



# A REPORT ON MEDICAL DEVICES

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## AIM.....

*Healthcare has always been a very crucial part of society. For a highly convenient and smooth healthcare system, there has always been a very relentless need in highly sophisticated and viable equipments that can ease up the task of doctors and various healthcare workers. In order to meet this ever-increasing demand for Biological Equipments, Biomedical Engineers have always contributed tremendously with their lethal Tech-Bio Intellect. This project report deals with some of the really useful and ubiquitous medical devices that have greatly impacted the Human Society.*

# 1. CAMERA PILL

## 1.1 INTRODUCTION

*Camera Pill is a tiny wireless camera that takes pictures of the patient's digestive tract. It is swallowed as a vitamin-size capsule. As it travels through the digestive tract, thousands of pictures that are transmitted to a recorder the patient wears on a belt around his/her waist are captured. Camera Pill helps doctors see inside the small intestine of a patient—an area that isn't easily reached with more-traditional endoscopy procedures.*

## 1.2 USES

*1.2.1 To Find the cause of gastrointestinal bleeding*

*1.2.2 To Diagnose inflammatory bowel diseases*

*1.2.3 To Diagnose cancer*



Figure 1: PILLCAM

## 1.3 NECESSARY PRECAUTIONS

*To help the camera capture clear images of your digestive tract, you'll be asked to stop eating and drinking at least 12 hours before the procedure. In some cases, your doctor may ask you to take a laxative before your capsule endoscopy to flush out your small intestine*

## 2. INFANT INCUBATOR

### 2.1 INTRODUCTION

*An infant incubator is a rigid box-like enclosure wherein an infant can be scrutinized and cared for in a regulated environment. The device may feature a heater, fan and container for water to increase humidity and also a control valve for replenishing oxygen, and nursing care access ports.*

### 2.2 TYPES

*Inside a typical infant incubator, the baby lies on a mattress in an enclosed and transparent cabinet. The ambient air is fully controlled by the incubator. The cabinet has some portholes so that the nurse can have access to the baby without opening the cabinet. Under the cabinet is the compartment functioning on the technology and the control panel. The whole incubator is mounted on a trolley.*

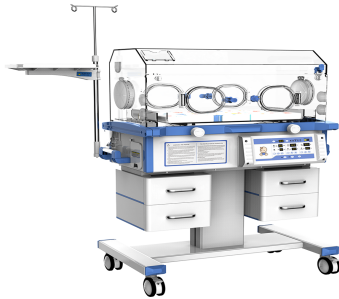


Figure 2: INFANT INCUBATOR

### 2.3 LIFE EXPECTANCY

*According to WHO the life expectancy of infant incubators is 7 - 10 years. Well maintained incubators can reach easily 15 years or more.*

### 2.4 TYPICAL PROBLEMS

*Broken hood thermometers should never be replaced against mercury glass-thermometers. The glass can break and mercury is toxic. The sleeves of the ports are often torn, filthy or missing, but you can find the material for replacement easily in every town*

### 3. HEMATOLOGY ANALYSER

#### 3.1 INTRODUCTION

*Hematology analyzers are the special devices used to count and identify blood cells moving at high speed with great accuracy. During the 1950s, laboratory technicians counted each individual blood cell underneath a microscope. After proving inaccuracy, this was replaced with the first, very basic hematology analyzer, engineered by Wallace H. Coulter. The early hematology analyzers relied greatly upon Coulter's Principle. However, they have evolved to accomodate numerous techniques.*

#### 3.2 TECHNIQUES ADOPTED

3.2.1 *Flow Cytometry*

3.2.2 *Spectrophotometry*

3.2.3 *Electrical Impedance*

3.2.4 *Digital Microscopy with AI*





Figure 3: HEMATOLOGY ANALYZER

### 3.3 USES

*Hematology Analyzers are widely used in:*

- 3.3.1 *RBC Distribution Width*
- 3.3.2 *Mean Corpuscular Volume*
- 3.3.3 *Platelet Distribution Width*
- 3.3.4 *Platelet mean volume*
- 3.3.5 *Large platelet cell ratio*

## 4. ARTIFICIAL HEART VALVE

### 4.1 INTRODUCTION

*An artificial heart valve is a one-way valve implanted into a person's heart to replace a heart valve that is functioning improperly (valvular heart disease). Artificial heart valves can be classified into three broad classes: mechanical heart valves, bioprosthetic tissue valves and engineered tissue valves. Heart valves can malfunction for a variety of reasons, which can impede the flow of blood through the valve and/or let blood flow backwards through the valve. Both processes put strain on the heart and may lead to severe problems, like heart failure. While some dysfunctional valves can be treated with drugs or repaired, others need to be replaced with an artificial valve.*

### 4.2 WORKING PRINCIPLE

*An Artificial Heart Valve uses a thin tube that is inserted; usually through your groin or wrist, to reach the valve and deploy a folded valve that unfolds and sits on top of the natural valve. The heart doesn't need to be stopped and the old valve is not removed.*



Figure 4: ARTIFICIAL HEART VALVE

### 4.3 RISKS DURING REPLACEMENT:

4.3.1 *Bleeding during or after treatment or damage to the blood vessels*

4.3.2 *Blood clots that can cause heart attack, stroke, or lung problems*

4.3.3 *Infection at the incision site*

### 4.4 REAL-LIFE EXAMPLES

*A 25-year old Nigerian survived for about 555 days outside hospital after receiving a heart transplant at UHMS in 2016.*

*Source: <https://healthblog.uofmhealth.org/heart-health/living-for-years-without-a-heart-now-possible>*

## 5. BED ALERT SYSTEM

### 5.1 INTRODUCTION

*A Bed Alert System comprises of a personal bed alarm that allows a caregiver to monitor the activities of a patient lying over bed. Typically, the bed alarm combines with a bed sensor or bed pad and operates through detecting a reduction of pressure when patient gets out of bed. Bed alarms, essentially, will alert the unit when pressure is removed from the sensor.*

### 5.2 WORKING PRINCIPLE

*The idea behind bed exit alarm pad is simple—a "thin, comfortable pad equipped with a sensor". It is a combination of a motion sensor pad, bed pad, and floor pad. These devices work together to monitor the movements of the person who is in the bed, watching specifically the movements and changes in pressure indicating that the patient is about to get out of bed. If the patient moves off the pad, it will trigger an alarm, alerting the caretaker about their movement. This system, called as exit alarm; is particularly useful for people with Alzheimer's or another form of dementia*



Figure 5: BED ALERT SYSTEM

### 5.3 DISADVANTAGES

*Many a times, meanwhile the nurse reaches the patient ward, the patient restlessly gets off the bed for urination and thus time delay causes problems. Also, many a times the alarm gets unnecessarily rung due to the random movements of the patient lying on bed, causing pressure differences*

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