Summary

Oxygen is the most essential element for life and breathing in oxygen free atmosphere is fatal in few minutes. The ultimate purpose of oxygenation in the lungs and oxygen transport in the blood is to provide oxygen to all body tissues to allow aerobic metabolism. The energy delivered through the aerobic metabolism is 20 times the energy of anaerobic metabolism. The brain metabolism is totally aerobic and this explains the rapid death in cardiopulmonary arrest.

Post operative respiratory therapy is designed to prevent pulmonary complication that are most often characterized as pneumonia and arterial hypoxemia. The frequency of post operative pulmonary complications is greatest after thoracic and upper abdominal surgery. For example, significant post operative atelectasis occurs in 20% to 40% of patients undergoing these types of surgery. In addition to the site of surgery and an associated decrease in lung volumes (FRC,VC) other factors that influence the incidence of post operative pulmonary complications include co-existing pulmonary disease, a history of cigarette smoking, obesity, and increasing age.

Patients with chronic respiratory disease have a very high incidence of post operative pulmonary complications (collapse and pneumonia); the incidence is 80% in chronic bronchitics compared with 7% in life long non-smokers. During evaluation of the patient one should enquire about exercise tolerance, cough, and sputum production. Auscultation may reveal wheezes or crepitations. It's important to distinguish whether a patient has obstructive (e.g. asthma, bronchitis, emphysema), or restrictive lung disease (interstitial fibrosis, obesity). On the whole, patients with restrictive lung disease get

fewer problems than patients with obstructive lung disease, since cough and ciliary action are intact. On other hand, restrictive disease is rarely reversible (a part from obesity) while a number of measures can be employed to reduce obstruction (i.e. steroids, beta agonists, anticholiergic drugs. Differential diagnosis between restrictive and obstructive lung disease is therfore important and this is best done from the history clinical examination, and pulmonary function tests.

Respiratory therapy includes oxygen therapy, humidification and aerosol therapy, bronchial hygiene, and mechanical ventilation to increase resting lung volumes, especially FRC, VC. This treatment may be initiated as the patient recovers from anesthesia in the PACU for continuation into the subsequent post operative period as necessary.

In deed, supplemental inspired oxygen is often routinely provided in PACU regardless of the duration or type of surgery, since almost every patient demonstrates a decrease in PaO_2 after anesthesia and surgery.

Thick pulmonary secretion can obstruct the small airways and alveoli and can adversely affect the alveolar ventilation and oxygenation. Liquefaction of these secretions, followed by chest physiotherapy and suctioning, is therapeutically useful to clear the air ways and to improve oxygenation and ventilation. More over some drugs can help ventilation (e.g. beta stimulants, steroids, anticholinergics) can be given in the form of aerosol therapy and/or injection. These simple physical maneuvers can save many patients form being mechanically ventilated.

Mechanical ventilation is a double-edged weapon and it can be the breathe of life and can be also the blow of death. Therefore, mechanical ventilation should be carried out only if it's truly indicated and by personnel experienced in endotracheal intubation and who under stands the mechanics Of the used ventilator and the ventilator-patient relationship.

Mechanical ventilatoy support is indicated when other simple measures of respiratory support (oxygen, aerosol, chest physiotherapy, suctioning) are not effective to improve oxygenation and/or ventilation. Indications can he classified according to necessity (absolute, relative), system involvement (respiratory, cardiovascular, neurologic) or the required mode of support. Absolute indications include apnea, persistent hypoxemia, severe hypoventilation and markedly elevated intracranial pressure. Most mechanically ventilated post operative patients have their ventilatory support discontinued within a day or two after surgery. However, some patients develop difficulties during the weaning process and require prolonged ventilation.

Various pattern or modes of ventilation are used to suit different clinical situations. The choice of a particular mode of ventilation depends on understanding of the physiological changes it produces and the underlying condition for which it's used. Mechanical ventilation of the lung can be achieved by a variety of modes which differ in the mode with which the ventilator cycles from expiration to inspiration as well as whether or not the patient is able to breathe spontaneously.

The following modes are available for postoperative respiratory support:

- Controlled mechanical ventilation (CMV).
- Assist- controlled mechanical ventilation (A/CMV).
- Intermittent mandatory ventilation (IMV).
- Synchronized intermittent mandatory ventilation (SIMV).
- Continuous positive airway pressure (CPAP).
- Positive end expiratory pressure (PEEP).
- Pressure support ventilation (PSV).
- Inverse ratio ventilation (IRV).
- Airway pressure release ventilation (APRV).
- Differential "independent" lung ventilation (DLV).
- Bilevel positive airway pressure (BiPAP).

Special techniques are used in management of cases difficult to be supported by conventional modes of mechanical ventilation. These techniques include:

- High frequency ventilation (HFV)
- Extra - Corporeal membrane oxygenation (ECMO).
- Liquid ventilation using perflurocarbon.

However, the most important single item in prevention of postoperative pulmonary complications is early ambulation and the associated changes in position. Presumably this therapeutic benefit reflects increased lung volumes, particularly FRC.