



AL- MUSTAQBAL UNIVERSITY COLLEGE
DEPARTMENT OF BIOMEDICAL ENGINEERING

Biomedical Instrumentation Lab

BME 514

Lecture 3

- Patient Monitor -

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Patient Monitor

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- The purpose of the central patient monitoring system is to provide quantitative information about the signals for several patients from a central location.
- This enables the doctors and healthcare professionals to keep an eye on the status of functioning of various physiological functions of the patients so as to make them fully prepared for emergency.



- The central station allows for the retrospective review of alarms, physiologic waves, and parameters from its database.
- A central monitoring system provide caregivers with reliable, timely physical data and comprehensive analysis tools for making appropriate clinical decisions.



- A conventional patient monitoring system is a bedside unit with various sensors connected to the patient to detect and process various physiological phenomena, especially cardiac activity.
- The devices in the system are usually configured per patient and provided at the bedside.
- The central monitoring system combines these independent systems into an integrated module and allows for remote monitoring and management of information from several patients at a time.



- The central monitoring systems enable the remote monitoring of many patients.
- They are typically made up of networked machines that consist of one or more sensors, display devices, processing components, and communication links for displaying or recording the results elsewhere through the monitoring network.

Stages



- Electrode or transducer stage for signal acquisition.
- An amplification stage.
- Conversion stage for analog-to-digital conversion.
- Data processing stage.
- Data display unit for viewing.
- Central processing stage for overall control of power.
- Various operations of the system.

System consists

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- The central patient monitoring system.
- Medical staff workstation.
- Wired/wireless network.
- Database server.

Types of Patient Monitor

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- Bedside Monitor.
- Wearable monitors.
- Noncontact monitors.



- Sensors attached to the patient are connected via cables/leads to a display unit near the patient's bed.
- Vital signs data can be viewed on these display units, at a central station, or on a remote display.



- In the patient-worn devices, the sensors are attached to the patient and connected to small, lightweight display units.
- These monitors can display vital signs data on their small screens and wirelessly transmit the data to a central station.
- The absence of a wire-connected bedside unit allows the patient to move more freely.
- These devices are compact and lightweight and have a built-in color display, alarm messages, and rechargeable battery.
- The devices are based on industry-standard Wi-Fi technology and provide continuous standalone monitoring.

Noncontact monitors



- These devices are designed to monitor certain vital signs such as, heart rate and respiratory rate, without the sensor having any physical connection to the patient.
- The sensors are placed beneath the mattress or bed sheet on which the patient lies.
- As long as the patient is in bed, the device can monitor vital signs and display the data on a unit situated near the patient's bed and/or at a central station.
- The patient is not required to be in direct contact with the sensor; however, if the patient leaves the bed, vital signs monitoring will cease until the patient returns.



- The central remote monitoring system is connected through wired and wireless network connections to each patient monitoring system, allowing for one medical professional to monitor several patients at a time and even monitor the state of patients outside the operating room during surgery.
- Data communication between bedside monitors and the central station.
- This solution enables the wide capability of a system to expand further for its needs and connection to a hospital's central computer network.
- Diagnosis can also be provided by reproducing the acquired vital signals using the storage device and database server.

Measurement Capabilities



- Heart/Pulse Rate.
- Electrocardiography (ECG).
- Oximetry (SpO₂).
- Non-invasive Blood Pressure (NIBP).
- Respiration Rate (RR).
- Temperature (TEMP).



- The patient monitor collect the data by using various methods for a different parameters.
- The input data are amplify, process and display as a waveform, and/ or a numerical value.
- Alarm limits can be adjusted to desired levels, for alert the medical staff of undesirable health conditions.

The Main Unit





1. Power switch: Press it for 3 seconds to start the monitor or turn off the monitor.
2. AC power indicator: When it is light it means that AC power supply is being used.
3. DC power indicator: When both AC and DC indicators are on, it means that AC power supply is applicable, and the battery is being recharged. If only DC indicator is on, it means that the battery is being used.



4. ECG lead.

5. Alarm silence.

6. Freeze: Press the key to freeze/unfreeze the waveforms.

7. NIBP: Press to start or stop NIBP measurement.

8. DISP: Click to shift the display modes or return to the Main Screen from other screens.



9. Navigation Knob: It is the major operating key of the system, which can be used to select functions or parameters.

10. Alarm indicator.

Indicator Color	Alarm Level
Red flashing	High priority alarm
Yellow flashing	Middle priority alarm
Yellow light	Low priority alarm
Green light	Normal

