

MEDICAL INSTRUMENTATION

SECOND YEAR

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LECTURE NO.(1)

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Examples of Medical Devices



Anesthesia Machines



Surgical Lights



Surgical Tables & Chairs



Monitors



Defibrillators



Electrosurgical



Stretchers



Microscopes



Infusion Pumps



Stainless Medical Equipment



Imaging



Respiratory Ventilators



Sterilizers



EKG Machines



Endoscopy Systems

1. INTRODUCTION

A medical device may be defined as any appliance, instrument, material, apparatus or other article, either used in a singular form in combination with other equipment/devices, including the software essential for its intended purpose by the manufacturer to be used for human beings for the following purpose of:

- **Diagnosis, prevention الوقاية, monitoring, treatment or alleviation التخفيف of disease**
- **Diagnosis, monitoring, treatment, alleviation of or compensation التعويض for an injury or handicap**
- **Investigation, replacement or modification of the anatomy or of a physiological process control of conception and which does not achieve its principal intended action in or on the human body by pharmacological, immunological or metabolic means, but which may be assisted in its function by such means.**

 <p>Anesthesia Machines</p>	 <p>Surgical Lights</p>	 <p>Surgical Tables & Chairs</p>	 <p>Monitors</p>	 <p>Defibrillators</p>
 <p>Electrosurgical</p>	 <p>Stretchers</p>	 <p>Microscopes</p>	 <p>Infusion Pumps</p>	 <p>Stainless Medical Equipment</p>
 <p>Imaging</p>	 <p>Respiratory Ventilators</p>	 <p>Sterilizers</p>	 <p>EKG Machines</p>	 <p>Endoscopy Systems</p>

Figure 1: Some of medical instruments and devices

Medical devices form an important component of patient care. From tongue depressors to dialysis machines , medical devices encompass a very broad and complex variety of technologies. The complexities are coupled with the presence of power factors in most medical devices. Thus, in addition to the device performance, the crucial aspect of patient safety and the health provider's safety gets incorporated. In order to comply with all safety requirements , sets of universal standards and norms have been prescribed, compliance to which ensures delivery of the right technology in the right way. A means to verify the devices against this desired compliance is testing. Thus, product testing brings into existence the first level of assessment of appropriateness and safety of a device.

With developing economies and increasing awareness, people are becoming more conscious about their health. Regardless of the cost factor, people are willing to opt for advanced technologies and solutions to improve their health. Hence medical devices have seen significant growth in the healthcare industry. Further, the medical device industry has its sub-industries like diagnostics, imaging, cardiovascular devices, surgical devices, and orthopedic devices.

Medical device types

there are many types of medical equipment such as:

- **diagnostic equipment**

diagnostic medical equipment is any type of equipment or tools used in a hospital setting for the sole purpose of diagnosing a patient's condition. Based on the symptoms described by the patient, a diagnostic test is performed using the appropriate equipment to evaluate the patient internally. The doctor or technician is looking for any abnormalities in the affected organs or parts of the body that are causing the symptoms to be exhibited. Below are some of the most common types of diagnostic equipment used in laboratories and medical clinics:

1. Medical imaging machines – medical imaging is a type of technology that is used to create visual representations of the human body's interior. The visual image produced by the equipment is used for clinical analysis and medical intervention. There are many medical imaging equipment, such as radiography (x-ray machine), computed tomography (CT scan), magnetic resonance imaging (MRI scan), ultrasound, and echocardiography, to name a few.

2. Aside from medical imaging machines, there are other medical devices used for diagnosing patients. Some examples include patient scales, stethoscopes, dopplers, and pulse oximetry.

Durable medical equipment (DME)

this type of medical equipment is used mainly for providing therapeutic benefits for certain conditions or illnesses. The use of this equipment must be prescribed by a physician, which is designed to serve a medical purpose. It is a **long-term and reusable device that can be used in the hospital or at home for patient care. There are several types of durable medical equipment such as the following:**

- 1. Manual wheelchairs or electric wheelchairs**
- 2. Hospital beds**
- 3. Walkers, crutches, canes (or any similar type of mobility assistive equipment)** مشايات وركائز وعكازات
- 4. Pressure mattresses**
- 5. Insulin pumps**
- 6. Breast pumps**
- 7. Patient Lifts**
- 8. Bili, lights and blankets**
- 9. Kidney machines**

Treatment equipment

Treatment equipment is any type of medical device or tool that is designed to treat a specific condition. It utilizes modern technology in order to address any abnormalities to restore function in the affected organs or tissues within the body. This can also include the surgical supplies designed to provide treatment for certain conditions that require surgical intervention. Below are common examples of medical treatment equipment that you will find in hospitals and clinics:

1. Infusion pumps – this type of treatment equipment is used in a hospital setting. It is designed to infuse medication, fluids, and other forms of treatment to the patient's circulatory system. This machine is used intravenously but you can also find epidural or arterial infusions. This machine is reliable because it injects controlled amounts of fluids into the patient's system over a given period of time.

2. LASIK Surgical Machines – The use of LASIK technology is used primarily for the treatment of eye conditions. It is designed for use on patients suffering from myopia قصر النظر, hyperopia بعد النظر, or astigmatism.

3. Medical Lasers – The laser is a revolutionary technology introduced in the medical field for the treatment of various medical conditions. It is a device that emits a wavelength of electromagnetic radiation for clinical applications. These wavelengths vary when it comes to energy level and pulse duration. These settings are to be determined by the attending physician during treatment.

Medical laboratory equipment

The use of medical laboratory equipment is often seen in medical clinics or diagnostic laboratories. These types of equipment are intended for the analysis of blood, urine, genes, and other biological material. Below are the most common examples of medical laboratory equipment used in the medical field:

- 1. Blood gas analyzers**
- 2. Chemistry analyzers**
- 3. Blood collection supplies**
- 4. Electrolyte analyzers**
- 5. Differential counters**
- 6. Drug testing analyzers**
- 7. Coagulation analyzers**
- 8. Hematology analyzers**
- 9. Urinalysis analyzers**
- 10. Microbiological systems**

as medical technology continues to develop, you can expect that there will be more types of medical equipment emerging. This is good news to patients who can expect quality medical care and diagnosis utilizing the latest in medical technology.

Medical device classification

The FDA categorizes medical devices into one of three classes – class I, II, or III – based on their risks and the regulatory controls necessary to provide a reasonable assurance of safety and effectiveness. Class I devices generally pose the lowest risk to the patient and/or user and class III devices pose the highest risk.

Class	Characterization / Device type	Example
Class I	Low risk level	Thermometers, Tongue depressors
Class IIA	Low to Moderate risk level	Hypodermic needles
Class IIB	Moderate to High risk level	Lung ventilators and bone fixation plates
Class III	High risk level	Heart valves and implantable defibrillators