



Introduction to General Systems and Specialized Tools in General Surgery:

Surgery

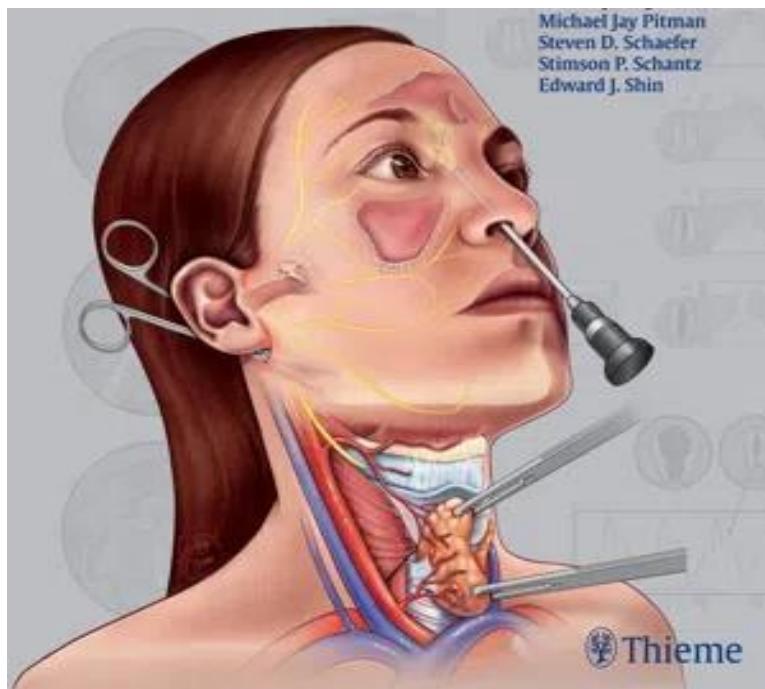
- Is a medical art dealing with a disease by surgical intervention (invasive method).
- The surgeon: is a physician trained to perform operation and to use other techniques to treat diseases.
- **Three aspects are associated with surgery:**
 - 1. Pain: associated with cutting in the body and is managed using anesthetic agents.
 - 2. The bleeding: that also associated with the cutting through the body, and it is managed mainly by the practices of the surgeon.
 - 3. The infections: due to bacteria and other micro-organisms that exist everywhere on the earth, it can be controlled and minimized by proper sterilization.

Types of Surgery

1. **Ophthalmology:** treats diseases of the eye by various methods including surgery.



2. **Otolaryngology (Ear, Nose, Throat):** treats diseases of the ear, nose, and throat using various techniques including surgery.



3. **Orthopedics:** treats diseases of the bones, joints and other locomotors organs (physical actions that allow a person to move from one location to another), and structures using various techniques including surgery.



4. **Neurosurgery:** treats certain diseases of the brain and nervous system using surgical techniques.



5. **Thoracic surgery:** surgical specialty that performs operations to treat diseases of the organs in the chest cavity.



6. **Gastroenterology and hepatic surgery:** surgical specialty that performs operations to treat diseases of the organs in the abdominal cavity.





7. **Urology:** treats diseases of the urinary system using various surgical techniques.



8. **Obstetrics:** manages pregnancy and delivery of babies.

9. **Gynecology:** treats diseases of the female reproductive system using various techniques including surgery.



Operating room

- An operating room (OR), also called surgery center, is the unit of a hospital where surgical procedures are performed.
- An operating room may be designed and equipped to provide care to patients with a range of conditions, or it may be designed and equipped to provide specialized care to patients with specific conditions.
- Operating rooms are sterile environments; all personnel wear protective clothing called scrubs. They also wear shoe covers, masks, caps, eye shields, and other coverings to prevent the spread of germs. The operating room is brightly lit, and the temperature is very cool; operating rooms are air-conditioned to help prevent infection.



**Al-Mustaql University / College of Engineering & Technology
Department (Medical Instrumentation Engineering Techniques)
4th Class**



Subject: Medical Instrumentation III

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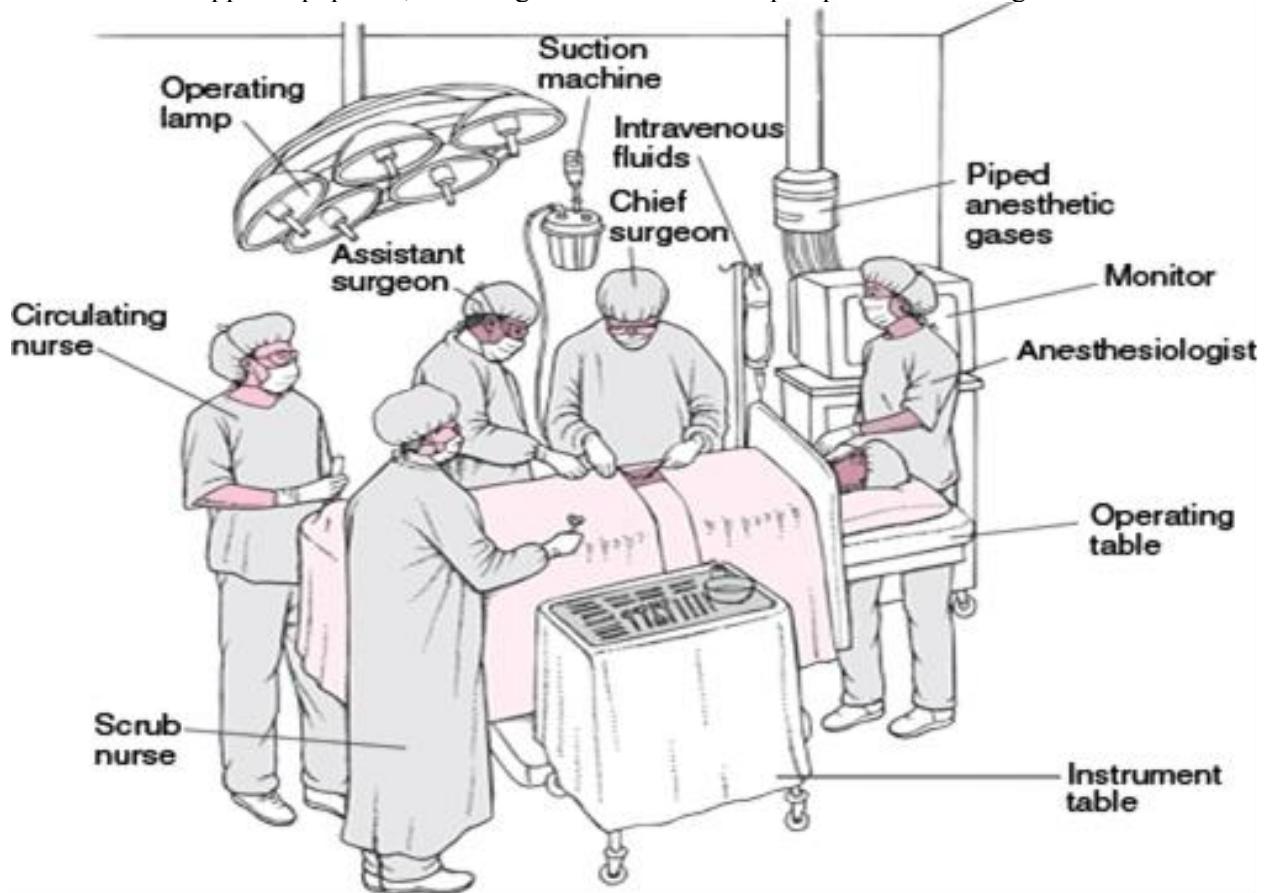
**First term – Lecture No. 1 & Lecture Name (Introduction to General
Systems and Specialized Tools in General Surgery)**





Operating room personnel:

1. "The surgeon is a physician who has received specialized training beyond medical school in the art of performing surgical operations and overseeing the postoperative management of patients' recovery. There are both chief surgeons and assistant surgeons."
2. An anesthesiologist is a physician who administers and controls anesthetic agents, as well as monitors patient responses. Alternatively, a nurse trained in anesthesia, known as a nurse anesthetist, can also perform these roles.
3. The circulating nurse operates outside of the sterile zone and serves various purposes, including record-keeping, obtaining supplies, and preparing drugs.
4. Scrub nurses work within a sterile zone and must adhere to the same antiseptic rules as the surgeon. They are responsible for maintaining the sterility of instruments, tools, and supplies.
5. Monitoring technicians are trained to operate and perform basic maintenance on a wide variety of physiological monitoring equipment, such as pressure monitors and ECG machines.
6. A cardiovascular technician is trained to operate and perform basic maintenance on a wide variety of life support equipment, including intra-aortic balloon pumps and heart-lung machines."





Operating Room Equipment

- The range of medical equipment found in various operating rooms depends on several factors like the types of surgery performed, physicians' preferences and level of activity.
- Operating rooms has special equipment such as respiratory and cardiac support, emergency resuscitative devices, patient monitors, and diagnostic tools and other Equipments.

1. Life support and emergency resuscitative Equipments: Equipment for life support and emergency resuscitation includes the following:

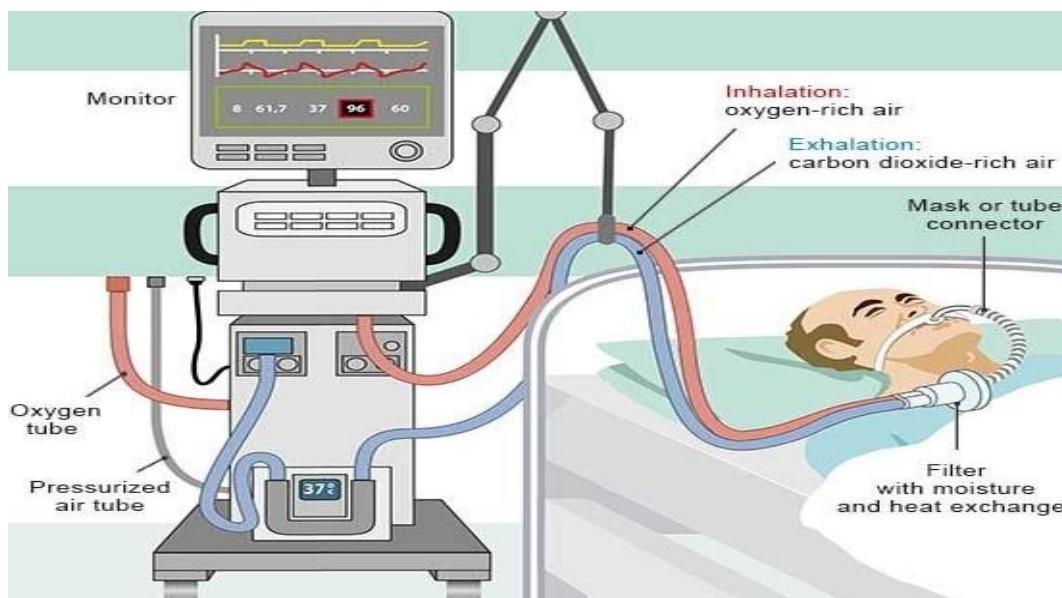
- Heart-lung bypass machine: also called a cardiopulmonary bypass pump takes over for the heart and lungs during some surgeries, especially heart or lung procedures. The heart-lung machine removes carbon dioxide from the blood and replaces it with oxygen. A tube is inserted into the aorta to carry the oxygenated blood from the bypass machine to the aorta for circulation to the body. The heart-lung machine allows the heart's beating to be stopped during surgery.



- Ventilator (also called a respirator): assists with or controls pulmonary ventilation. Ventilators consist of a flexible breathing circuit, gas supply, heating/humidification mechanism, monitors, and

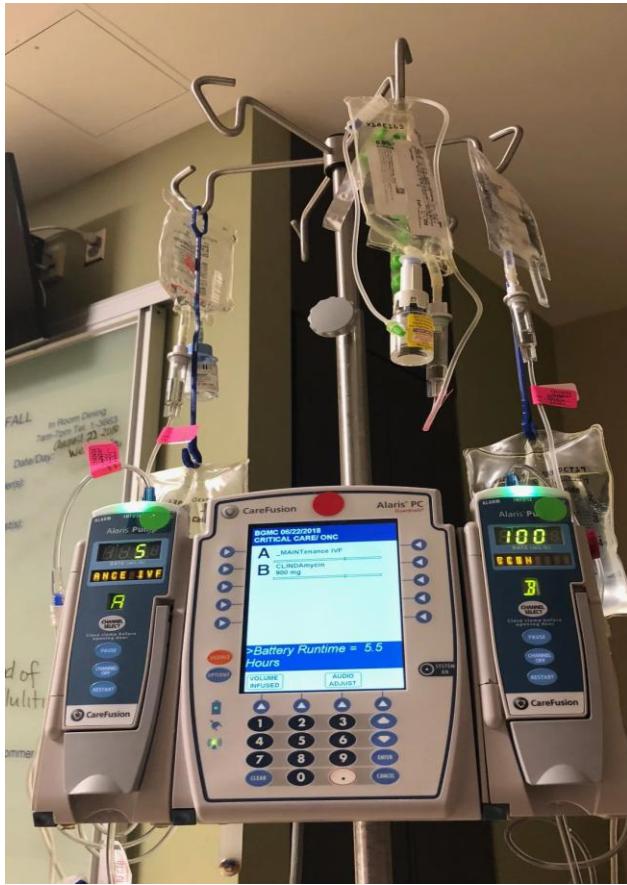


alarms.
They are microprocessor-controlled and programmable, and regulate the volume, pressure, and flow of respiration.





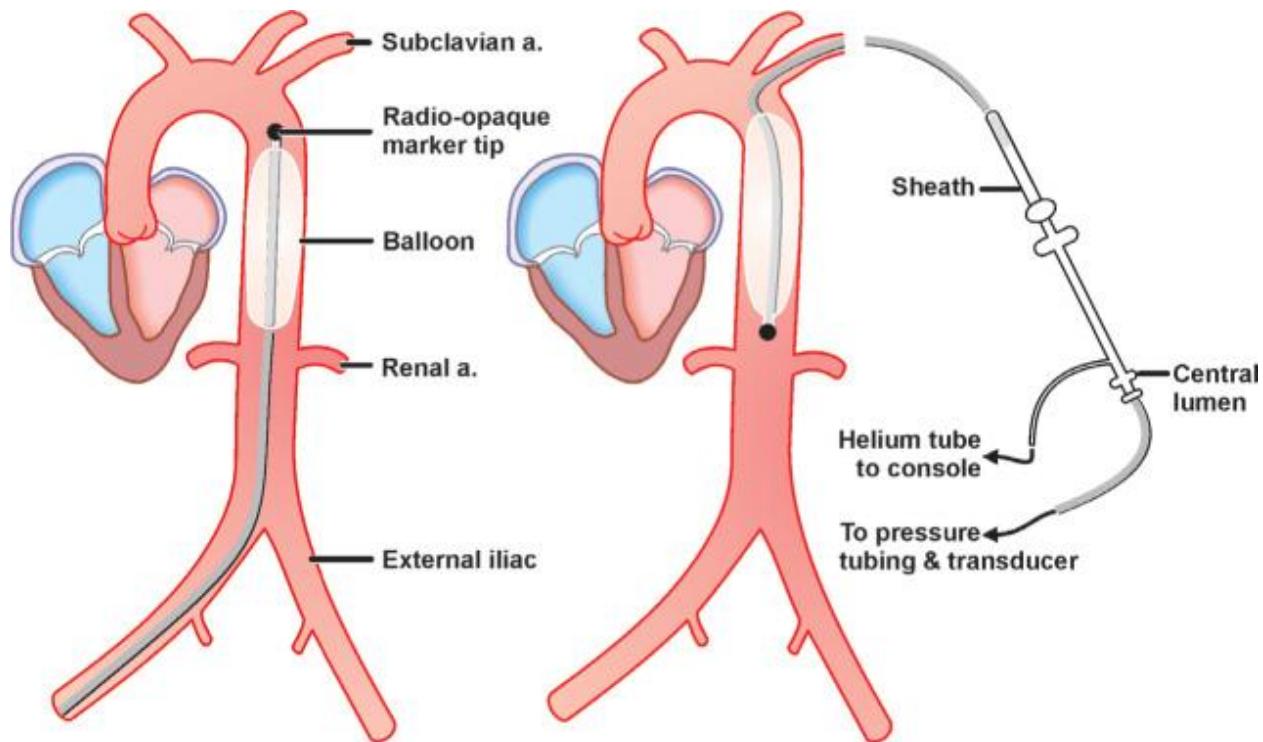
- Infusion pump: device that delivers fluids intravenously through a catheter. Infusion pumps employ automatic, programmable pumping mechanisms to deliver continuous anesthesia, drugs, and blood infusions to the patient. The pump hangs from an intravenous pole that is located next to the patient's bed.



- Crash cart: also called resuscitation cart or code cart. A crash cart is a portable cart containing emergency resuscitation equipment for patients who are "coding" (i.e., vital signs are in a dangerous range). The emergency equipment includes a defibrillator, airway intubation devices, resuscitation bag/mask, and medication box. Crash carts are strategically located in the operating room for immediate accessibility if a patient experiences cardiorespiratory failure.



- Intra-aortic balloon pump (IABP): a device that helps reduce the heart's workload and helps blood flow to the coronary arteries for patients with unstable angina, myocardial infarction. Intra-aortic balloon pumps use a balloon placed in the patient's aorta. The balloon is on the end of a catheter that is connected to the pump's console, which displays heart rate, pressure, and electrocardiogram (ECG) readings. The patient's ECG is used to time the inflation and deflation of the balloon.



A

B

Optimal positioning of the IABP is shown in (Panel A) the femoral artery approach and (Panel B) the left brachial artery approach

- Anesthesia machines: a device that delivers a precisely-known but variable gas mixture, including anesthetizing and life-sustaining gases. In this sense, anesthesia units dispense a mixture of gases and vapors of known concentrations in order to control the level of consciousness or analgesia of the patient undergoing surgery.



2. Patient monitoring equipment

- Monitoring system: comprehensive patient monitoring systems that can be configured to continuously measure and display various parameters via electrodes and sensors connected to the patient. Parameters monitored may include the electrical activity of the heart via an ECG, respiratory (breathing) rate, blood pressure (noninvasive and invasive), body temperature, cardiac output, and blood carbon dioxide. Intracranial pressure monitoring may be a capability included in a physiologic monitor.



Pulse oximeter: monitors the arterial hemoglobin oxygen saturation (oxygen level) of the patient's blood with a sensor clipped over the finger or toe.



3. Diagnostic equipment

The use of diagnostic equipment may be required in the operating room. Mobile X-ray units are used for bedside radiography, particularly of the chest. These portable units use a battery-operated generator that powers an x-ray tube.



- Handheld portable clinical laboratory devices, called point-of-care analyzers, are used for blood analysis at the bedside. A small amount of whole blood is required, and blood chemistry parameters can be provided much faster than if samples were sent to the central laboratory.



- 4. **Electrosurgery machine:** produce currents of intensity needed to cut tissue and cauterize bleeding blood vessels.





Suction apparatus: used to remove blood, mucous, other material from the patient's body, mouth, or the surgical wound.



- **6. Operating Table:** An operating table, or surgical table, is the table on which the patient lies during a surgical operation; Operating tables differ among hospitals and among rooms in the same hospital. However, most of the tables consist of a rectangular metal top that rests upon a hydraulic or mechanic, wheeled or fixed base. The table is designed for placement of the patient in many different positions according to the type of surgery, while enabling his body structures and his vital processes to be safeguarded no matter what his surgical position is.





- 7. **Surgical light (Operating Light):** is to assist medical personnel during a surgical procedure by illuminating a local area or cavity of the patient. A combination of several surgical lights is often referred to as a “surgical light system”. The light should offer a good illumination on a flat, narrow or deep surface in a cavity, despite obstacles such as surgeons' heads or hands, The central luminance cannot exceed 160 000 lux and should not be lower than 40 000 lux.

