1 Nursing Care of Clients with Stressors of Ventilation and Perfusion

- Acute respiratory failure
- ARDS
- chest trauma
- lung cancer
- Pulmonary embolism

2 Specialized Interventions to Restore Ventilation/Perfusion

- Intubation with mechanical ventilation
- chest tube insertion and drainage
- surgical resection of masses that effect ventilation and perfusion
- Maintenance of adequate pulmonary circulation

3 Acute Respiratory Failure

- Respiratory dysfunction in combination with hypercapnia, hypoxemia and acidemia
  - PO2 < 50-60 mm Hg
  - PCO2 > 50 mm Hg
  - pH < 7.30

4 Acute Respiratory Failure

- member of the 50 - 50 CLUB
  - PAO2 and PCO2 is already around 50 mm Hg, hypoxemia,acidemia pH< 7.30
  - respiratory function is closely monitored
  - marked increases in respiratory rate taken for full minute increase suspicion of profound respiratory dysfunction.

Consider Acute Respiratory Failure

5 Stressors that precipitate Acute Respiratory Failure

- Ventilatory failure
  - Extrapulmonary
    • Neuromuscular disorders
    • Spinal cord injuries
    • Central nervous system dysfunction
    • Chemical depression
    • Sleep apnea
    • Kyphoscoliosis
  - Intrapulmonary
    • Airway disease
    • Ventilation-perfusion mismatch
Stressors that precipitate Acute Respiratory Failure

- Oxygenation failure
  - Low atmospheric oxygen concentration
  - Pneumonia
  - CHF with pulmonary edema
  - Pulmonary embolism
  - ARDS
  - Hypovolemic shock
  - Hypoventilation
  - Drug toxicities

There are three priorities of the client in acute respiratory distress that must be managed immediately....

PRIORITY NURSING DIAGNOSES
- IS THE PATIENT’S SPUMTUM SO COPIOUS AS TO IMPEDE THE AIRWAY?
  - INEFFECTIVE AIRWAY CLEARANCE
    what interventions would help?

PRIORITY NURSING DIAGNOSES
- IS THE PATIENT HYPOVENTILATING?
  - INEFFECTIVE BREATHING PATTERN
    what interventions would help?

PRIORITY NURSING DIAGNOSES
- IS THERE EVIDENCE OF HYPOXEMIA OR HYPERCAPNIA?
  - IMPAIRED GAS EXCHANGE
    what would you do?

Nursing assessment
- Multi system assessment for evidence of respiratory failure
- What would you expect to find?
  - Integument
    • cyanosis
  - Neuro
    • HA early sign of hypercapnia
    • altered mental state assoc with hypoxia
  - CV
    • tachycardia, hypertension, palpitations, PVCs, other arrhythmias

Nursing Assessment
- lungs and thorax
  - inspection
    • labored breath with tachypnea progresses to hypoventilation as hypercapnia advances
  - palpation
    • decreased expansion
– percussion
  • dullness over area of infiltrate, decreased diaphragmatic excursion
– auscultation
  • evidence of adventitious sounds
– Pulse oximetry decreases

13 Diagnostics
  ■ Pulse oximetry
    – hypoxemia
  ■ ABGS
    – respiratory acidosis with hypoxemia
    – hypercapnia
  ■ Chest Xray
    – evidence of insult

14 Nursing priorities
  ■ Maintain airway
  ■ promote ventilation
  ■ correct hypoxemia

15 Nursing interventions
  ■ Position client
    • awake, maintaining own airway:
      – HOB 90 degrees, 100% non rebreather mask
  ■ Decrease work of breathing
    – Energy conservation
    – BiPAP machine
  ■ Pharmacological agents
    – Bronchodilators, corticosteroids
    • declining consciousness:
      – supine BVM 100% O2, tracking respirations & pulse oximetry
  initiate ACLS and prepare for intubation

16 Endotracheal Intubation
  2 Nursing responsibilities
  ■ confirm placement
  ■ document size
  ■ secure at cm marking and location
  ■ get post-intubation x ray reviewed
  7.5 Fr ET at 23 cm secured at corner of right lip Xray done, pending review

17 Mechanical ventilation
  ■ Settings are adjusted towards clients needs and include:
    _mode of ventilation_
    – CMV (continuous mandatory ventilation)
    – AC (assist control ventilation)
    – SIMV (synchronized intermittent mandatory ventilation)
    – HFV (high frequency ventilation)
    – IVR (inverse ventilation ratio)
    – DLV (differential lung ventilation)
    – BiPAP
    -tidal volume
      – volume of air to be delivered with each breath
      – FIO2
Ventilator Modes

CMV Continuous Mandatory Ventilation
- Used for apneic clients or those who should not initiate breathing on their own
- Machine does all the work

Assist control (AC)
- Delivers preset volume & rate usually 12-16 BPM
- Full ventilatory support, AKA resting mode
- Responds to client’s effort to initiate a breath and delivers the tidal volume preset, while allowing client to control rate
- May contribute to hyperventilation

Synchronized Intermittent Mandatory Ventilation (SIMV)
- Delivers preset tidal volumes & rate for machine breaths only. Rate gradually decreased from 12-2 as client resumes spontaneous breathing.
- Will deliver the mandatory breath in synchrony with the client’s.
- Client breathes spontaneously and does the work of breathing
- Used in liberating client from ventilator

High frequency ventilation
- Ventilator delivers breaths at a rate > than 60/min
- Tidal volumes lower than normal

Inverse ventilation ratio
- Inspiration time longer than expiration time, usually two times longer
- Reduces tendency to collapse alveoli since they do not have time to empty

Differential lung ventilation
- Each lung ventilated separately
- Special intubation needed
  - Bifurcated endotracheal tube
  - Two endotracheal tubes

Bi-level positive airway pressure (BiPAP)
- Noninvasive positive pressure support ventilation via nasal or face mask

Selected Pressure Support

CPAP
- Continuous positive airway pressure that is delivered throughout the respiratory cycle, used in liberating/weaning client from vent. Keeps alveoli open, (like a t-piece with alarms)

PSV
- Gives support during inspiration to enhance tidal volumes. Client breathes spontaneously

PEEP (very serious sign)
- Positive end-expiratory airway pressure delivered at the end of expiration, used when it is feared client is at risk for alveolar collapse
- Oxygen is delivered with all of the above pressure support systems, client does the work of breathing

Complications of Pressure Support

Can reduce preload and afterload through increased intrathoracic pressure
- Preload drops r/t decreases in venous return
  - Manifests as hypotension
• tachycardia
• decreased peripheral pulses
• decreased pulse pressure

23 Sample Ventilator Setting

- Ventilator mode
  • AC or SIMV
- Tidal volume
  • weight and age adjusted - number of ml's delivered with each breath (10-15ml/kg), lower in clients with severe compromise
- Respiratory Rate
- FIO2
  • percentage of oxygen delivered
- PEEP/PSV/CPAP
  • cm of H2O representing the exerted pressure at end of expiration (PEEP) or during inspiration (PSV) or throughout respiratory cycle (CPAP)
- PIP (peak inspiratory/airway pressure)
  - Pressure needed by vent to deliver tidal volume

24 Nursing Goals for Vented Client

- Restore ventilation, maintain airway and correct hypoxemia
- reverse precipitating stressors
- maintain adequate nutrition
- prevent complications
- enhance coping
- prepare for liberation from ventilator
- Promote wellness

25 Airway and Breathing

- Neuro, Resp, CV, PV, GI, GU assessment
- check ET tube placement and vent settings
- mon pulse ox and ABG’S
- monitor for tachy/brady dysrhythmias and PVCs
- position HOB > 45 degrees, prevents VAP
- determine need for suctioning based on objective criteria using closed suction systems
- Frequent oral hygiene: tooth brushing Q 12 hrs and swabbing with chlorhexidine Q 2 hrs to prevent VAP
- Frequent subglottic suctioning & proper cuff pressure
- chest PT
- frequent T&P and transferring to chair

26 Adequate Nutrition

- Mon integument, daily weights: serum prealbumin and electrolytes: adequate calcium, potassium, magnesium and phosphates
- perform abdominal assessment- Gastroparesis
- Keep patient NPO
- dietary consult
- insert feeding tube for enteral nutrition. Enteral nutrition preferable than TPN for nutrition
- nutrition products that minimize production of CO2?
- consider TPN if gut doesn’t work

27 Adequate Nutrition

Best practice for withholding feeding r/t residual volume (RV) in stomach
- How much does residual volume relate to food intolerance?
- Average rates of gastric secretion are 100 to 150ml/hr.
- Feeding tube placement is a factor. When placed in noncontracting portion of stomach, RV can be as high as 800ml without adverse effects because stomach can distend.
- If tip is in duodenum, RV of 200ml may cause discomfort & possibly reflux or intestinal perforation
Preventing Complications of mechanical ventilation
- Nursing care issues related to use of the equipment and interpretation of alarms
- accidental extubation
- Ventilator associated pneumonia
- atelectasis
- Barotrauma
- oxygen toxicity
- weaning problems

Troubleshooting selected Ventilator alarms
- High pressure alarms
  - a setting determined by the peak inspiratory pressure (PIP)
  - high pressure is set at about 20 cm H2O above PIP
  - Think that delivery of air is meeting resistance
  - check patient
    - may need to be suctioned
    - client is fighting the preset delivered breaths
      - “bucking the vent”
  - check equipment
    - kink in tubing or ventilator circuit

Troubleshooting selected Ventilator alarms
- low exhaled tidal volumes
  - there is evidence of an air leak so that measured volumes are not reaching the ventilator
  - check patient
    - identify physiological cause
  - check equipment
    - deflated Endotracheal cuff
    - bitten ET tube
    - disconnection in ventilator circuit

Troubleshooting selected Ventilator alarms
- Electrical failure
  - all ventilators have rechargeable batteries that should kick in; however…..
  - check patient
    - mechanically BVM client with appropriate levels of O2
  - check equipment
    - check outlet
    - initiate internal disaster plan for electrical outage

SAFETY: PREVENTION OF EXTUBATION IN ACUTE PHASE
- ALL VENTILATED PATIENTS:
  - should be restrained
  - their ET tubes should be secured
  - the client should be adequately sedated in the acute phase

Prevention of pneumonia and atelectasis
- Perform chest PT, get client out of bed
- Meticulously wash hands.
- Manage client's pain so he doesn't guard his breathing.
- Suction client as needed and clear oropharyngeal secretions as well
- Frequent tooth brushing and swabbing or spraying oral cavity with chlorhexidine
- Use aspiration precautions
- Consider using positive end-expiratory pressure (PEEP)
- Use of aerosolized ABX's prophylactically or to treat VAP

34  □ Prevention of Volutrauma and Barotrauma
- Injury to the lung tissue from mechanical ventilation occurs because of excessive tidal volume or excessive pressures.
- Seen with pressure support
- Seen in clients with lung disease from air trapping (called auto-peeping) or clients who are extremely anxious and undersedated
- Peak airway pressures rise
- Continuous positive airway pressure (CPAP) and PEEP may trigger Barotrauma by keeping the alveoli inflated under pressure.

35  □ Prevention of Barotrauma
- Maintain oxygenation with minimal positive pressure, using low levels of PEEP and pressure support.
- Prevent hyperventilation. Relaxation exercises, music therapy, and sedation can help reduce your patient's anxiety and, as a result, his airway pressure.

36  □ Oxygen toxicity
- Oxygen at concentrations greater than 70% for as little as 16 to 24 hours increase susceptible to oxygen toxicity.
- Prolonged hyperoxgenation triggers production of excess oxygen free radicals
- In the presence of oxygen and inflammation, oxygen free radicals oxidize fatty acids in cell membranes, impairing cellular metabolism.
- Gas diffusion and surfactant activity decrease, and the patient's risk of alveolar fibrosis and pulmonary edema increases.

37  □ Prevention of Oxygen toxicity
- Use PEEP with pressure support ventilation to increase oxygen diffusion.
- Choose the lowest oxygen setting possible to prevent hypoxemia.
- Perform aggressive pulmonary hygiene, which helps minimize the need for oxygen support.

38  □ Dysfunctional Ventilatory Weaning Response
- Manifestations of dysfunctional weaning
  - Anxiety
  - Tachypnea
– use of accessory muscles
– altered mental state
– hypoxemia

39 Keys to Early Liberation from Vent

- Sedation holidays
- Daily spontaneous breathing trials, toleration > 45 minutes predicts liberation
- Liberation: correctible factors
  - Narcotic/benzodiazepine overdose
  - Pulmonary edema/ fluid overload
  - Systemic infection/ fever
  - Respiratory tract infection
  - Electrolyte disturbances
  - Hyperinflation/ bronchospasm
  - Malnutrition/ catabolism
  - Deconditioning (muscle weakness)

40 Enhancing liberation/weaning

- Initiate weaning as early as possible
- Use minimal support to maintain muscle strength
- Optimize cardiac output before weaning attempts
- Provide adequate nutrition
- Minimize use of sedating medications, such as opioids and long-acting benzodiazepines.
- Provide psychological support. Teaching client and his family and staying with him to coach breathing help decrease anxiety associated with weaning.

41 Enhance Coping

- Explore stress reduction strategies
- Establish means of communication
- Give as much control to client as possible
- Use sedatives only as needed
  - Ativan, versed, morphine
- Carefully screen clients receiving neuromuscular blockade for adequate sedation

42 Extubation Preparation

- Explain procedure
- Review ABG’s carefully
- Gather equipment: O2, reintubation stuff
- Suction thoroughly (ETT & oropharynx)
- Hyperoxygenate
- Deflate cuff
- Remove ETT quickly, applying constant suctioning
- Encourage C & DB, apply O2, monitor VS, LOC, ABG’s closely
- Post extubation chest X-ray

43 ARDS (Acute Respiratory Distress Syndrome)

- A specific syndrome usually occurring within 48 hours of lung injury or other stressors
  - Causes a type of acute respiratory failure (oxygenation failure) with a high mortality rate (50%).
Also known as:
- “HPPE” (High Permeability Pulmonary Edema), Noncardiac Pulmonary Edema or “Shock Lung”.

44 Pathophysiology of ARDS
- Damage to the endothelial lining of the alveolar capillary (AC) membranes
- increased permeability of AC membrane leads to pulmonary edema
- Dilution & reduction of surfactant results in alveolar collapse
- impaired gas exchange and hypoxemia
- reduction in lung capacity and compliance
- fibrotic changes to the lungs.

45 Pathophysiology of ARDS
- A V/Q mismatch occurs
- widespread intrapulmonary shunting produces hypoxemia unrelieved even by supplemental oxygen
  - the patient must be intubated and mechanically ventilated using PEEP (Positive End Expiratory Pressure)
  - purpose of PEEP is to open the collapsed airways and relieve shunting and improve gas exchange

46 Causes of ARDS
- Intrinsic
  - Sepsis
  - Pulmonary embolism
  - Shock
  - Pancreatitis
- Extrinsic
  - Aspiration injury
  - Inhalation injury
  - trauma

47 Clinical Manifestations - acute phase (exudative phase) ARDS
- 12-24 HOURS AFTER INSULT
  - dyspnea, tachypnea
  - cough
  - possible inspiratory crackles
  - tachycardia
  - anxiety
  - mental status changes

48 Course of disorder into chronic phase (fibrotic phase)
  OCCURS IN CLIENTS WHO DO NOT RECOVER FROM INITIAL INSULT
- 3-10 days after insult
  - hypoxemia from decreased blood flow to oxygenated alveoli
  - fibrotic changes to lung tissue
    - increases pulmonary vascular resistance
Diagnostics

- Chest xray
  - showing patchy infiltrates progressing to hazy or “ground glass” appearance and eventually, “white-out” of both lungs
- ABGS
  - hypoxemia resistant to supplemental oxygen, metabolic and respiratory acidosis as ARDS progresses
- Hemodynamics
  - increased PAWP as cardiac output decreases
- Pulmonary Function
  - overall decreases in lung volumes, lung compliance, and residual capacity

Treatment

- Mechanical ventilation
- fluid management
- management of initial insult

Nursing priorities in client’s diagnosed with ARDS

- maximize oxygenation and ventilation
- minimize pathophysiologic complication

PROMOTING OXYGENATION

- Monitor for increasing requirements for oxygen
  - early identification of clients in developing ARDS
  - keep FIO2 < 60% after stabilized maintaining pulse oximetry > 90%
- augmenting preload to preserve cardiac output without precipitating worsening edema
  - careful monitoring of fluid balance indicators to minimize interstitial edema that prevents adequate gas exchange

PROTECTIVE VENTILATION

- Low Tidal Volumes To Prevent “Volutrauma” in Combination with PEEP
  - PEEP recruits alveoli that have inadequate oxygenation due to disease process and keep them open
  - levels usually of 20 cm H2O are indicated
  - treat clients as if they have small lungs
  - monitor PEEP impact on decreased cardiac output

PREVENT LUNG TISSUE INJURY

- Position client on prone position when PEEP in use
  - enhances blood flow to oxygenated areas
  - prevents alveoli distention
  - has not been proven to increase mortality
- follow agency protocol regarding alternating positions versus non-alternating position
- protection of pressure injury is a priority
- may persist in prone position for up to 12 days
Care of the Client experiencing Chest Trauma

Chest Trauma facts
- Trauma is one of the most sudden, dramatic and often irreversible medical conditions.
- Injury to the chest directly accounts for 25% of all trauma related deaths
  - it plays a major contributing role in another 25% of trauma deaths.
- most trauma is related to motor vehicle accidents which often involve otherwise healthy young adults.

Categories of chest trauma
- Blunt
  - closed chest trauma
    - pneumo/hemothorax
    - sternal/rib fractures
    - pulmonary and cardiac contusion
    - ex: cardiac tamponade
- Penetrating
  - open chest trauma
    - gun shot wound/knife wound
    - laceration to major vessels and organs
    - pneumo/hemothorax
    - ex: sucking chest wound

Traumatic Pneumothorax
- Closed pneumothorax
  - usually fractured ribs penetrate pleura from trauma
- open pneumothorax
  - sucking chest wound as result of penetrating trauma

Manifestations and diagnosis
- Tachypnea, dyspnea, possible CP
- diminished breath sounds on affected side
- hyperesonant to percussion on affected side
- hypoxemia
- diagnosed with CXR

Tension Pneumothorax
- Pneumothorax with Mediastinal shift to unaffected side
- tracheal deviation to unaffected side
- hypotension from impaired cardiac output

TREATMENT
- Insertion of chest tubes to water seal drainage and application of suction to restore normal pressures and reinflate lung

Purpose of Chest Tube Drainage
- Reinflate lung and remove collections of fluid from hemothorax or pleural effusions from the pleural cavity

Chest Tube Drainage Collection System
Three bottle system
- suction chamber
- water seal chamber
- collection chamber

Collection chamber
- This collects drainage and allows you to monitor the volume, rate, and nature of the drainage.
- In case of reduction of pneumothorax
  - this chamber remains empty because air is the only thing being removed

Water-Seal Chamber
- Most chest drainage systems use water as a seal or one-way valve (some newer systems use dry seals)
- The underwater seal allows air or fluids to drain from the client's chest but not return.
- this chamber is filled with sterile NS or H2O, typically 2 cm, enough to submerge the bottom of the water-seal tube,
  creating a one-way valve.

Suction Control Chamber
- Chest drainage systems use suction to increase the drainage rate and help reexpand the lung.
- regulates the uncontrolled suction source to levels acceptable for thoracic drainage (usually -20 cm of water). Continuous bubbling indicates proper functioning
- The fluid level in the suction-control chamber--not the suction regulator from the outside suction source--governs the suction's intensity.

Using the chest drainage system

Positioning the unit.
- at least 1 foot, (preferably 2-3 feet) below the level of the chest tube insertion site
- Never apparatus have one way valves, therefore positioning of unit not an issue
- If the unit accidentally tips over, stand it upright immediately.
- if you see that drainage has migrated from the collection chamber, you should replace the unit.

Monitor output
- Routinely monitor the volume, rate, and nature of the drainage
  - red drainage: hemorrhage
  - cloudy drainage: infection
- Mark output directly on the unit.
  - When the chamber is filled to capacity, replace the chamber or unit.
  - Never empty a pleurovac.
- Notify the physician if your patient has a drainage rate greater than 100 ml/hour or the rate is increasing progressively.

Maintain Patency of Drainage System
- Bloody drainage in the chamber indicates a potential for clot formation in the tubing. Little or no drainage may indicate that clots have obstructed the connecting tubing.
- If a clot forms, gently pinch the tube at the level of the clot to move the clot into the collection chamber.
Don’t strip the tube, check your institution’s policy on clots and tube stripping.
- Stripping is a controversial procedure because it creates high negative pressure, causes patient discomfort, and may damage tissue.

Monitor water seal for bubbling
- A large amount of bubbling in the water-seal chamber may signal a large patient air leak or a leak in the system.
- Bubbling will slowly disappear as the lung reexpands, air stops leaking, and the lung fills the pleural space.
  - A small amount of bubbling will normally occur when you first connect the patient to the chest drainage unit and begin suction, and fluid drainage displaces air in the collection chamber.

TROUBLESHOOTING WATER SEAL BUBBLING
- Rule out a leak in the drainage system.
- Check all connections and resecure tape.
- Try to locate it by clamping the tube momentarily at various points along its length using rubber-tipped clamps to prevent tube puncture.
  - Start at client and work your way towards the unit.
  - The bubbling will stop when a clamp is placed between the air leak and the water seal.
  - If you clamp along the tube’s entire length and the bubbling continues, the drainage unit may be cracked and should be replaced.

Tidaling in the water seal chamber
- Fluctuations in the fluid level indicate pressure changes in the pleural space, which occur when your patient breathes.
- Normal breathing causes the water in the water-seal chamber to fluctuate 5 to 10 cm.
  - With shallow breathing, the fluctuations will be smaller.
  - Fluctuations diminish as the lung reexpands and fills the pleural space.
  - Unexpected absence of Tidaling indicate a blockage in the tubing.

Suction control chamber
- Monitor this chamber for water level and bubbling.
- Gentle, moderate bubbling is expected.
- CT to gravity means that you disconnect from suction sources at the pigtail of the unit, not at the suction device on the wall.
  - Maintaining connections and turning off the suction is the equivalent of clamping the tubing and can contribute to lung collapse.
- Outside suction sources do not determine the pressures exerted.
  - Monitor and replace fluids in case of evaporation.

Assessing the client with a chest tube
- Check the chest tube and connections for air leakage.
  - In case of hissing noise:
    - Seal the site quickly with sterile petroleum gauze and a gauze dressing to prevent external air from entering the pleural cavity.
    - Notify the physician, who may need to insert a new tube.
  - Make sure the tubing is free from any dependent loops or kinks.

Accidental Disconnection
- If the chest tube and drainage unit become disconnected:
  - Immerse the chest tube’s open end in a bottle of sterile water.
  - Replace the unit with a sterile unit.

Accidental dislodgment
- Significant risk for tension pneumothorax.
■ treat like sucking chest wound
■ apply occlusive dressing taped in three sides after client performs Valsalva
■ call surgeon stat

77 Monitor for complications
■ evaluate the client's vital signs, respiratory status, skin color, comfort level, and emotional state, as well as the integrity of the dressing.
■ Assess for pain and administer pain medications as needed so the client can better participate in his treatment regimen.
■ Monitor especially for respiratory distress, rapid or shallow breathing, dyspnea, subcutaneous emphysema, chest pain, and excessive bleeding.
■ Watch for signs and symptoms of tension pneumothorax, including muffled heart sounds, respiratory distress, tracheal deviation, and dyspnea. If any of these are present, notify the physician immediately.

78 Management of hemothorax
■ Blood collection at base of pleura
■ dull to percussion at bases
■ managed the same as pneumothorax

79 Management of Flail Chest
■ Multiple rib fractures that can involve sternum that is characterized by paradoxical chest movement and crepitus noted
■ treated with intubation and chest tube insertion

80 Cardiac Tamponade
■ Characterized by hypotension, jugular venous distension, muffled heart sounds, pulsus paradoxus.
  • Pulsus paradoxus is a drop in inspiratory systolic pressures > 10 mm Hg
■ Treatment is rapid fluid infusion, pericardiocentesis.

81 Care of the client experiencing stressors related to the management of lung cancer

82 Lung Cancer facts
Lung cancer is the most frequent cause of cancer death in men and women world wide and usually results from cigarette smoking.
■ Only 15% of clients have small resectable tumors and localized disease at the time of diagnosis (ACS, 2005)
■ Overall 5 year survival rate for all clients with lung cancer is 14%

83 Types of Lung cancers
■ Subdivided into two subtypes
  – nonsmall cell (NSCLC) - 80% of cases
    • Epidermoid carcinoma – 30%
    • Adenocarcinoma – 30-35%
    • Large cell -10%
  – small cell (SCLC) - 20% of cases
    • most malignant type
• spreads early via lymphatics
  • Diagnosis, therapy, and prognosis are different for these two subtypes.

Treatment according to type
NONSMALL CELL LUNG CANCER.
  • Surgery, Chemotherapy
SMALL CELL LUNG CANCER
  • Chemotherapy—priority treatment
  • radiation to the chest in patients with limited disease also prolongs survival.
  • Surgery used relatively infrequently
  • Photodynamic therapy (PDT) injection with a drug that makes cancer cells more sensitive to laser-laser then kills the cancer cells

Clinical Manifestations
Why is lung cancer in advanced stages when diagnosed?
  • May be asymptomatic
  • shortness of breath
  • chronic cough
  • hemoptysis
  • dull aching chest pain Vs pleuritic pain
  • hoarseness and dysphagia
  • weight loss, anorexia, and fatigue

  • Methods of diagnosing this neoplasm within the lung include bronchoscopy, often with lavage; transbronchial biopsy; and most commonly, computed tomography (CT) guided needle biopsy. Bronchoscopy may be performed in addition to help with staging. Less commonly, when all else fails, mediastinoscopy, mediastinotomy, or even thoracotomy may be used for diagnosis. For widely metastatic disease, biopsy of a lymph node, the liver, or another area often is done in place of a thoracic procedure. Although a histologic diagnosis is ideal, sputum cytology is often diagnostic. However, it requires an experienced cytopathologist to differentiate the two major types of lung cancer.

CLINICAL MANIFESTATIONS THAT NEED IMMEDIATE ATTENTION
  • SUPERIOR VENA CAVA COMPRESSION
    – swelling in the neck and face, difficulty breathing, coughing. Bending forward or lying down may make symptoms worse.
  • SPINAL CORD COMPRESSION
    – back pain and tenderness that feels worse when lying on the back and a tingling sensation in the back or legs

SIGNS AND SYMPTOMS THAT NEED IMMEDIATE ATTENTION
BOWEL OBSTRUCTION
- abdominal pain and vomiting

CHANGE IN BREATHING PATTERN, COUGH OR SPUTUM
- seek immediate attention

ROUTINE INSTRUCTIONS
- Stop smoking

Endocrine paraneoplastic syndromes associated with lung cancer

Ectopic hormone
- Adrenocorticotrophic hormone (ACTH)
- Antidiuretic hormone

- Follicle stimulating hormone
- Parathyroid hormone
- Ectopic insulin

Manifestation
- Cushing’s syndrome

- SIADH
  - Weight gain
  - General edema
  - Dilution of electrolytes
- Gynecomastia

- Hypercalcemia
- hypoglycemia

Nonendocrine paraneoplastic syndromes
These resemble many of the general clinical manifestations assessed in clients with lung cancer, complicating diagnosis. Review in text. Categorized by systems:

- connective tissue
- hematologic system
- neuromuscular system
- integumentary system
- vascular system
- renal system

Diagnosis of Lung Cancer

Chest XRAY Versus spiral CT
sputum for cytology (often diagnostic)
bronchoscopy, often with lavage and biopsy
computed tomography (CT) guided needle biopsy.
  - Most common method
  - Bronchoscopy may be performed in addition to help with staging

Positron emission tomography (PET) best way to find metastasis

Diagnosis of Lung Cancer
LESS FREQUENTLY PERFORMED YET NEED TO BE MENTIONED:
mediastinoscopy, mediastinotomy, or even thoracotomy may be used for diagnosis.
  - Rare, only if staging unable to be performed adequately with other methods
In widely metastatic disease:
• biopsy of a lymph node, the liver, or another area often is done in place of a thoracic procedure.

92 LUNG BIOPSY

93 Pt teaching: CT guided needle biopsy of the lung
- Using a CT scan, a needle will be guided into your lung to remove a small amount of the suspicious tissue for testing.
- Before the doctor inserts the needle, you will receive a local injection of anesthetic.
- You will feel pressure and brief sharp pain when the needle touches the lung.
- You will be monitored for a few hours after the procedure and then sent home.

94 Staging
- Staging is done at time of diagnosis
- TNM system (describes anatomic extent)
  - T-primary tumor
  - N-regional lymph nodes
  - M-distant metastasis
- Staging also described as occult (hidden) stage; Stage 0 (Ca in situ), I, II, IIIA, IIB, IV (higher numbers representing later stages and less chance for cure or long term survival)
- Staging helps determine treatment and predict outcomes
- Emotional support for client and family during this anxious time when awaiting results of biopsy and other diagnostics

95 Surgical options in non-small cell
- The purpose of staging is to differentiate disease that is potentially resectable from disease that is not. For example:
  - Stage I and II tumors are completely resectable. Stage IIIA disease may be resectable.
- Surgery is clearly the best treatment of this disease if it can be carried out safely with complete resection of the tumor.

96 Who does not get surgery?
- Reasons other than resectability that can prevent resection include
  - poor pulmonary function that will reduce survivability after surgery
  - anatomic location of lesions that cannot be properly dealt with surgically
  - a medical contraindication to major surgery
  - lack of patient consent to surgery
  - stage IIIIB and stage IV tumors

97 Types of surgery: non-small cell
- Lobectomy
- pneumonectomy
- wedge resection and segmental resections may also be carried out for this disease

98 NURSING CARE OF CLIENTS RECEIVING SURGERY
- Clients undergoing Pneumonectomy, lobectomy or wedge resection to remove cancerous lung tumors
– PRE-OP CARE:
  • Pulmonary function tests, ABGs, CBC, Chest films, CT scans, EKG, PT, PTT, Blood chemistries
– TEACHING:
  • Chest tube setup; Info about Epidural or PCA pain control, orientation to ICU, use of incentive spirometer, and incisional management

Review Nursing Care Plan in Text pp. 618-622 Thoracotomy

99 Chest Tube Drainage

• The chest tube drainage varies depending on the operation performed.
• Chest tube drainage should decrease each hour after surgery.
• Amounts greater than 200 ml per hour for more than one or two hours postoperatively are abnormal. (note difference from routine chest tube management; surgeon has final say)
• Assess for presence of pneumothorax

100 Care of the pneumonectomy client: immediate post-op

  • Monitoring
    • most will have an arterial line
    • baseline arterial blood gas
    • continuous Pulse oximetry is a standard
    • continuous cardiac monitoring required

101 Care of the pneumonectomy client: immediate post-op

  • chest X-ray, routine ICU labs
  • individualized fluid orders
    • (these patients require judicious postoperative fluid administration i.e. tend to run them on the “dry” side),
  • chronic medications
  • routine DVT prophylaxis orders
  • analgesic orders where indicated.

102 Care of the pneumonectomy client: immediate post-op

  • Patient is usually mechanically ventilated
  • Care is taken to avoid continuous coughing
    – can trigger the ETT migration down a mainstem bronchus.
    – could also damage a staple line.
      • Preservative free lidocaine instilled down the tracheal lumen near the end of the case will enable emergence with less coughing.
  • No chest tubes after pneumonectomy

103 General management post-op

  • Positioning
    • do not position patient on affected side as this can put undue pressure on the internal sutures: Good lung down (GLD)
  • Teaching:
    • May include site care, use and purpose of medications, need for rest, activity restriction, gradual increase in activity, avoidance of people with infections.
    • If adjunctive treatment such as radiation is to be done, support and teaching regarding this is needed.

104 Radiation therapy in non-small cell
Used to treat metastatic sites or to relieve bronchial obstruction or hemoptysis.
High-dose radiation therapy may be curative in some patients.

It is not the treatment of choice.
- Done if surgery is not possible…

Chemotherapy in non-small cell
- Every non-small cell cancer gets chemotherapy
- used as an adjuvant after complete resection.
- Drugs used: all highly emetogenic therefore antiemetics given before, during, after treatment
  - Carboplatin
  - Cisplatin
  - Docetaxel
  - Irinotecan
  - Paclitaxel
  - Erlotinib (tarceva): new drug: inactivates growth factor receptors on cancer cells, growth slows significantly, may extend life span in stage III and IV NSCLC refractory to 1st and 2nd line chemo agents
  - Motexafin Gadolinium slows brain Damage from spread on NSCLC

Other Treatments for NSCLC
- **Watchful waiting**: (is closely monitoring a client’s condition without giving any treatment until symptoms appear or change. This may be done in certain rare cases of non-small cell lung cancer.
- **Laser surgery**
- **Photodynamic therapy (PDT)** injection with a drug that makes cancer cells more sensitive to laser-laser then kills the cancer cells
- **Clinical trials**
  - Chemoprevention (drugs, vitamins, to reduce risk of cancer occurrence or to reduce risk of reoccurrence
  - Biologic therapy (substances that boost client’s own immune system to fight cancer
  - New combinations (of treatments)

Treatment of small cell Lung Cancer
- **Two-stage definitions**
  - limited stage
  - extensive stage
  - Small cell lung cancer has a tendency to spread much more rapidly to systemic sites
- **Chemotherapy is the mainstay of treatment of small cell lung cancer**
  - places clients at risk for severe myelosuppression
    - may require neupogen and epogen injections to prevent life-threatening neutropenia and anemia
- **Prophylactic cranial irradiation (PCI)** sometimes used even if no brain mets-to prevent tumors forming in the brain

Radiation/Surgery in Small cell Cancer
- Radiation therapy can be used for palliation of painful bony metastases, cerebral metastases, hemoptysis, or bronchial obstruction.
- surgery is used relatively infrequently, and only for limited stage disease

Risk of Malignant Pleural Effusion
- Fluid collection in pleural space
- Thoracentesis may be performed at bedside
- **Explain the procedure**
  - client is in position with upper extremities resting over locked bedside table.
  - local anesthesia is used at the insertion site.
  - Client is instructed to remain still.
  - Client should not feel pain only pressure unless the lung is inadvertently punctured
- post procedure
– monitor s/s of pneumothorax and pts tolerance. Position on unaffected side
– Bedrest until chest x-ray done

110 □ Priority nursing diagnoses for Lung Cancer clients
- Ineffective breathing pattern
- Impaired gas exchange
- Activity intolerance
- Acute pain
- Chronic pain
- PC: myelosuppression
- Coping
- Anticipatory grieving

111 □ PULMONARY EMBOLISM-WHEN A DVT GOES BAD

Pathophysiology of PE
- Ventilation exceeds perfusion, causing massive vasoconstriction
- decrease in perfusion results in ischemia
- resultant defect in perfusion can lead to pulmonary infarct and resultant damage

112 □ Clinical Manifestations
- Symptoms of sudden onset
  - Apprehension, restlessness, confusion
  - Shortness of breath with tachypnea, crackles, pleural friction rub
  - cough with possible hemoptysis
  - chest pain: stabbing, pleuritic type
  - Cyanosis
  - Petechiae over chest and axilla
  - possible JVD
- severity correlates to degree of disruption to pulmonary vasculature

113 □ Diagnostic tests
- Chest xray
- PT/PTT/INR
- Cardiac workup with EKG
- ABGs are not performed if the client is a candidate for thrombolysis
- otherwise ABGs may be done
- Ventilation/perfusion scan is diagnostic

114 □ Treatment
- High flow oxygen
- IV access
- Heparin therapy
  - follow weight-adjusted standard protocol
- Thrombolysis with TPA over three hours if massive and meets inclusion criteria
- Surgery-embolectomy
- Filtering devices

115 Nursing priorities
- Impaired gas exchange
- Altered tissue perfusion: pulmonary
- Risk for decreased cardiac output
  - prepare to give dopamine, levophed
- Risk for bleeding r/to thrombolysis or anticoagulant
- anxiety

116 Prevention of pulmonary embolism
- Best Practice for prevention of P.E. outlined in text and covered in NR 33 and in PVD discussion
- What would you teach the client?
- PE is the most common acute pulmonary stressor (90%) among hospitalized clients.
  What would you assess for?