Medical Oxygen Supply

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Equipments needed for oxygen administration

• oxygen source :

cylinder or pipeline system

- flowmeter
- humidifier filled with sterile water
- oxygen therapy tubings

 (Nasal prong ,Simple mask, NRBM)
 Bowel of water



Components:

- ✓ Body
 ✓ Valve Port, stem
- ✓ Handle
- Pressure relief
 device
- ✓ Conical depression
- ✓ Pin index safety system



- The Body of most medical gas cylinders are made of steel with various alloys added
- ✓ steel-carbon cylinders can hold more gas and light in weight.

Cylinders that have a marking **3AA** are made from steel. The marking **3AL or 3ALM** indicates that the cylinder is made from aluminum

Cylinders are filled and discharged through a valve (spindle shaped) attached to the neck

 It is made of bronze or brass which is heavily plated with nickel or chromium so as to allow rapid dissipation of heat.

Cylinder valves are of various types

- ✓ Those used on anesthesia machines are 'flush' types which fits with the pin index system on the machine
- ✓ For medium and large capacity cylinders bull nose valves are used

✓ Color coding



Stem

- ✓ Each valve contains a stem (spindle/screw-pin) or shaft that is rotated to open or close the cylinder valve
- ✓ It is made up of very hard steel
- ✓ To close the valve the stem seals against the seat that is part of the valve
- ✓ when the valve is opened –stem is moved upwards and allows the gas to flow to the port

Handle/ Hand wheel:

 \checkmark It is used to open or close a cylinder valve

✓ It is turned counter-clockwise to open and clock-wise to close

(this causes the stem to turn)



Flow regulator

The flow meter will measure and guide to the right amount of oxygen to be provided to the patient.







Cylinder Pressure Gauge

The indicator is circular, the lowest pressure indication must be between the 6 o`clock and the 9 o`clock position on a clock face.

The scale must be at least 33% more than the maximum filling pressure.

MARKINGS

- DOT/TC specification number
- Service pressure in psi
- Serial number
- Identifying symbol of the purchaser, user or manufacturer
- Initial qualifying test date
- Retest date
- 5 pointed star after last test date=may be retested every 10 instead of 5 years
- •+' after test date = cylinder can be charged upto 10% in excess





PRECAUTIONS FOR OXYGEN ADMINISTRATION.

- Avoid naked flames near oxygen cylinder.
- Put a No Smoking sign at the entrance of the ward and near patient bed to warn others.
- Do not use oil on the oxygen cylinder. Oil can ignite if exposed to oxygen.
- Do not use electrical gadgets or any article which can cause sparks near oxygen cylinder.



RULES FOR SAFE USE OF CYLINDERS

Identify contents by label; Check for DOT
 Immediately before fitting, remove the protective cover

- Pressure reducing regulators always used; inspect them for any damage before connecting
- Remove dust and foreign bodies



RULES FOR SAFE USE OF CYLINDERS

- Never interchange parts of cylinder used for one gas with other
- No adapters please...
- Keep the valve closed when not in use
- Valve is most prone for damage
- No alterations
- Dont use as a roller
- Avoid electric contact



STORAGE OF CYLINDERS

- The storage area should be cool, dry, ventilated, clean area constructed of fire resistant material
- \checkmark Should have segregation of "Full" and "Empty cylinders"
- \checkmark Cylinders with an oldest fill date should be used first
- ✓ Cylinders should not be stored in direct sunlight.
- Cylinders should not be exposed to dampness, corrosive chemicals, fumes
- Cylinders should always be kept in place with chain or any other restraining device
- ✓ The suitable trolley/cart should be used to transport and support the cylinders.

Medical Gas Pipeline System

 Health care facilities use pipeline systems to deliver non flammable gases such as oxygen, nitrous oxide, air, carbon dioxide and nitrogen to OT, ICU locations and other patient care areas.

COMPONENTS

A medical gas distribution system includes

- Central supply
- **Piping** extending to locations where the gas is required (copper)
- Terminal units at each use point
- Hoses that extend from terminal units to anesthesia machine, Ventilators.

Supply sources

- **Two cylinder banks** (each bank must contain at least an average day's supply with a min of 2 cylinders)
- Cylinders are connected to a common **manifold header** that converts them into one continuous supply.
- A check valve between each cylinder lead and header to prevent loss of gas.
- **Primary supply(duty , running)** portion supplying the system at any time.
- The other bank is **secondary supply**. When the primary fails, the secondary automatically becomes the primary supply



Master Alarm System

- Monitors the central supply and the distribution system for all medical gas systems.
- Master signal panels must be located in two separate locations- one panel should be in principal working area of the dept. and one or more panels to assure continuous surveillance.

Area Alarm Systems

- Critical life support areas such as operating room suites, post anesthesia care units, intensive care units must have an area alarm system.
- Indicates if the pressure increases or decreases 20% from the normal line pressure.

Types of terminal units

- Wall outlets
- Ceiling mounted hoses
- Ceiling mounted pendants
- Ceiling column

Components of Terminal Unit

- BASE BLOCK
- GAS SPECIFIC CONNECTION POINT(SOCKET ASSEMBLY)
- DIAMETER INDEX SAFETY SYSTEM
- QUICK CONNECTORS



FIGURE 2.11 Pipeline inlets to the anesthesia machine have DISS connectors.



Oxygen concentrator

- Special devices that ensure a steady and concentrated supply of oxygen flow from the outlet to patients.
- They are provided with an oxygen delivery device for this purpose .
- Preferred mode of delivering oxygen to patients at home

Oxygen Concentrators have

Air compressors, Two cylinders filled with pellets, Reservoir to equalize Pressure Number of interconnecting valves and tubes



Oxygen Concentrator



Diagram of a molecular sieve oxygen concentrator. Sodium-aluminium-silicate pellets absorb carbon dioxide, nitrogen and water vapour



Principle on which they work

• These devices use the **pressure swing adsorption** method to concentrate oxygen.

 PSA works by quickly cycling of pressure and simultaneously alternately venting the opposite ends of the column. This leads to reduction of size of adsorbed bed and discarding of gas.

Versatility of use

- These devices plug into wall sockets. They also have batteries that can be used away from homes.
- As they can be plugged into outlets in vehicles they are useful for ambulances too.
- A few airlines permit the use of these devices on commercial flights too.
- Larger devices operate on pulse flow and continuous flow modes as required by patients.

Oxygen Concentrator

Advantages

No waste or loss, low pressure system (15 psi), cost-effective when continuous supply of oxygen is needed, eliminates need for oxygen delivery

Disadvantages

Disruption in electrical service renders system inoperable, back-up oxygen is necessary, cannot operate ventilators or other high pressure devices, concentration of oxygen decreases with flow rate, electrical costs for operating system may be substantial

Conclusion

- Less dangerous than oxygen cylinders.
- Particularly advantageous for outdoor use.
- Reliable enough to be provided to patients at home.
- Avoids the hassle of replenishing cylinders at regular intervals.
- Controls cost of supplying oxygen to patients.

Oxygen sources

Cylinders



- Very
- common
- Mobile but can be heavy
- Require high pressure compressor for filling
- Require supply chain

Manifold systems



- Cylinder based
- Require supply chain
- Require facility to
- have pipingRelatively low
- maintenance
- Difficult to repair

- - Mobile
 - Do not require supply chain
 - Require
 - electricity

Concentrat

ors

- Require
- maintenance

Oxygen plants



- Do not require supply
- chain
- Require
 electricity
- Require
 - maintenance
- May need piping
- Capable of filling cylinders

Liquid oxygen



- Space requirements
- Requires facility to have piping
- Supply chain
- Suitable for larger facilities

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