



**AL- MUSTAQBAL UNIVERSITY COLLEGE**  
**DEPARTMENT OF BIOMEDICAL ENGINEERING**

# **Laboratory Instrumentation**

**BME 422**

**Lecture 2**

**- Infusion Pumps -**

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# Infusion Pumps





- Infusion pump delivers measured amounts of fluids or medications into the bloodstream over a period of time.
- They supply a controlled amount of drugs very slowly into the bloodstream over a period of time.

# Techniques for the pumping action



- First method is using the pulleys on the cylinder to compress the fluid tubing in a controlled manner to force the fluid down the tubing.
- A second method is obtained by using a chamber that fills with fluid, then emptied out by the pumping mechanism in a controlled manner.



- The Infusion Pump uses a combination of these two techniques described.
- The user can set the rate of fluid delivery in milliliters per hour (ml/hr) together with the volume of fluid that should be delivered in milliliters (ml).
- The pump will not deliver fluid beyond a certain delivery pressure to prevent harm to the patient.
- This is achieved by monitoring the pressure in the giving set and ensuring that it does not exceed a certain level.



- If the pressure is exceeded, pumping is stopped and an alarm sounded to alert the user.
- This alarm is called an occlusion alarm flow.
- Monitoring of the function of the pump occurs continuously and alarm sound will prevent any possible danger to the patient such as failure of delivering fluid in the manner expected .
- The Infusion Pump has battery back up so that it can continue operating even when mains failure occurs.

# Components of Infusion Pump



The drug infusion systems basically consist of two components:

- Open Loop System:
  - The art of delivery is set by the nurse on the basis of past experience, mathematical computation, or by trial & error.
  
  - The fluid is delivered at the set rate until the setting is changed.



- Closed Loop System:
  - The effect of drugs are monitored by appropriate transducers.
  - The desired delivery rate is computed and set automatically.



# Types of Infusion



The user interface of pumps usually requests details on the type of infusion from the technician or nurse that sets them up:

- Continuous Infusion.
- Intermittent Infusion.
- Patient Controlled Infusion.



- Consists of small pulses of infusion, usually between 20 Nano liters and 100 micro liters depending on the pump's design.
- The rate of pulses depending on the programmed infusion speed.

# Intermittent Infusion



- Has a "high" infusion rate.
- Alternating with a low programmable infusion rate to keep the cannula open.
- The timings are programmable.



- Infusion on-demand, usually with a preprogrammed ceiling to avoid intoxication.
- The rate is controlled by a pressure pad or button that can be activated by the patient.
- It is the method of choice for patient analgesia.

# Types of Pump



There are two basic classes of pumps.

- Large volume pumps can pump nutrient solutions large enough to feed a patient.
- Small-volume pumps infuse hormones, such as insulin, or other medicines, such as opiates.

