem failure

### Principles of Critical Care

- Continuous monitoring and treatment
- High intensity therapies
- Expert surveillance and efficiency
- Alert to early manifestations and recognition of parameters denoting progress and deterioration



There are different approaches in assessing patients, most often, the head to toe approach is used. System approach may also be used. In assessing critically ill patients, it usually starts when the nurse becomes aware of the pending admission of the patient and continues until transitioning to the next phase of care.

### Four Stages of the Assessment Framework:

#### 1. Pre – arrival assessment

- determines the possible picture of the client and his or her needs. (anticipate possible resources needed by the patient)
- starts as soon as the nurse becomes aware of a patient coming in the ICU, whether from the ward, operating room or emergency room
- usual documentation – abbreviated report on patient (age, gender, chief complaint, diagnosis, pertinent history, physiologic status, invasive devices, equipment and status of laboratory or diagnostic tests)

#### 2. Admission-quick check

- obtained immediately after the arrival and assessment
- based on the parameters represented by ABCDE
  - A – airway
  - B – breathing
  - C – circulation, cerebral perfusion, chief complaint
  - D – drugs and diagnostic tests
  - E – Equipment

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- General appearance of the client is checked (i.e. consciousness or responsiveness, allergies, etc.)
3. Comprehensive admission assessment
- determines the physiologic and psychosocial baseline for comparing data and to determine whether the status is improving or deteriorating)
  - physical assessment is usually by system approach
  - psychosocial assessment is performed, too, as this could determine prognosis
  - defines the status of the patient prior to the illness
  - assessment data includes:
    - a. Past Medical History
    - b. Social History
    - c. Psychosocial history
    - d. Spirituality
    - e. Physical Assessment
    - f. Psychosocial assessment
    - g. General communication
    - h. Coping styles
    - i. Anxiety and Stress
    - j. Family needs
    - k. Unit orientation
    - l. Referrals
4. On – going assessment
- Determines response to therapy, progression of improvement of his or her condition
  - Performed as long as the client is in the hospital,
  - Continuous assessment is necessary to determine outcome of the client's disease

## TERMINOLOGIES

**Critical care** – care of individuals who are seriously ill, including their families and/or significant others

**Critical care nursing** – a complex, challenging area of nursing practice, where clinical expertise is developed over time by integrating critical care knowledge, clinical skills, and caring practice (AACCN, 2019)

**Critically-ill client** – an individual who requires more intensive and careful nursing care

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## **FURTHER READINGS**

Emergency Nurses Association. (2019). *Sheehy's Manual of Emergency Care*, 7th ed. St. Louis: Elsevier Mosby. pp 504-593

Tlili, M., et. al. (July 2021). A baseline assessment of patient safety culture and its associated factors from the perspective of critical care nurses: Results from 10 hospitals. *Australian Critical Care* 34:4, pp. 363-369. Retrieved from <https://www.sciencedirect.com/science/article/pii/S1036731420303040>

## **UNIT TASKS**

Draw and label an ideal intensive care unit set-up. List the health care providers involved in critical care units and their function(s)

## **REFERENCES**

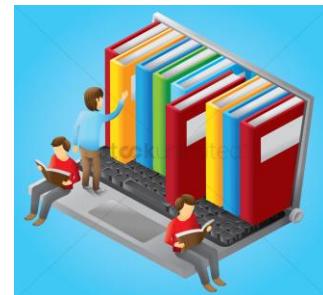
Burns, S. and Delgado, S. (2019). *Essentials of Critical Care Nursing*, 4th ed. USA: McGraw-Hill

Critical Care Nurses Association of the Philippines (CCNAP). (2021). Critical care nursing guidelines, standards, and competencies. <https://www.ccnapi.org/news-and-events/critical-care-nursing-guidelines-standards-and-competencies/>

Emergency Nurses Association. (2019). *Sheehy's Manual of Emergency Care*, 7th ed. St. Louis: Elsevier Mosby.

Schumacher, L., & Chernecky, C. C. (2010). *Saunders nursing survival guide: critical care & emergency nursing*. St. Louis, Mo.: Elsevier Saunders.

Tlili, M., et. al. (July 2021). A baseline assessment of patient safety culture and its associated factors from the perspective of critical care nurses: Results from 10 hospitals. *Australian Critical Care* 34:4, pp. 363-369. Retrieved from <https://www.sciencedirect.com/science/article/pii/S1036731420303040>





# COURSE UNIT



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COURSE MODULE	COURSE UNIT	WEEK
1	2	2
Ethical and Legal Considerations in Critical care Nursing		

### CHECK LIST

- ✓ Comprehend the course and unit objectives.
- ✓ Peruse through the study guide prior to class attendance.
- ✓ Analyze the required learning resources; refer to unit terminologies for jargons.
- ✓ Proactively participate in classroom discussions
- ✓ Participate in weekly discussion board (Canvas).
- ✓ Answer and submit course unit tasks on time.



### UNIT EXPECTED OUTCOMES (UEOs)

At the end of this unit, the students are expected to:

1. Adhere to ethico-legal considerations when providing safe, quality, and professional nursing care.
2. Adhere to established norms of conduct based on the Philippine Nursing Law and other legal, regulatory, and institutional requirements relevant to safe nursing practice.
3. Protect client rights based on “Patient’s Bill of Rights and Obligations.”
4. Demonstrate continued competence and professional growth.

### REQUIRED READINGS

- Burns, S. and Delgado, S. (2019). *Essentials of Critical Care Nursing*, 4th ed. USA: McGraw-Hill
- Schumacher, L., & Chernecky, C. C. (2010). *Saunders nursing survival guide: critical care & emergency nursing*. St. Louis, Mo.: Elsevier Saunders.

## STUDY GUIDE

### FOUNDATIONS FOR ETHICAL DECISION MAKING

1. Professional codes and standards
2. Institutional policies
3. Legal standards
4. Principles of ethics
  - a. Beneficence – best interest of the patient remains more important than self-interest
  - b. Nonmaleficence – not only the will to do good but the equal commitment to do no harm
  - c. Autonomy – freedom from external control; acknowledge and protect a patient's independence
  - d. Privacy – right of the patient to be free from unjustified access by others
  - e. Confidentiality – protection of information; patient information should be shared within the healthcare team directly involved in patient care
  - f. Fidelity – agreement to keep promises
  - g. Veracity – being truthful or honest.



### Contemporary Issues

1. Informed consent – patients must make decisions based on accurate and appropriate information; voluntary
  - The client understands the nature of the treatment and its advantages and disadvantages
  - To indicate that NO COERCION was made before signing
  - To PROTECT the client against unauthorized procedure
  - To PROTECT the surgeon and the hospital against legal actions
  - a. Emancipated minor
    - ✓ a college student living away from home
    - ✓ in military service
    - ✓ Pregnant
    - ✓ Anybody who has given birth
  - b. Authorized representatives for:
    - ✓ Minors
    - ✓ Unconscious patients
    - ✓ Psychologically incapacitated



**EXEMPTIONS:** if experts agreed that the care is an EMERGENCY, has life-threatening conditions, or patient is unconscious and authorized representative cannot be reached

2. Determining capacity – reflects a medical decision on patient's functional ability to participate in the decision-making process; patients are presumed to have the determining capacity

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- 3. Advance directives – statements made by a patient with decision-making capacity describing the care of treatment he/she wishes to receive when no longer competent
    - a. Treatment directives (“living will”) – specify in advance his/her treatment choices and which interventions are desired
    - b. Proxy directives – durable power of attorney for health care
  - 4. End of life care issues
    - end-of-life care includes physical, emotional, social, and spiritual support for patients and their families
    - Goal: to control pain and other symptoms to make the patient as comfortable as possible; quality of life
      - a. Decisions to forego life-sustaining treatments
      - b. Nutrition and hydration
      - c. Pain management
      - d. Resuscitation decisions – DNR, DNI
  - 5. Paternalism – deliberate restriction of autonomy by health care professionals based on the idea that they know what is best for the client

#### Laws on Critical care Nursing

- 1. Scope of Nursing Practice based on R.A. 9173
- 2. Nurses' Code of Ethics
- 3. Patient's Bill of Rights and Obligations
- 4. Dying Patient's Bill of Rights



\*\*\*Senate Bill 586 - AN ACT PROVIDING PALLIATIVE AND END-OF-LIFE CARE, APPROPRIATING FUNDS THEREFOR AND FOR OTHER PURPOSES

#### The Process of Ethical Analysis (AACCN, 2019)

- 1. Assessment
  - a. Identify the problem – clarify the competing ethical claims, conflicting obligations, and personal and professional values; acknowledge the emotional and communication issues
  - b. Gather data – distinguish the morally relevant facts, including medical, nursing, legal, social, and psychological facts; clarify patient's religious and philosophical beliefs and values
  - c. Identify the individuals involved in the problem's development and who should be involved in the decision making; discern factors that may impede the patient's ability to make the decision
- 2. Plan
  - a. Consider all options and avoid restricting choices to the most obvious
  - b. Identify the pros and cons (“harms and goods”)
  - c. Analyze if plan is in accordance with ethical theories and principles
  - d. Look into institutional policies and/or procedures that address the issue
- 3. Implementation – choose a plan and act (anticipate objections)
- 4. Evaluation
  - a. Outline the results
  - b. Identify what harm or good occurred as a result
  - c. Identify necessary changes in the institutional policy(ies) or other strategies to avoid similar issues in the future

## **TERMINOLOGIES**

End-of-life care – care given to patients who are near death and/or have stopped treatment to cure or control his/her disease

## **FURTHER READINGS**

Karnik, S. and Kanekar, A. (2016). Ethical Issues Surrounding End-of-Life Care: A Narrative Review. *Healthcare (Basel)*, 4(2): 24. doi: 10.3390/healthcare4020024

Wiegand, D., MacMillan, J., Dos Santos, M, and Bousso, R. (April 2015). Palliative and End-of-Life Ethical Dilemmas in the Intensive Care Unit. *AACN Advanced Critical Care*, 26(2):142-50. DOI:10.1097/NCI.0000000000000085

## **UNIT TASKS**

If a critical care nurse will be given a chance to be heard for the Senate Bill 586 to be passed, and you would be that nurse, would you be in the proposition (affirmative) or opposition (negative) side? With the chosen side, present your argument and ensure to cite valid and credible sources to further strengthen your argument.

## **REFERENCES**

Burns, S. and Delgado, S. (2019). Essentials of Critical Care Nursing, 4th ed. USA: McGraw-Hill

Emergency Nurses Association. (2019). *Sheehy's Manual of Emergency Care*, 7th ed. St. Louis: Elsevier Mosby.

Karnik, S. and Kanekar, A. (2016). Ethical Issues Surrounding End-of-Life Care: A Narrative Review. *Healthcare (Basel)*, 4(2): 24. doi: 10.3390/healthcare4020024

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COURSE MODULE	COURSE UNIT	WEEK
1	3	3
Quality and Safety Improvements in Critical Care Units		

### CHECK LIST

- ✓ Comprehend the course and unit objectives.
- ✓ Peruse through the study guide prior to class attendance.
- ✓ Analyze the required learning resources; refer to unit terminologies for jargons.
- ✓ Proactively participate in classroom discussions
- ✓ Participate in weekly discussion board (Canvas).
- ✓ Answer and submit course unit tasks on time.



### UNIT EXPECTED OUTCOMES (UEOs)

At the end of this unit, the students are expected to:

1. Participate as a member of research in the conduct of a research study.
2. Provide appropriate evidence-based nursing care derived from a variety of theories, care standards, research and client preferences.
3. Use of appropriate technology to perform safe and efficient nursing activities.
4. Implement system of informatics to support the delivery of health care.
5. Assume responsibility for lifelong learning, own personal development and maintenance of competence.
6. Demonstrate continued competence and professional growth.

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- 7. Engage in advocacy activities to deal with health-related concerns and adopts policies that foster the growth and development of the nursing profession.

## ■ REQUIRED READINGS

Burns, S. and Delgado, S. (2019). *Essentials of Critical Care Nursing*, 4th ed. USA: McGraw-Hill

Schumacher, L., & Chernecky, C. C. (2010). *Saunders nursing survival guide: critical care & emergency nursing*. St. Louis, Mo.: Elsevier Saunders.

## ■ STUDY GUIDE

### Evidence based nursing (EBN)

- under the umbrella of Evidence Based Practice. Definitions of evidence-based nursing have varied in scholarly literature. Scott & McSherry's extensive literature review looked at commonalities between EBN definitions and synthesized them to come up with the following definition:
- "An ongoing process by which evidence, nursing theory and the practitioners' clinical expertise are critically evaluated and considered, in conjunction with patient involvement, to provide delivery of optimum nursing care for the individual," (Melnyk, B, Fineout-Overholt, E., Stillwell, S., and Williamson, K., 2010).



Steps: (Melnyk, B, Fineout-Overholt, E., Stillwell, S., and Williamson, K., 2015)

- Step 1: Ask clinical questions
  - a. PICOT format
    - ✓ P – patient / population of interest / problem (start with the patient, or group of patients, or problem)
    - ✓ I – intervention or area of interest (What is the proposed intervention?)
    - ✓ C – comparison intervention or group (What is the main alternative, to compare with the intervention? This might be: no intervention.)
    - ✓ O – outcome (What is the anticipated or hoped-for outcome?)
    - ✓ T – time frame (How long will it take to reach the desired outcome?)
  - this provides an efficient outline for searching electronic databases (to retrieve articles relevant only to the clinical question)
  - Example: "I work in MICU where ventilator-related infections are a common problem. I've heard that oral care of ventilated patients even with water can help prevent this. I wonder if there's any evidence for that and whether it might help our patients?"
    - P Patients in MICU
    - I water
    - C oral care with water only
    - O Prevention of ventilator-related infections
    - T (will depend on the time frame set)

- b. The SPIDER tool – can be used when dealing attitudes and experiences rather than scientifically measurable data since it focuses less on the intervention and more on the design
- deals with "samples" rather than a "patient" or "populations".  
 S – ample (group of participants)  
 PI – phenomenon of interest (how and why of behaviors and experiences)  
 D – esign (how the study was devised and conducted)  
 E – valuation (measurement of outcome; might be subjective and not necessarily empirical)  
 R – esearch Type (qualitative, or quantitative, or mixed)
  - Research questions framed using the SPIDER tool tend to begin with "What are the experiences of ...?"
  - Example: "What are the experiences of fourth year university students in using their critical care units related learning experience?"  
 S    Fourth year university students  
 PI   CCUs RLE  
 D    Survey  
 E    Experiences (of having the RLE in CCUs)  
 R    Qualitative
- Step 2: Search for the best evidence / Obtain the best research literature
    - ✓ to describe if clinical practice is streamlined when questions are asked
  - Step 3: Critically appraise the evidence.
    - ✓ Once articles are selected for review, these must be rapidly appraised to determine those most relevant, valid, reliable, and applicable to the clinical question.  
*(Guide: Are the results of the study valid? What are the results and are they important? Will the results help me care for my patients?)*
  - Step 4: Integrate the evidence with clinical expertise and patient preferences and values.
    - ✓ synthesize the studies to determine if they come to similar conclusions, thus supporting an EBP decision or change
    - ✓ Research evidence alone is not sufficient to justify a change in practice. Clinical expertise, based on patient assessments, laboratory data, and data from outcomes management programs, as well as patients' preferences and values are important components of EBP
  - Step 5: Evaluate the outcomes of the practice decisions or changes based on evidence.
    - ✓ to monitor and evaluate any changes in outcomes (positive effects can be supported and negative ones remedied)

NOTE: EBP results should be disseminated.

- 
- ✓ leads to needless duplication of effort, and perpetuates clinical approaches that are not evidence based
  - ✓ Examples of ways to disseminate successful initiatives: presentations at local, regional, and national conferences; reports in peer-reviewed journals; professional newsletters; and publications for general audiences

Salient Points to consider in the use of EBN Practice:

- Promotes use of EBP among advanced practice nurses and direct care nurses
- Identifies a network of stakeholders who are supportive of the EBP project
- Cognitive behavioral theory underpinnings

- Emphasis on healthcare organizational readiness and identification of facilities and barriers
- Encompasses research, patient values, and clinical expertise as evidence.

## QUALITY AND SAFETY MONITORING

1. Care bundles
  - A group of 3-5 evidence-based interventions, when performed together, have a better outcome than if performed individually
  - can be used to ensure the delivery of the minimum standards of care
  - can be used as an audit tool to assess the delivery of interventions (NOTE: cannot be used to assess how well individual interventions are performed)
  - encourage the review of evidence and modification of clinical care guidelines, engendering staff education in best practice
  - key principle = high level of adherence to all components
  - Example: The sepsis care bundle, part of the international Surviving Sepsis campaign, is the most widely utilized bundle.
2. Checklists
3. Continuous quality improvement
4. PDCA - Plan-Do-Check-Act (PDCA) cycle (Deming Cycle, Shewhart Cycle)
  - a management tool for continuous improvement of a business's products or processes. It can be applied to standardize nursing management and thus improve the nursing quality and increase the survival rate of patients
  - Uses: implementation of change, solve problems, and continuously improve nursing management processes
  - cyclical nature; allows it to be utilized in a continuous manner for ongoing improvement

P - PLAN the change or improvement  
D – DO = conduct a pilot test of the change  
C – CHECK = gather data about the pilot change to ensure the change was successful  
A – ACT = implement the change on a broader scale; continue to monitor the change and repeat as necessary by repeating the cycle

  - Expertise Required: easy to use and requires little or no training.
  - Advantages:
    - ✓ Makes sure that all appropriate steps are followed.
    - ✓ Offers a systematic improvement method.
    - ✓ Is an effective process improvement guide.
    - ✓ Informs future improvement by providing feedback.
    - ✓ Maintains order during problem solving.
  - Disadvantage: Requires significant commitment over time.



## Multidisciplinary plans of care



- benefits to both patients and the hospital system:
1. Improve patient's outcome
  2. Increased quality and continuity of care
  3. Improve communications and collaboration
  4. Identification of hospital system problems
  5. Coordination of necessary services and reduced duplication
  6. Prioritization of activities
  7. Reduce length of stay and health care costs.

Format for the multidisciplinary approach categories:

1. Discharge outcomes
2. Patient goals
3. Assessment and evaluation
4. Consultations
5. Tests
6. Medications
7. Nutrition
8. Activity
9. Education
10. Discharge planning



NOTE: Primary consideration = patient's safety

### Information and communication technologies in CCU

1. Clinical Information System
2. Computerized provider order entry (CPOE)
3. Hand-held Technologies
4. Tele-health Initiatives (Tele-ICU)



### Advocacy: Access to social care services

- A. PhilHealth
- B. DOH
- C. DSWD
- D. PAGCOR
- E. PCSO

## TERMINOLOGIES

**Evidence-based practice in nursing** – an integration of research evidence, clinical expertise and a patient's preferences; problem-solving approach to clinical practice intended to encourage nurses to provide individualized patient care

**Quality improvement** – an important activity for all members of the interdisciplinary critical care team to ensure safe, timely, effective, efficient, equitable, and patient-centered care

**Multidisciplinary plan of care** - is a set of expectations for the major components of care a patient should receive during hospitalization to manage a specific medical or surgical problem.

**Clinical Pathways** – this is another term for multi-disciplinary plan of care. The result is diagnosis-specific plan of care that focuses the entire care team on expected patient outcomes

## **FURTHER READINGS**

Chen, Y., Zheng, J., Wu, D., Zhang, Y., and Lin, Y. (May 2020). Application of the PDCA cycle for standardized nursing management in a COVID-19 intensive care unit. *Annals of Palliative Medicine*, 9(3):1198-1205. doi: 10.21037/apm-20-1084

Lavallée, J.F., Gray, T., Dumville, J., Russell, W., and Cullum, N. (November 2017). The effects of care bundles on patient outcomes: a systematic review and meta-analysis. *Implementation Science* 12(142). <https://doi.org/10.1186/s13012-017-0670-0>

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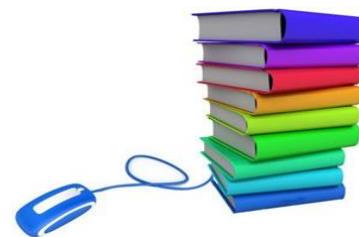
## **UNIT TASKS**

Read and understand the nursing research articles of Raurell-Torredà, M. and Udeh, C., et. al. (listed in the References). Compare and contrast how the Philippines fair in the fourth industrial revolution in terms of critical care management and use of technologies in an essay of 200-300 words; include its implications in the practice of critical care nursing. Use the following indicators as basis / guide in writing your essay: critical care units nursing care quality rates, mortality rates, and survival rates. Cite your references to further support your insights.

## **REFERENCES**

Burns, S. and Delgado, S. (2019). *Essentials of Critical Care Nursing*, 4th ed. USA: McGraw-Hill

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Melnyk, B. M., & Fineout-Overholt, E. (2015). Evidence-based practice in nursing and healthcare: A guide to best practice. Philadelphia, PA: Wolters Kluwer.

Raurell-Torredà, M. (2020). Management of ICU nursing teams during the COVID-19 pandemic. *Enferm Intensiva*. 2020;31:49-51. <https://www.sciencedirect.com/science/article/pii/S2529984020300197>

Sanghavi, D., Guru, P., and Franco, P. (2019 July). Quality Improvement and Telemedicine Intensive Care Unit A Perfect Match. *Critical Care Clinics*, 35(3):pp 451-462. <https://www.sciencedirect.com/science/article/abs/pii/S0749070419300168>

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Udeh, C., et. al. (2018 Apr-Jun). Telemedicine/Virtual ICU: Where Are We and Where Are We Going? *Methodist DeBakey cardiovascular Journal*, 14(2): 126–133. doi: 10.14797/mdcj-14-2-126



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COURSE MODULE	COURSE UNIT	WEEK
1	4	4
Respiratory Assessment, Techniques and Monitoring Systems		

### CHECK LIST

- ✓ Comprehend the course and unit objectives.
- ✓ Peruse through the study guide prior to class attendance.
- ✓ Analyze the required learning resources; refer to unit terminologies for jargons.
- ✓ Proactively participate in classroom discussions
- ✓ Participate in weekly discussion board (Canvas).  
Answer and submit course unit tasks on time.



### UNIT EXPECTED OUTCOMES (UEOs)

At the end of this unit, the students are expected to:

1. Perform safe and quality respiratory assessment techniques and interventions to address the client's identified needs/ problems.
2. Offer client health education using selected and appropriate approaches of care for the sick adult client.
3. Document nursing care and services rendered and processes outcomes of the findings/ result of the client data.
4. Ensure completeness, integrity, safety, accessibility, and security of information.
5. Adhere to protocols of confidentiality in safekeeping and releasing of records and other information.

## **REQUIRED READINGS**

Burns, S. and Delgado, S. (2019). *Essentials of Critical Care Nursing*, 4th ed. USA: McGraw-Hill

Schumacher, L., & Chernecky, C. C. (2010). *Saunders nursing survival guide: critical care & emergency nursing*. St. Louis, Mo.: Elsevier Saunders.

## **STUDY GUIDE**

### **REVIEW ON THE ASSESSMENT OF RESPIRATORY FUNCTION**

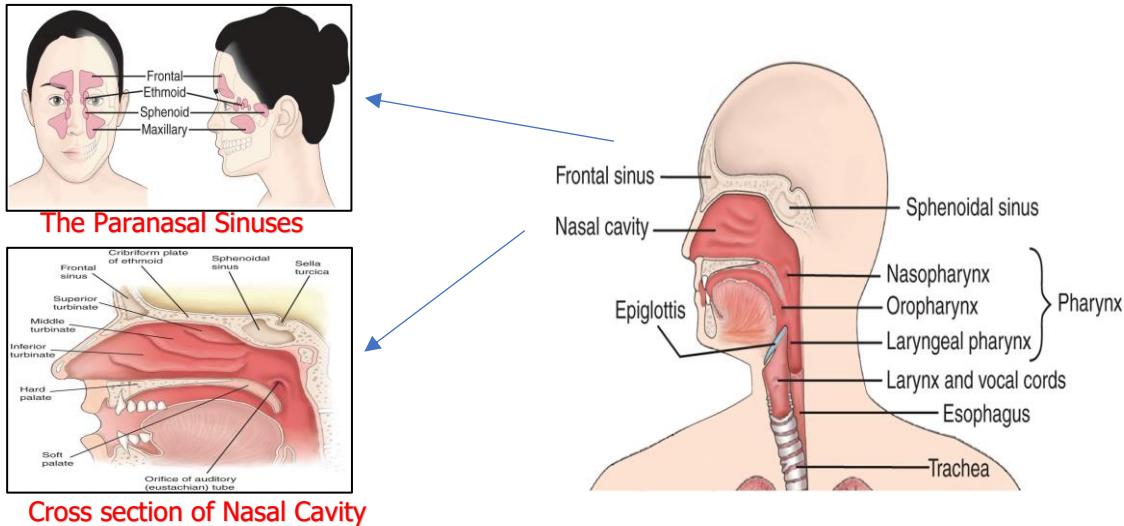
#### **PURPOSE OF THE RESPIRATORY SYSTEM**

- § The lungs, in conjunction with the circulatory system, deliver oxygen to and expel carbon dioxide from the cells of the body.
- § The upper respiratory system warms and filters air.
- § The lungs accomplish gas exchange.

#### **STRUCTURES OF THE RESPIRATORY SYSTEM**

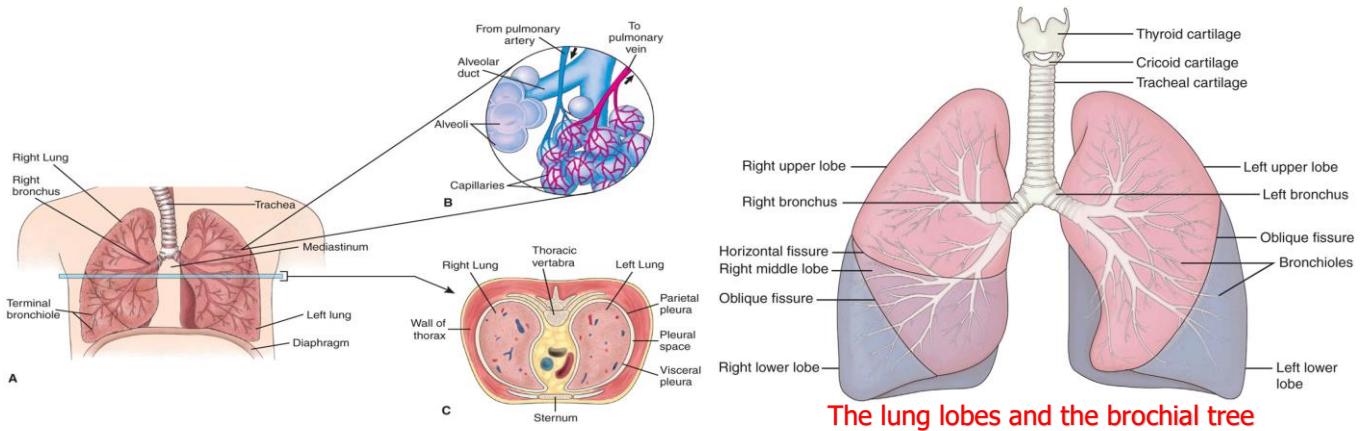
1. Parts of the Upper Respiratory System
  - § Nose
  - § Sinuses and nasal passages
  - § Pharynx, Tonsils and adenoids
  - § Larynx: epiglottis, glottis, vocal cords, and cartilages

Figure 1. The Upper Respiratory System



2. Parts of the Lower Respiratory System
  - § Lungs, Pleura and mediastinum
  - § Lobes of the lungs: Left (upper & lower); right (upper, middle, lower)
  - § Bronchi & bronchioles and the alveoli (gas exchange)

Figure 1. The Lower Respiratory System



## VENTILLATION

- Inspiration: contraction of the diaphragm and contraction of the external intercostal muscles increases the space in the thoracic chamber (lowered intrathoracic pressure causes air to enter through the airways and inflate the lungs)
- Expiration: with relaxation, the diaphragm moves up and intrathoracic pressure increases (pushes air out of the lungs); expiration requires the elastic recoil of the lungs.
- Inspiration = 1/3 of the respiratory cycle; expiration = 2/3 of the respiratory cycle

## RESPIRATION

- Oxygen diffuses from the air into the blood at the alveoli to be transported to the cells of the body.
- Carbon dioxide diffuses from the blood into the air at the alveoli to be removed from the body.

## ASSESSMENT OF BREATH SOUNDS

- Normal breath sounds: Vesicular, Bronchovesicular, Bronchial
- Abnormal (adventitious) breath sounds:
  - Crackles
  - Wheezes
  - Friction rubs

## VENTILLATION PERFUSION (V/Q) RATIO

- Ventilation is the movement of air in and out of the lungs.
- Air must reach the alveoli to be available for gas exchange.
- Perfusion is the filling of the pulmonary capillaries with blood.
- Adequate gas exchange depends upon an adequate V/Q ratio, a match of ventilation and perfusion.
- Shunting occurs when there is an imbalance of ventilation and perfusion. This results in hypoxia.

## LUNG CAPACITIES

- Tidal volume (TV): air volume of each breath
- Inspiratory reserve volume (IRV): maximum volume that can be inhaled after a normal inhalation.
- Expiratory reserve volume (ERV): maximum volume that can be exhaled after a normal exhalation.

- 
- Vital capacity (VC): the maximum volume of air exhaled from a maximal inspiration,  $VC = TV + IRV + ERV$ .
  - Forced expiratory volume (FEV): volume exhaled forcefully over time in seconds. Time is indicated as a subscript, usually 1 second.

## MEASUREMENT OF VOLUME AND INSPIRATORY FORCE

- A spirometer measures volumes of air exhaled and is used to assess lung capacities.
- When assessing TV, measure several breaths. TV varies from breath to breath.
- Pulmonary function tests assess respiratory function and determine the extent of dysfunction.
- Peak flow rate reflects maximal expiratory flow and is frequently done by patients using a home spirometer.

## INSPIRATORY FORCE

- Evaluates the effort of the patient in making an inspiration.
- A monometer which measures inspiratory effort can be attached to a mask or endotracheal tube to occlude the airway and measure pressure.
- Normal inspiratory pressure is approximately 100 cm H<sub>2</sub>O.
- Force of less than 25 cm usually requires mechanical ventilation.

## ARTERIAL BLOOD GAS

- Measurement of arterial oxygenation and carbon dioxide levels.
- Used to assess the adequacy of alveolar ventilation and the ability of the lungs to provide oxygen and remove carbon dioxide.
- Also assesses acid base balance

## PULSE OXIMETRY

- A noninvasive method to monitor the oxygen saturation of the blood.
- Does not replace ABGs
- Normal level is 95-100%.
- May be unreliable

## DIAGNOSTIC TESTS

- Imaging tests: Chest x-ray, CT scan, MRI, Fluoroscopic Studies and Angiography, Radioisotope procedure-lung Scans, Bronchoscopy, Thoracoscopy
- Pulmonary function tests
- Arterial blood gases
- Sputum tests
- Thoracentesis
- Biopsies

## RESPIRATORY CONDITIONS:

### 1. UPPER AIRWAY OBSTRUCTION

- Causes: Foreign bodies/materials; enlargement of tissues in the wall of airway, pressure on the walls of the airway, altered level of consciousness

#### ASSESSMENT:

- Inspection (eye)
  - Palpation (touch)
  - Auscultation (hearing)
-

## AIRWAY MANAGEMENT

1. OROPHARYNGEAL AIRWAY (OPA)
  - Also known as Oral bite block
  - Temporary
  - Relieves upper airway obstruction
  - Tongue relaxation, secretions, seizures
  - Not recommended for alert clients
  - May trigger gag and cause vomiting

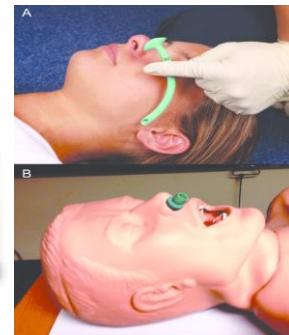


### Nursing Responsibility

- Frequent assessment of the lips and tongue to identify pressure areas
- Removed at least q 24 hours to check for pressure areas and to provide oral hygiene

2. NASOPHARYNGEAL AIRWAY

- a.k.a. Nasal trumpet
- Maintains airway patency
- Also used to facilitate nasotracheal suctioning
- Size: French 26-35



### Complications

- Bleeding
- Sinusitis
- Erosion of the mucus membranes

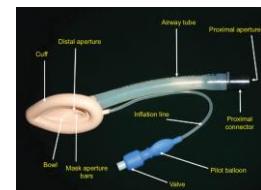
### Nursing Responsibility

- Assessment of the pressure areas and occlusion due to secretions
- Rotation of tube from nostril to nostril daily

3. LARYNGEAL MASK AIRWAY

### Laryngeal Mask Airway

- An ET with a small mask on one end that can be passed orally over the larynx
- Provides ventilatory assistance and prevent aspiration



### Combitube

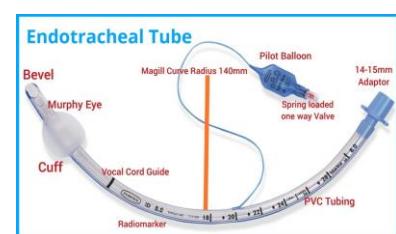
- Esophageal/tracheal double lumen airway
- Used for difficult or emergency intubation
- Permits blind placement

4. Endotracheal (ET) tube

- Includes a 15mm adapter at the end for connection to life support equipment
- Distance marker on the sides for placement
- Inserted into the trachea through the mouth or nose

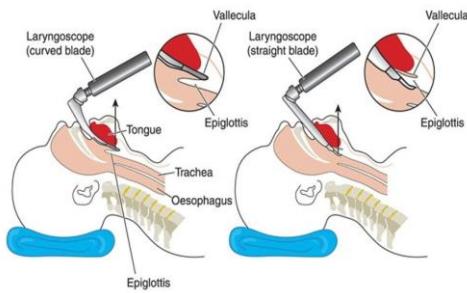
### Insertion of Endotracheal (ET) Tube

- Using laryngoscope to visualize the upper airway
- Inserted through the vocal cords into the trachea
- 2-4 cm above the carina
- Anchored by inflating the cuff  
(prevents air leakage and aspiration)



### **Confirm proper placement**

- Presence of bilateral breath sounds
- Equal
- Suctexcursion during inspiration
- Absence of breath sounds over the stomach
- PETCO<sub>2</sub>: 35-40 mmHg



### **Verification: CXR**

- Anchor with tape or ET fixation device
- Centimeter marking at the lip is documented during each shift
- 10-14 days of intubation: tracheostomy is usually indicated

### **Complications:**

- Laryngeal and tracheal damage
- Laryngospasm
- Aspiration
- Infection and discomfort
- Vocal cord paralysis (should not be used longer than 3 week)

## **MECHANICAL VENTILLATION**

- A form of assisted ventilation; takes over all part of the work performed by the respiratory muscles and organs
- Indication: impaired patient's ability to oxygenate and exchange carbon dioxide
- Main goal: to support gas exchange until the disease process is resolved



## **POSITIVE PRESSURE VENTILLATION (PPV)**

- Most common form of mechanical ventilation used in the acute care setting
- Forces oxygen into the lungs with each breath through an endotracheal tube or tracheostomy tube
- Volume-cycled modes (deliver breath until preset tidal volume is reached with each breath)
- Pressured-cycled modes (deliver breath until a preset pressure is achieved within the airway)

## **MODES OF VENTILLATION**

- Ways in which ventilation is triggered, allowing the patient partial or complete control over their breathing
- Factors affecting selection of ventilator modes:
  - Underlying pulmonary status
  - Oxygenation
  - Presence of spontaneous breathing

## **Assist-control Ventilation (ACV)**

- Delivers a preset volume at a preset rate and whenever the patient initiates a breath (i.e. if the patient does not initiate a breath within a preset time, the ventilator will deliver a breath)
- Used in patients with weak respiratory muscles

---

### **Synchronized Intermittent Mandatory Ventilation (SIMV)**

- Delivers a preset volume at a preset rate and is synchronized with the patient's effort
- Allows spontaneous breathing between ventilated breaths
- Prevents competition between patient and ventilator
- Common mode for patients requiring minimal ventilation
- Used for WEANING for ventilator support

### **Pressure-controlled ventilation (PCV)**

- Delivers positive-pressure breath until a maximum amount of airway pressure is reached, then the inspiratory phase of the breath stops
- Maximum inspiratory pressure limit is preset to help minimize ventilator-induced lung injury (VILI)
- Settings are adjusted to achieve a goal tidal volume designated by physician
- Tidal volume goal: based on patient's weight and pulmonary status

### **Pressure-regulated volume control (PRVC)**

- A type of PCV in which the ventilator makes pressure adjustments to aim for a predetermined tidal volume
- Using this mode, the ventilator senses any changes in lung compliance (ex. Increase in peak inspiratory pressure) and reduces the tidal volume until airway pressures are back within normal range

## **ADDITIONAL VENTILATORY MODES**

### **Positive end-expiratory pressure (PEEP)**

- Holds positive pressure in the alveoli during expiration
- Frequently used as a supplement to most modes of ventilation

Advantages:

- Prevents alveoli from collapsing at end-expiration
- improves oxygenation
- Increases functional residual capacity
- Range: 2 to 24 cmH<sub>2</sub>O pressure

Disadvantage:

- PEEP greater than 10 cmH<sub>2</sub>O
- Increased intrathoracic pressure that causes decreased venous return and decreased cardiac output (HYPOTENSION)
- Increase preload with fluids or vasopressors

### **HIGH LEVELS OF PEEP**

- Increased airway pressure
- VILI, hypotension, increased ICP, alveolar ventilation-perfusion mismatch

### **Constant Positive Airway Pressure (CPAP)**

- Similar to PEEP but provides positive pressure during spontaneous breaths
- Increases oxygenation by preventing closure of alveoli at end-expiration thereby maximizing functional residual capacity (FRC)

- 
- General range: 5-10 cmH<sub>2</sub>O; more than 10cmH<sub>2</sub>O = hypotension/pneumothorax
  - Frequently used to wean patients as a non-invasive method

### **Pressure Support Ventilation (PSV)**

- Augments the tidal volume of spontaneous breaths by delivering a preset positive pressure during inspiration
- Can be added to SIMV and CPAP for weaning
- Range: 8-20 cmH<sub>2</sub>O
- Increases patient comfort by decreasing the amount of work required in each spontaneous breath

## **VENTILLATOR SETTINGS**

- Individualized settings
- Adjustments are based on ABG measurements and Arterial Oxygen saturations (SaO<sub>2</sub>)

### **Vt (Tidal Volume)**

- Amount of oxygen delivered to a patient with each preset ventilated breath; 5-15 mL/kg (average: 10mL/kg)

### **Back up rate (BUR) or Respiratory rate**

- Number of breaths per minute that ventilator is set to deliver; 4-20 breaths/minute

### **Fraction of inspired oxygen (FiO<sub>2</sub>)**

- Percentage of oxygen delivered by ventilator with each breath 21 - 100%

### **Inspiratory to Expiratory ratio (I:E Ratio)**

- Number of breaths per minute that ventilator is set to deliver 1:2

### **Sensitivity**

- Determines amount of effort patient must generate before ventilator will give a breath
- Too low: patient works harder to obtain a breath
- Too high: patient's respiratory effort may compete with ventilator

### **Flow rate**

- Determines how fast Vt will be delivered during inspiration
- High – increase airway pressure
- Low – decrease airway pressure

### **Pressure limit**

- Regulates maximum amount of pressure the ventilator will generate to deliver preset Vt
- Ventilated breath will stop when pressure limit is reached

## **VENTILATION TERMINOLOGIES**

### **Compliance**

- Elasticity of the lung tissue
  - Decreased compliance = increased resistance to breath
-

## Peak Inspiratory Pressure (PIP)

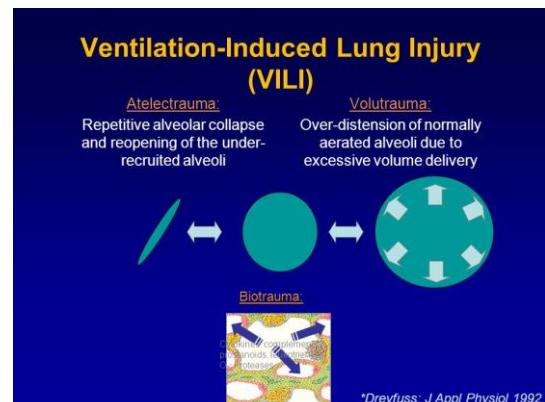
- Airway pressure at maximum inspiration
- A.K.A. peak airway pressure

## Low pressure alarms

- LEAK or DISCONNECTION in ventilator circuit
- Patient not receiving adequate ventilation

## High pressure alarms

- PIP has exceeded a safe limit
- Patient at risk of VILI



## Volutrauma

- Injury to the lung tissue from **over distension of alveoli**

## Barotrauma

- Injury to the lung tissue from too much pressure on the airway

## Atelectrauma

- VILI from a low intra-alveolar pressure causing collapse of alveoli

## MECHANICAL VENTILLATION COMPLICATIONS:

### VENTILLATOR - ASSOCIATED PNEUMONIA (VAP) BUNDLES OF CARE

- Elevation of the head of the bed (HOB)
- Daily sedation vacations and assessment of readiness to extubate
- Peptic ulcer disease prophylaxis
- Deep vein thrombosis (DVT) prophylaxis
- Daily oral care with chlorhexidine (added in 2010)

## WEANING PATIENT FROM MECHANICAL VENTILLATION:

### METHODS OF MEANING:

#### 1. Assist-Control (A/C) ventilation

- Control rate is decreased, patient strengthens respiratory muscle by triggering more progressive respirations
- Nursing Management:
  - WOF: rapid or shallow breathing, use of accessory muscles, decrease in LOC, increase in CO<sub>2</sub> levels, decrease O<sub>2</sub> saturation and tachycardia

#### 2. Synchronized Intermittent mandatory Ventilation (SIMV)

- Indicated for patients who satisfied weaning criteria but cannot sustain adequate spontaneous ventilation for long periods
- As respiratory muscles strengthen, the pressure is decreased

#### 3. T-piece

- Usually used when patient is awake and alert, breathing without difficulty, and has good gag and cough reflex
- Maintained on oxygen level on the same or greater than oxygen concentration the patient is receiving in mech vent

- 
- WOF: respiratory distress and hypoxia

## **TERMINOLOGIES**

**Respiration** – the process of gas exchange between atmospheric air and the blood at the alveoli, and between the blood cells and the cells of the body; exchange of gases occurs due to differences in partial pressures.

**Ventilation** – the movement of air in and out of the lungs

## **FURTHER READINGS**

Hinkle, J. and Cheever, K. (2017). Brunner & Suddarth's Textbook of Medical-Surgical Nursing, 14th ed. USA: Wolters Kluwer

## **UNIT TASKS**

Search, read, and understand journals / research articles from Science Direct and EBSCO on the common causes of ventilator-induced trauma / injuries and management. List them down and then develop a plan on how you can prevent these from occurring as future nurses to your future patients. Submit this via Canvas as a 200–300-word essay.

## **REFERENCES**

Burns, S. (2018) AACN Essentials of Critical Care Nursing. Mc Graw Hill Education.

Schumacher L. (2012) Saunder's Nursing survival guide: Critical Care and Emergency Nursing. Elsevier





# COURSE UNIT



## BACHELOR OF SCIENCE IN NURSING: NCMB 418 - CARE OF THE CLIENT WITH LIFE- THREATENING CONDITIONS, ACUTELY ILL / MULTI- ORGAN PROBLEMS, HIGH ACUITY AND EMERGENCY SITUATION (ACUTE AND CHRONIC)

COURSE MODULE	COURSE UNIT	WEEK
1	5	5
Nursing Care of Clients with Altered Ventilatory Function		

### CHECK LIST

Comprehend the course and unit objectives

- ✓ Peruse through the study guide prior to class attendance
- ✓ Analyze the required learning resources; refer to unit terminologies for jargons
- ✓ Proactively participate in classroom discussions
- ✓ Participate in weekly discussion board (Canvas)
- ✓ Answer and submit course unit tasks on time



### UNIT EXPECTED OUTCOMES (UEOs)

At the end of this unit, the students are expected to:

1. Discuss the pathophysiologic responses of clients with altered ventilatory functions.
2. Analyze the health status/competence of clients with altered ventilatory functions.
3. Formulate a plan of care based on client's priorities to address the needs/ problems.
4. Institute appropriate corrective actions to prevent or minimize harm arising from adverse effects.
5. Apply safe and quality interventions to address the client's identified needs/ problems.
6. Offer client health education using selected planning models as appropriate for clients.
7. Document nursing care and services rendered and processes outcomes of the findings/ result of the client data.

- 
- 8. Ensure completeness, integrity, safety, accessibility, and security of information.
  - 9. Adhere to protocols of confidentiality in safekeeping and releasing of records and other information.
  - 10. Evaluate the client's health status / competence and/or expected outcomes of nurse-client working relationship.

## **REQUIRED READINGS**

Schumacher, L., & Chernecky, C. C. (2010). Saunders nursing survival guide: critical care & emergency nursing. St. Louis, Mo.: Elsevier Saunders. Crouch, R., Charters, A., Dawood, M., &

Bennett, P. (2017). Oxford handbook of emergency nursing. Oxford, United Kingdom: Oxford University Press.

Baid, H., Creed, F., & Hargreaves, J. (2016). Oxford handbook of critical care nursing. Oxford, United Kingdom: Oxford University Press.

## **STUDY GUIDE**

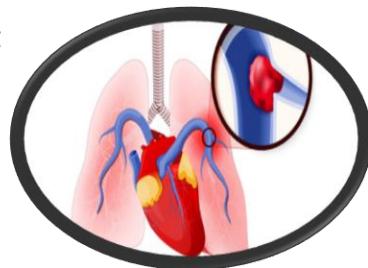
Respiratory emergencies may range from “shortness of breath,” or dyspnea, to complete respiratory arrest, or apnea. These conditions can result from a large number of causes, but most typically they involve the lungs.

### **Pulmonary Embolism (Pulmonary Embolus)**

This is a thrombotic or non-thrombotic embolus that lodges in the pulmonary artery system. It can damage part of the lung due to restricted blood flow, decrease oxygen levels in the blood, and affect other organs as well. Large or multiple blood clots can be fatal. The blockage can be life-threatening

#### **Risk Factors**

- 1. Injury or damage leading to blood clot formation
- 2. Inactivity for prolonged periods
- 3. Medical conditions or treatment procedures that cause blood to clot easily (e.g. surgery, DVT, etc.)



#### **Clinical Manifestations**

- 1. Virchow's triad: venous stasis, coagulation problems, vessel wall injury
- 2. Chest pain
- 3. Tachycardia, tachypnea
- 4. Anxiety, restlessness
- 5. Clammy or bluish skin

#### **Diagnostics**

- 1. CXR – to rule out other disorders with the same presenting manifestations
  - 2. ABG analysis
  - 3. D-dimer test – detects clot fragments from clot lysis
  - 4. ECG
  - 5. V/Q scan / Pulmonary angiography / spiral CT scan
-

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### Treatment:

1. Oxygenation (ET and mechanical ventilation)
2. Heparin therapy
3. Surgery – umbrella filter, pulmonary embolectomy
4. Prevention of development of DVT

### **Acute Respiratory Distress Syndrome (ARDS) / Lung Injury**

This is a syndrome with inflammation and increased permeability of the alveolocapillary membrane that occurs as a result of an injury to the lungs. This condition is fatal when left undiagnosed or treated for 48hrs.

### Risk Factors

1. Critically ill patients
2. Age (60y/o and above)
3. Malignancy (cancers)
4. Cigarette smoking, COPD

Causes: Aspiration pneumonia or systemic illness (e.g. burns, sepsis, drug overdose)

### Clinical Manifestations:

- Signs and symptoms are often exhibited within 24-48 hours after initial insult to the lungs
1. Restlessness,
  2. Hyperventilation, tachycardia, SOB
  3. Hypoxemia
  4. Severe: hypotension, cyanosis, decreased UO

Diagnostic: Chest x-ray = reveals “white out” lungs

### Treatment

- Goal: improving and maintaining oxygenation and prevent respiratory and metabolic complications
- 
1. Fluid management to maintain tissue perfusion
  2. Corticosteroid therapy to decrease permeability of the alveolocapillary membrane
  3. Nutrition – enteral feeding
  4. Supplemental oxygen: Mechanical Ventilation – a form of artificial ventilation that takes over all or part of the work performed by the respiratory muscles and organs
    - ✓ Modes, Settings, Alarms

### **Acute Respiratory Failure**

It is a change in respiratory gas exchange such that normal cellular function is jeopardized. ARF is defined as'pO<sub>2</sub> of less than 50 mmHg and a pCO<sub>2</sub> of greater than 50 mmHg and a pH of less than 7.30. Actual pO<sub>2</sub> and pCO<sub>2</sub> that define ARF vary, depending on the different factors that influence patient's normal arterial blood gasses. For example, if pO<sub>2</sub> level of a 75 – year old man is 55 mmHg, ARF will not be diagnosed until the pO<sub>2</sub> have decreased to 50 mmHg or less.

This is a condition in which the blood doesn't have enough oxygen or has too much carbon dioxide, sometimes one can have both problems.

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Respiratory failure is divided into type I and type II.

- Type I respiratory failure involves low oxygen, and normal or low carbon dioxide levels.
- Type II respiratory failure involves low oxygen, with high carbon dioxide.

Table 1. Types of Acute Respiratory Failure

Type I (Hypoxic)	Type II (Hypercapnic)
Lung failure, respiratory insufficiency	Pump failure, ventilatory failure
Failure of lungs and heart to provide adequate oxygen	Failure of lungs to eliminate adequate CO <sub>2</sub>
PaCO <sub>2</sub> < 60mmHg with normal or decreased PaO <sub>2</sub>	PaCO <sub>2</sub> > 50mmHg
Alveolar hypoventilation	Increase dead space
Associated with acute diseases of the lungs (pulmonary edema, ARDS, pneumonia)	Drug overdose, neuromuscular disease, chest wall deformity, COPD

Causes of Acute respiratory failure in adults

- Impaired ventilation
  - Spinal cord injury above C5
  - Phrenic nerve damage
  - Neuromuscular blockade
  - Guillain barre syndrome
  - CNS depression
  - Respiratory muscle fatigue
- Impaired gas exchange
  - Pulmonary edema
  - ARDS
  - Aspiration pneumonia
- Airway obstruction
  - Aspiration of foreign body
  - Thoracic tumors
  - Asthma
  - Bronchitis
  - Pneumonia
- Ventilation – perfusion abnormalities
  - Pulmonary embolism
  - Emphysema

### Chronic obstructive pulmonary disease (COPD)

It is an umbrella term to describe various diseases (e.g. chronic bronchitis, emphysema, chronic asthma). Also described as a slowly progressive and irreversible disease, although some patients may show a degree of reversibility with bronchodilator treatment. This usually occurs in people over 50y of age and smoking is a major factor in its development

#### Assessment:

- Patient's history:
- Mild = a 'smoker's cough' is the only abnormal sign.
- Moderate = breathlessness and/ or wheeze on moderate exertion, cough, and generalized reduction in breath sounds.

- Severe = breathlessness at rest, cyanosis, prominent wheeze and/ or cough, and lung overinflation

❖ Consider and record the following, too:

- ✓ current treatment— inhalers, nebulizers, antibiotics, steroids, O<sub>2</sub>, and theophyllines;
- ✓ exercise tolerance;
- ✓ previous admissions, especially intensive care or treatment with NIV; the reason for ED attendance— it is important to identify whether the exacerbation has been accompanied by an increase in the amount or type of sputum produced; a recent fall or chest injury may be the cause of the symptoms.



### In the ED, assess for the following:

- cough; sputum— color and amount;
  - cyanosis;
  - tachypnea; wheeze;
  - accessory muscle usage; lip pursing on expiration;
  - chest expansion (which is often poor);
  - fever;
  - dehydration;
  - confusion or reduction in conscious level;
  - pain
- ⊕ Consider whether the patient is septic, and treat any signs of sepsis, severe sepsis, or septic shock immediately.

### Diagnostics and Laboratory

- Continuous monitoring— HR, RR, and SpO<sub>2</sub>.
- CXR.
- ECG.
- ABG analysis as soon as possible.
- FBC, U&E, and theophylline level (if the patient is taking theophylline).
- Sputum for C&S if purulent.
- Blood cultures if the patient is pyrexial.

### Nursing interventions



- Reassurance.
- Nurse the patient in an upright position.
- O<sub>2</sub> therapy to keep saturations in the range of 88– 92%
- Nebulizers (may need to be continuous).
- Steroids.
- IV theophylline (for patients who do not respond to nebulizers).
- Assessment for NIV.
- Mouth care.
- IV fluids if the patient is dehydrated.
- Analgesia.
- AVPU and GCS scores.

### Management:

#### 1. Non- invasive ventilation (NIV)

- Increasingly used in ED resuscitation rooms (evidence suggests that using NIV in patients with COPD reduces mortality and the need for invasive ventilation)

- 
- NIV should be considered in patients who meet the following criteria:
    - respiratory acidosis ( $\text{pH} < 7.35$ ,  $\text{PaCO}_2 > 6\text{kPa}$ ) that persists despite maximal medical therapy;
    - not moribund, GCS score  $> 8$
    - able to protect the airway;
    - cooperative and conscious;
    - few co-morbidities;
    - hemodynamically stable;
    - no excess respiratory secretions;
    - potential for recovery to a quality of life acceptable to the patient.



Ideally, patients should have an anesthetic assessment prior to the commencement of NIV, in order to determine their suitability and outline what the ceiling treatment should be. A 'do not attempt resuscitation' (DNAR) order may be completed at this time if the patient is not suitable for invasive ventilation.

## 2. Intensive care

- Patients with exacerbations of COPD should not be automatically excluded from invasive ventilation if all other treatments are failing. The following will have to be considered:
  - quality of life (ideally involving the family in the discussion);
  - O<sub>2</sub> requirements when stable;
  - co-morbidities;
  - forced expiratory volume in 1s (FEV1);
  - body mass index (BMI).

## Pneumonia

Pneumonia is an inflammation of the lung, which is characterized by exudation into the alveoli. It can be classified anatomically as lobar or by etiology. It is most commonly caused by bacteria. The terms 'pneumonia' and 'chest infection' are often used interchangeably.

### Causes:

Pneumonia can be caused by any of over 100 microorganisms. Therefore, the treatment should be started before the causative organism has been identified.

Common microorganisms that can cause Pneumonia

- *Streptococcus pneumoniae* (90% of cases)
- *Haemophilus influenzae*
- *Staphylococcus aureus*
- *Legionella species*

### Types of Pneumonia:

- Community acquired – not hospitalized or residing in a long-term care facility for  $\geq 14$  days prior to onset of symptoms.
- Hospital acquired – more than 48 h between admission and onset of symptoms.
- **Ventilator associated** – more than 48–72 h between intubation and onset of symptoms.
- Aspiration – micro-aspiration of bacteria colonizing the upper respiratory tract, macro-aspiration of gastric contents, indirect transmission from staff, inhaled aerosols.
- Atypical

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## **Assessment findings:**

- The clinical findings are often referred to as consolidation.
  - Expansion is reduced on the affected side.
  - There is percussion dullness over the area of consolidation.
  - Breath sounds are bronchial; adventitious crackles.
  - Tachypnea and central cyanosis.
  - Fever, sweats, and rigors.
  - Cough and sputum.

## **Diagnostics and Laboratory:**

- Sputum microscopy, culture, and sensitivity.
- CXR.
- ABG (if SpO<sub>2</sub> is <93% on room air) and pulse oximetry
- FBC, U&E, CRP, and LFTs.

## **Management**

### **Initial (ED) management:**

- Supplemental O<sub>2</sub> to maintain saturations at >93%
- IV fluids (if the patient is dehydrated)
- Medications: IV antibiotics, analgesia, antipyretic
- Bronchoalveolar lavage may be used for patients who are immunocompromised, those who do not respond to antimicrobial therapy, or those from whom a sputum sample cannot be obtained.

## **Nursing Management**



- Positioning (upright)
- Ensure timely antimicrobial therapy.
- Monitor hemodynamics, fluid and electrolytes and imbalances
- Adherence to infection prevention and control.
- Ventilator-associated pneumonia care bundle

## **Ventilator-associated pneumonia**

Ventilator-associated pneumonia (VAP) develops 48 h or later after commencement of mechanical ventilation via endotracheal tube or tracheostomy. It develops as a result of colonization of the lower respiratory tract and lung tissue by pathogens. Intubation compromises the integrity of the oropharynx and trachea, allowing oral and gastric secretions to enter the airways. VAP is the most frequent post-admission infection in critical care patients, and significantly increases the number of mechanical ventilation days, the length of critical care stay, and the length of hospital stay overall.

- Risk factors: immunocompromised, the elderly, and those with chronic illnesses (e.g. lung disease, malnutrition, obesity).
- Diagnosis is difficult due to the number of differential diagnoses that present with the same signs and symptoms (e.g. sepsis, ARDS, cardiac failure, lung atelectasis); radiological changes = consolidation and new or progressive infiltrates)
- Clinical signs include;
  - pyrexia > 38°C
  - raised or reduced white blood cell (WBC) count
  - new-onset purulent sputum

- increased respiratory secretions/suctioning requirements
- worsening gas exchange.

### **Management:**

#### A. Care Bundle approach for the prevention of ventilator-associated pneumonia

- demonstrated to be an effective preventive strategy.
- 6 elements for the prevention (should be reviewed daily):
  1. Elevation of the head of the bed to 30–45° (unless contraindicated)
  2. Sedation level assessment – unless the patient is awake and comfortable, sedation is reduced or held for assessment at least daily (unless contraindicated).
  3. Oral hygiene – clean with chlorhexidine gluconate ( $\geq 1\text{--}2\%$  gel or liquid) q6h; teeth are brushed q12h with standard toothpaste.
  4. Subglottic aspiration – a tracheal tube (endotracheal or tracheostomy) that has a subglottic secretion drainage port is used if the patient is expected to be intubated for  $> 72$  h. Secretions are aspirated via the subglottic secretion port 1- to 2-hourly.
  5. Tube cuff pressure – cuff pressure is measured q4h, and maintained in the range 20–30 cmH<sub>2</sub>O (or 2 cmH<sub>2</sub>O above peak inspiratory pressure).
  6. Stress ulcer prophylaxis – stress ulcer prophylaxis is prescribed only for high-risk patients, according to locally developed guidelines.

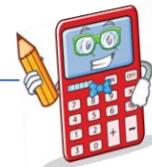
#### B. Scoring the severity of pneumonia

- validated CURB- 65 score to assess severity, risk of death, and risk of ICU admission
- Scoring can also guide subsequent treatment and the decision about the need for hospital admission

CURB-65	Clinical Feature	Points
C	Confusion	1
U	Urea $> 7$ mmol/L	1
R	RR $\geq 30$	1
B	SBP $\leq 90$ mm Hg OR DBP $\leq 60$ mm Hg	1
65	Age $> 65$	1
CURB-65 Score	Risk group	30-day mortality
0 - 1	1	1.5%
2	2	9.2%
3-5	3	22%
Management		
0 - 1	1	Low risk, consider home treatment
2	2	Probably admission vs close outpatient management
3-5	3	Admission, manage as severe

#### **CURB-65 Scoring Interpretation:**

- 0 or 1 – relatively mild symptoms with good social support and no other significant health problems can usually be discharged home.
- 2 – more severe symptoms; at higher risk; for admission
- $\geq 3$  – associated with a 17% risk of death.



### **Pneumonia and Sepsis**

The elderly is particularly vulnerable to developing sepsis from pneumonia, and general assessment of the breathless patient should identify any signs of sepsis

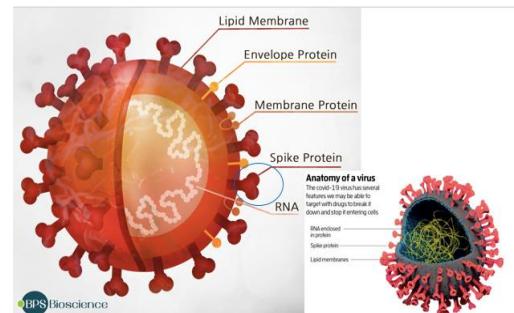
### **COVID-19**

COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization; zoonotic (passed between animals and people)

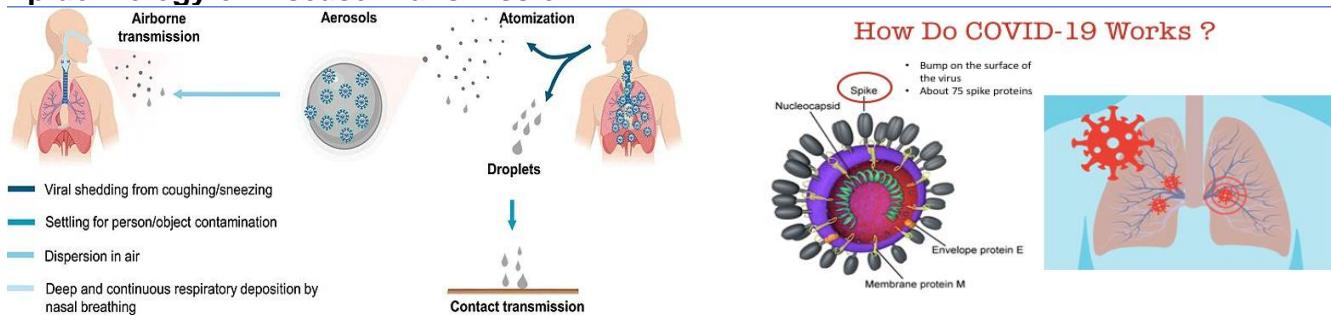
1. Severe Acute Respiratory Syndrome-2 (SARS-CoV-2) = COVID-19
  - new (novel) strain of coronavirus
  - not previously identified in humans
2. Middle East Respiratory Syndrome (MERS-CoV) = 2012
3. Severe Acute Respiratory Syndrome (SARS-CoV) = 2003

### Origin of Covid-19:

- bats or pangolins
- transmitted to humans directly or through an intermediate host
- source location: large live animal market in Wuhan, Hubei Province
- human – to – human spread



### Epidemiology of Disease Transmission:



Source: WHO, 2021

\*\*\*Incubation period – 2-14 days; symptoms usually begin around 5<sup>th</sup> day



### VARIANTS OF CONCERN: WHO as of August 13, 2021

- Increase in transmissibility or detrimental change in COVID-19 epidemiology; OR
- Increase in virulence or change in clinical disease presentation; OR
- Decrease in effectiveness of public health and social measures or available diagnostics, vaccines, therapeutics.

### Clinical Manifestations:

1. Most common symptoms:
  - Fever (83% - 99%), dry cough (59% - 92%), shortness of breath (31% - 40%)
2. Less common symptoms:
  - aches and pains
  - sore throat
  - diarrhea
  - conjunctivitis
  - headache
  - loss of taste or smell (anosmia or ageusia)
  - a rash on skin, or discoloration of fingers or toes
3. Serious symptoms:
  - difficulty breathing or shortness of breath, chest pain or pressure, loss of speech or movement

**Diagnostics:** C-Xray, CT scan, ECG

**Laboratory tests:** CBC with differential, metabolic profile, inflammatory markers (CRP, D-dimer, ferritin)

**Prevention:**

- Keep at least a 1-meter distance from others, even from family members.
- Wear a medical mask to protect others, including if/when seeking for medical care.
- Clean hands frequently. Use soap and water, or an alcohol-based hand rub.
- When possibly exposed, stay in a separate room from other family members, and if not possible, wear a medical mask.
- Keep the room well-ventilated; choose open, well-ventilated spaces over closed ones. Open a window if indoors
- If sharing a room with another person, place beds at least 1 meter apart.
- Stay home if you feel unwell and call COVID hotlines; monitor self for any symptoms for 14 days.
- Call a health care provider immediately if any of the danger signs are observed: difficulty breathing, loss of speech or mobility, confusion or chest pain.
- Stay positive by keeping in touch with loved ones by phone or online, and by exercising at home.

**Medical treatments**

WHO does not recommend self-medication with any medicines, including antibiotics, as a prevention or cure for COVID-19.



- Optimal supportive care includes oxygen for severely ill patients and those who are at risk for severe disease and more advanced respiratory support such as ventilation for patients who are critically ill.
- **Dexamethasone** is a corticosteroid that can help reduce the length of time on a ventilator and save lives of patients with severe and critical illness.

**Other medicines used in COVID-19:**

1. Antiviral agents:
  - a. **Remdesivir**
  - b. **Tocilizumab**
  - c. **Bamlanivimab and Casirivimab and Imdevimab**
  - d. **Baricitinib in combination with remdesivir**

**Prevention:**

To prevent the spread of COVID-19:

- Maintain a safe distance from others, even if they don't appear to be sick.
- Wear a mask in public, especially indoors or when physical distancing is not possible.
- Choose open, well-ventilated spaces over closed ones. Open a window if indoors.

## **TERMINOLOGIES**

**Coronaviruses** – family of viruses causing illness from the common cold to severe critical illness

**COPD** – chronic obstructive pulmonary disease is a condition involving constriction of the airways and difficulty or discomfort in breathing

**Embolism** – a mass, such as an air bubble, detached blood clot or foreign body that travels in the bloodstream, lodges in a blood vessel and obstructs or occludes it.

**Respiratory failure** – a syndrome in which the respiratory system fails in one or both of its gas exchange functions: oxygenation and carbon

**pCO<sub>2</sub>** – partial pressure of carbon dioxide usually from the arterial blood (35 – 45 mmHg)

**pO<sub>2</sub>** – partial pressure of oxygen usually from the arterial blood (80 – 100 mmHg)

**Pneumothorax** – a collapsed lung that occurs when air enters into the pleural cavity, the space around lungs causing pain in the chest and difficulty in breathing

**Sars-Cov-2** – a new type of coronavirus that can affect people first detected in December 2019 in Wuhan City causing now a pandemic

**Pandemic** – world wide

## **FURTHER READINGS**

Emergency Nurses Association. (2019). *Sheehy's Manual of Emergency Care*, 7th ed. St. Louis: Elsevier Mosby. pp 504-593

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## **UNIT TASKS**

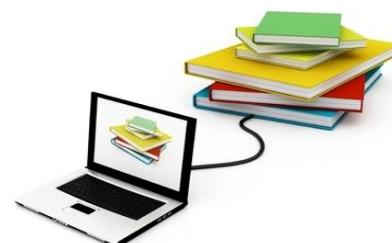
Read and summarize the research article by Lentz, et.al found in ScienceDirect.com. Explain its objectives, methods, and results, then reflect on its implication(s) in today's nursing practice.

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OUR LADY OF FATIMA  
UNIVERSITY

# COURSE UNIT



## BACHELOR OF SCIENCE IN NURSING:

### NCMB 418 - CARE OF THE CLIENT WITH LIFE-THREATENING CONDITIONS, ACUTELY ILL / MULTI-ORGAN PROBLEMS, HIGH ACUITY AND EMERGENCY SITUATION (ACUTE AND CHRONIC)

COURSE MODULE	COURSE UNIT	WEEK
1	5	5
Respiratory Assessment Technique, Airway Management and Basic Ventilator Management		

## STUDY GUIDE

### ASSESSMENT OF RESPIRATORY FUNCTION:

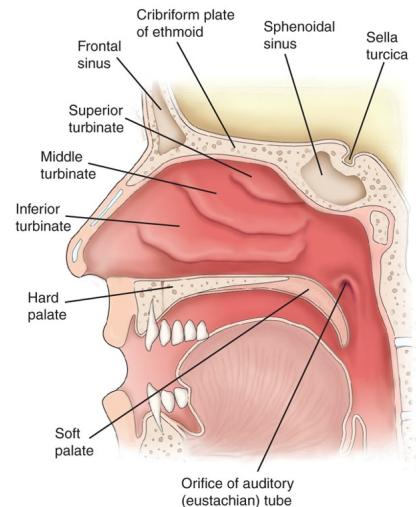
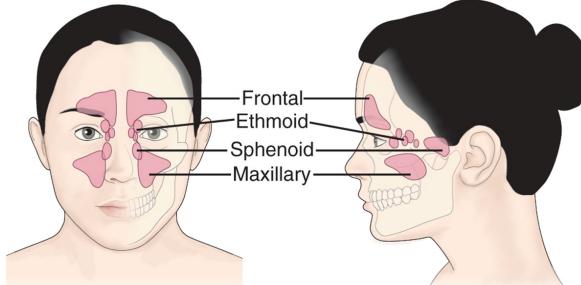
#### PURPOSE OF THE RESPIRATORY SYSTEM

- The lungs, in conjunction with the circulatory system, deliver oxygen to and expel carbon dioxide from the cells of the body.
- The upper respiratory system warms and filters air.
- The lungs accomplish gas exchange.

#### STRUCTURES OF THE RESPIRATORY SYSTEM

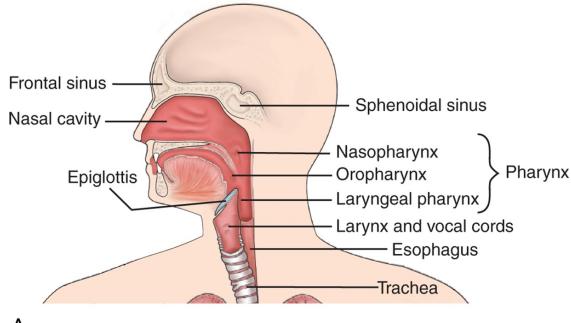
- Nose
- Sinuses and nasal passages
- Pharynx
- Tonsils and adenoids
- Larynx: epiglottis, glottis, vocal cords, and cartilages

## PARANASAL SINUSES



## CROSS SECTION OF NASAL CAVITY

## UPPER RESPIRATORY SYSTEM



A

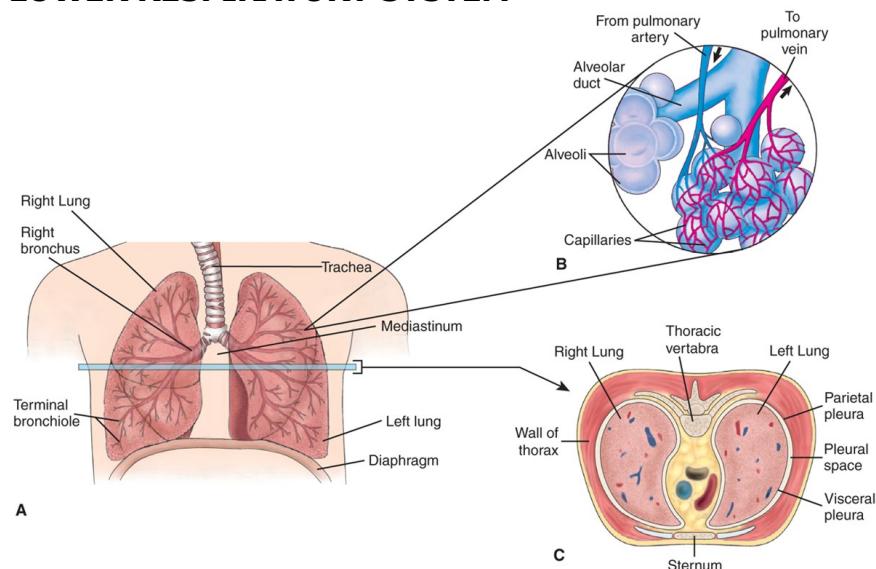
## STRUCTURES OF THE LOWER RESPIRATORY SYSTEM

- Lungs
- Pleura
- Mediastinum
- Lobes of the lungs:
  - Left: upper and lower
  - Right: upper, middle, and lower
- Bronchi and bronchioles
- Alveoli

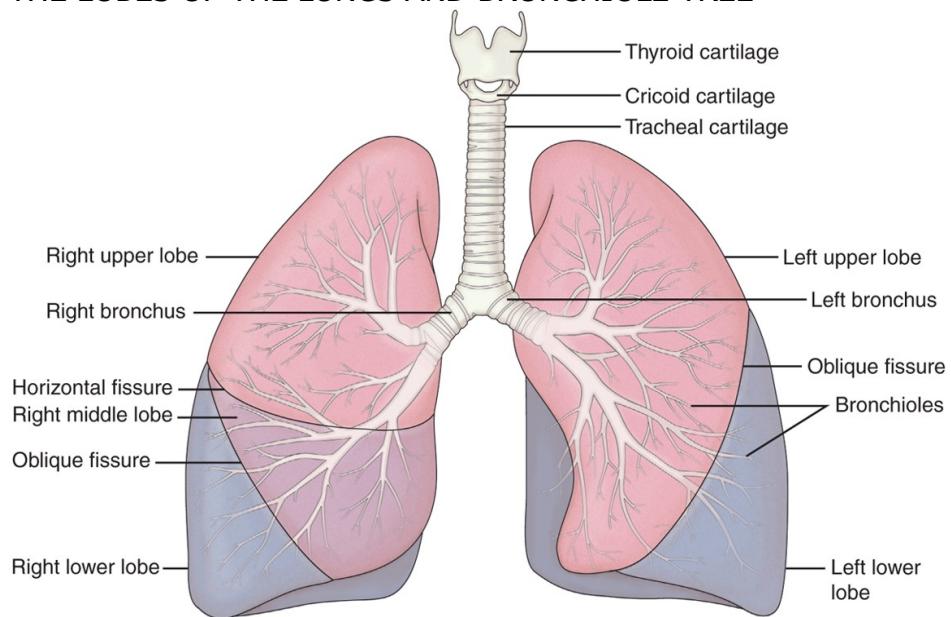
## ALVEOLI

- Where gas exchange takes place
- Alveolar-capillary membrane
- Types of alveolar cells
- Surfactant

## LOWER RESPIRATORY SYSTEM



## THE LOBES OF THE LUNGS AND BRONCHIOLE TREE



## VENTILLATION; THE MOVEMENT OF AIR IN AND OUT OF THE LUNGS

- The thoracic cavity is an airtight chamber. The floor of this chamber is the diaphragm.
- Inspiration: contraction of the diaphragm (movement of this chamber floor downward) and contraction of the external intercostal muscles increases the space in this chamber. Lowered intrathoracic pressure causes air to enter through the airways and inflate the lungs.
- Expiration: with relaxation, the diaphragm moves up and intrathoracic pressure increases. This increased pressure pushes air out of the lungs. Expiration requires the elastic recoil of the lungs.
- Inspiration normally is 1/3rd of the respiratory cycle and expiration is 2/3rds.

## **RESPIRATION**

- The process of gas exchange between atmospheric air and the blood at the alveoli, and between the blood cells and the cells of the body.
- Exchange of gases occurs because of differences in partial pressures.
- Oxygen diffuses from the air into the blood at the alveoli to be transported to the cells of the body.
- Carbon dioxide diffuses from the blood into the air at the alveoli to be removed from the body.

## **VENTILLATION PERFUSION (V/Q) RATIO**

- Ventilation is the movement of air in and out of the lungs.
- Air must reach the alveoli to be available for gas exchange.
- Perfusion is the filling of the pulmonary capillaries with blood.
- Adequate gas exchange depends upon an adequate V/Q ratio, a match of ventilation and perfusion.
- Shunting occurs when there is an imbalance of ventilation and perfusion. This results in hypoxia.

## **ASSESSMENT OF BREATH SOUNDS**

- Normal breath sounds:
  - Vesicular
  - Bronchovesicular
  - Bronchial
- Abnormal (adventitious) breath sounds:
  - Crackles
  - Wheezes
  - Friction rubs

## **LUNG CAPACITIES**

- Tidal volume (TV): air volume of each breathe.
- Inspiratory reserve volume (IRV): maximum volume that can be inhaled after a normal inhalation.
- Expiratory reserve volume (ERV): maximum volume that exhaled after a normal exhalation.
- Vital capacity (VC): the maximum volume of air exhaled from a maximal inspiration,  $VC = TV + IRV + ERV$ .
- Forced expiratory volume (FEV): volume exhaled forcefully over time in seconds. Time is indicated as a subscript, usually 1 second.

## **MEASUREMENT OF VOLUME AND INSPIRATORY FORCE**

- A spirometer measures volumes of air exhaled and is used to assess lung capacities.
- When assessing TV, measure several breaths. TV varies from breath to breath.
- Pulmonary function tests assess respiratory function and determine the extent of dysfunction.

- Peak flow rate reflects maximal expiratory flow and is frequently done by patients using a home spirometer.

## **INSPIRATORY FORCE**

- Evaluates the effort of the patient in making an inspiration.
- A manometer which measures inspiratory effort can be attached to a mask or endotracheal tube to occlude the airway and measure pressure.
- Normal inspiratory pressure is approximately 100 cm H<sub>2</sub>O.
- Force of less than 25 cm usually requires mechanical ventilation.

## **ARTERIAL BLOOD GAS**

- Measurement of arterial oxygenation and carbon dioxide levels.
- Used to assess the adequacy of alveolar ventilation and the ability of the lungs to provide oxygen and remove carbon dioxide.
- Also assesses acid base balance

## **PULSE OXIMETRY**

- A noninvasive method to monitor the oxygen saturation of the blood.
- Does not replace ABGs
- Normal level is 95-100%.
- May be unreliable

## **DIAGNOSTIC TEST**

- Pulmonary function tests
- Arterial blood gases
- Sputum tests
- Chest X-ray
- Computerized Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Fluoroscopic Studies and Angiography
- Radioisotope procedures-Lung Scans
- Bronchoscopy
- Thoracoscopy
- Thoracentesis
- Biopsies

## **UPPER AIRWAY OBSTRUCTION**

### **CAUSES:**

- Foreign bodies/materials
  - Enlargement of tissues in the wall of airway
  - Pressure on the walls of the airway
  - Altered level of consciousness
-

## ASSESSMENT:

- Inspection (eye)
- Palpation (touch)
- Auscultation (hearing)

## AIRWAY MANAGEMENT

### 1. OROPHARYNGEAL AIRWAY (OPA)

- Also known as Oral bite block
- Temporary
- Relieves upper airway obstruction
- Tongue relaxation, secretions, seizures
- Not recommended for alert clients
- May trigger gag and cause vomiting

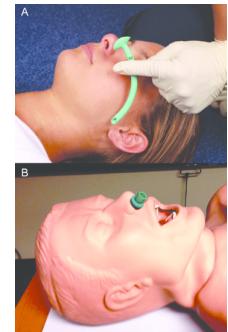


#### Nursing Responsibility

- Frequent assessment of the lips and tongue to identify pressure areas
- Removed at least q 24 hours to check for pressure areas and to provide oral hygiene

### 2. NASOPHARYNGEAL AIRWAY

- AKA Nasal trumpet
- Maintains airway patency
- Also used to facilitate nasotracheal suctioning
- Usually 26-35 french



#### Complication

- Bleeding
- Sinusitis
- Erosion of the mucus membranes

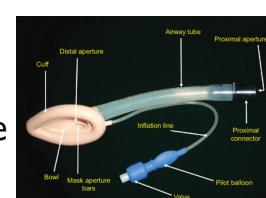
#### Nursing Responsibility

- Assessment of the pressure areas and occlusion due to secretions
- Rotation of tube from nostril to nostril daily

### 3. LARYNGEAL MASK AIRWAY

#### Laryngeal Mask Airway

- An ET with a small mask on one end that can be passed orally over the larynx
- Provides ventilatory assistance and prevent aspiration



#### Combitube

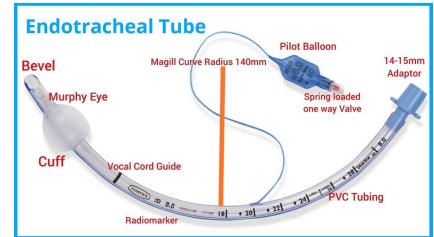
- Esophageal/tracheal double lumen airway
- Used for difficult or emergency intubation
- Permits blind placement



## ENDOTRACHEAL (ET)

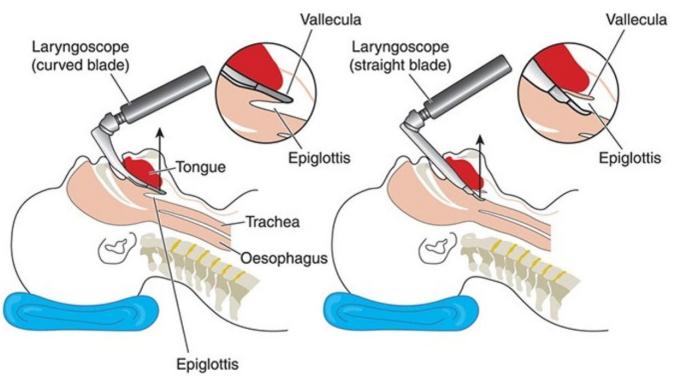
### 4. Endotracheal (ET) tube

- Includes a 15mm adapter at the end for connection to life support equipment
- Distance marker on the sides for placement
- Inserted into the trachea through the mouth or nose



### Insertion of Endotracheal (ET) Tube

- Using laryngoscope to visualize the upper airway
- Inserted through the vocal cords into the trachea
- 2-4 cm above the carina
- Anchored by inflating the cuff (prevents air leakage and aspiration)



### Confirm proper placement

- Presence of bilateral breath sounds
- Equal
- Suctexcursion during inspiration
- Absence of breath sounds over the stomach
- PETCO<sub>2</sub>: 35-40 mmHg

### Verification: CXR

- Anchor with tape or ET fixation device
- Centimeter marking at the lip is documented during each shift
- 10-14 days of intubation: tracheostomy is usually indicated

### Complications:

- Laryngeal and tracheal damage
- Laryngospasm
- Aspiration
- Infection and discomfort
- Vocal cord paralysis (should not be used longer than 3 week)



## MECHANICAL VENTILLATION

- A form of assisted ventilation that takes over all part of the work performed by the respiratory muscles and organs
- Initiated when patient's ability to oxygenate and exchange carbon dioxide is impaired
- Main goal is to support gas exchange until the disease process is resolved

## **POSITIVE PRESSURE VENTILLATION (PPV)**

- Most common form of mechanical ventilation used in the acute care setting
- Forces oxygen into the lungs with each breath through an endotracheal tube or tracheostomy tube
- Volume-cycled modes (deliver breath until preset tidal volume is reached with each breath)
- Pressured-cycled modes (deliver breath until a preset pressure is achieved within the airway)

## **MODES OF VENTILLATION**

- Ways in which ventilation is triggered, allowing the patient partial or complete control over their breathing

### **Factors affecting selection of ventilator modes:**

- Underlying pulmonary status
- Oxygenation
- Presence of spontaneous breathing

### **Assist-control Ventilation (ACV)**

- Delivers a preset volume at a preset rate and whenever the patient initiates a breath
- If the patient does not initiate a breath within a preset time, the ventilator will deliver a breath
- Used in patients with weak respiratory muscles

### **Synchronized Intermittent Mandatory Ventilation (SIMV)**

- Delivers a preset volume at a preset rate and is synchronized with the patient's effort
- Allows spontaneous breathing between ventilated breaths
- Prevents competition between patient and ventilator
- Common mode for patients requiring minimal ventilation
- Used for WEANING for ventilator support

### **Pressure-controlled ventilation (PCV)**

- Delivers positive-pressure breath until a maximum amount of airway pressure is reached, then the inspiratory phase of the breath stops
- Maximum inspiratory pressure limit is preset to help minimize ventilator-induced lung injury (VILI)
- Settings are adjusted to achieve a goal tidal volume designated by physician
- Tidal volume goal: based on patient's weight and pulmonary status

### **Pressure-regulated volume control (PRVC)**

- A type of PCV in which the ventilator makes pressure adjustments to aim for a predetermined tidal volume

- Using this mode, the ventilator senses any changes in lung compliance (ex. Increase in peak inspiratory pressure) and reduces the tidal volume until airway pressures are back within normal range

## **ADDITIONAL VENTILATORY MODES**

Positive end-expiratory pressure (PEEP)

- Holds positive pressure in the alveoli during expiration
- Frequently used as a supplement to most modes of ventilation

### **Advantages:**

- Prevents alveoli from collapsing at end-expiration
- improves oxygenation
- Increases functional residual capacity
- Range: 2 to 24 cmH<sub>2</sub>O pressure

### **Disadvantage:**

- PEEP greater than 10 cmH<sub>2</sub>O
- Increased intrathoracic pressure that causes decreased venous return and decreased cardiac output (HYPOTENSION)
- Increase preload with fluids or vasopressors

## **HIGH LEVELS OF PEEP**

- Increased airway pressure
- VILI, hypotension, increased ICP, alveolar ventilation-perfusion mismatch

## **Constant Positive Airway Pressure (CPAP)**

- Similar to PEEP but provides positive pressure during spontaneous breaths
- Increases oxygenation by preventing closure of alveoli at end-expiration thereby maximizing functional residual capacity (FRC)
- Generally range: 5-10 cmH<sub>2</sub>O
- More than 10cmH<sub>2</sub>O (hypotension/pneumothorax)
- Frequently used to wean patients as a non-invasive method

## **Pressure Support Ventilation (PSV)**

- Augments the tidal volume of spontaneous breaths by delivering a preset positive pressure during inspiration
- Can be added to SIMV and CPAP for weaning
- Range: 8-20 cmH<sub>2</sub>O
- Increases patient comfort by decreasing the amount of work required in each spontaneous breath

## **VENTILLATOR SETTINGS**

- Individualized settings



- Adjustments are based on ABG measurements and Arterial Oxygen saturations (SaO<sub>2</sub>)

### **Vt (Tidal Volume)**

- Amount of oxygen delivered to a patient with each preset ventilated breath
- 5-15 mL/kg (average: 10mL/kg)

### **Back up rate (BUR) or Respiratory rate**

- Number of breaths per minute that ventilator is set to deliver
- 4-20 breaths/minute

### **Fraction of inspired oxygen (FiO<sub>2</sub>)**

- Percentage of oxygen delivered by ventilator with each breath 21 - 100%

### **Inspiratory to Expiratory ratio (I:E Ratio)**

- Number of breaths per minute that ventilator is set to deliver 1;2

### **Sensitivity**

- Determines amount of effort patient must generate before ventilator will give a breath
- Too low: patient works harder to obtain a breath
- Too high: patient's respiratory effort may compete with ventilator

### **Flow rate**

- Determines how fast Vt will be delivered during inspiration
- High – increase airway pressure
- Low – decrease airway pressure

### **Pressure limit**

- Regulates maximum amount of pressure the ventilator will generate to deliver preset Vt
- Ventilated breath will stop when pressure limit is reached

## **VENTILATION TERMINOLOGIES**

### **Compliance**

- Elasticity of the lung tissue
- Decreased compliance = increased resistance to breath

### **Peak Inspiratory Pressure (PIP)**

- Airway pressure at maximum inspiration
- A.K.A. peak airway pressure

### **Low pressure alarms**

- LEAK or DISCONNECTION in ventilator circuit
- Patient not receiving adequate ventilation

### **High pressure alarms**



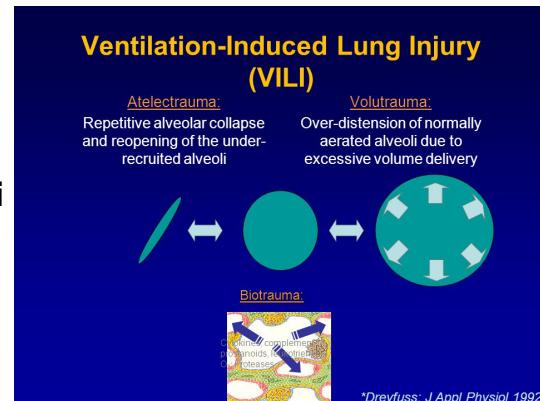
- PIP has exceeded a safe limit
- Patient at risk of VILI

### **Volutrauma**

- Injury to the lung tissue from **over distension of alveoli**

### **Barotrauma**

- Injury to the lung tissue from too much pressure on the airway



### **Atelectrauma**

- VILI from a low intraalveolar pressure causing collapse of alveoli

## **MECHANICAL VENTILLATION COMPLICATIONS:**

### **VENTILLATOR - ASSOCIATED PNEUMONIA (VAP) BUNDLES OF CARE**

- Elevation of the head of the bed (HOB)
- Daily sedation vacations and assessment of readiness to extubate
- Peptic ulcer disease prophylaxis
- Deep vein thrombosis (DVT) prophylaxis
- Daily oral care with chlorhexidine (added in 2010)

## **WEANING PATIENT FROM MECHANICAL VENTILLATION:**

### **METHODS OF MEANING:**

#### **1. Assist-Control (A/C) ventilation**

- Control rate is decreased, patient strengthens respiratory muscle by triggering more progressive respirations
- Nursing Management:
  - WOF: rapid or shallow breathing, use of accessory muscles, decrease in LOC, increase in CO<sub>2</sub> levels, decrease O<sub>2</sub> saturation and tachycardia

#### **2. Synchronized Intermittent mandatory Ventilation (SIMV)**

- Indicated for patients who satisfied weaning criteria but cannot sustain adequate spontaneous ventilation for long periods
- As respiratory muscles strengthens, the pressure is decreased

#### **3. T-piece**

- Usually used when patient is awake and alert, breathing without difficulty, and has good gag and cough reflex
- Maintained on oxygen level on the same or greater than oxygen concentration the patient is receiving in mech vent
- WOF: respiratory distress and hypoxia

