Al-Mustaqbal University
College of Engineering & Technology
Biomedical Engineering Department

Subject Name: Introduction to Biomedical Engineering

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Lecture No.:-1

Lecture Title: [Introduction]

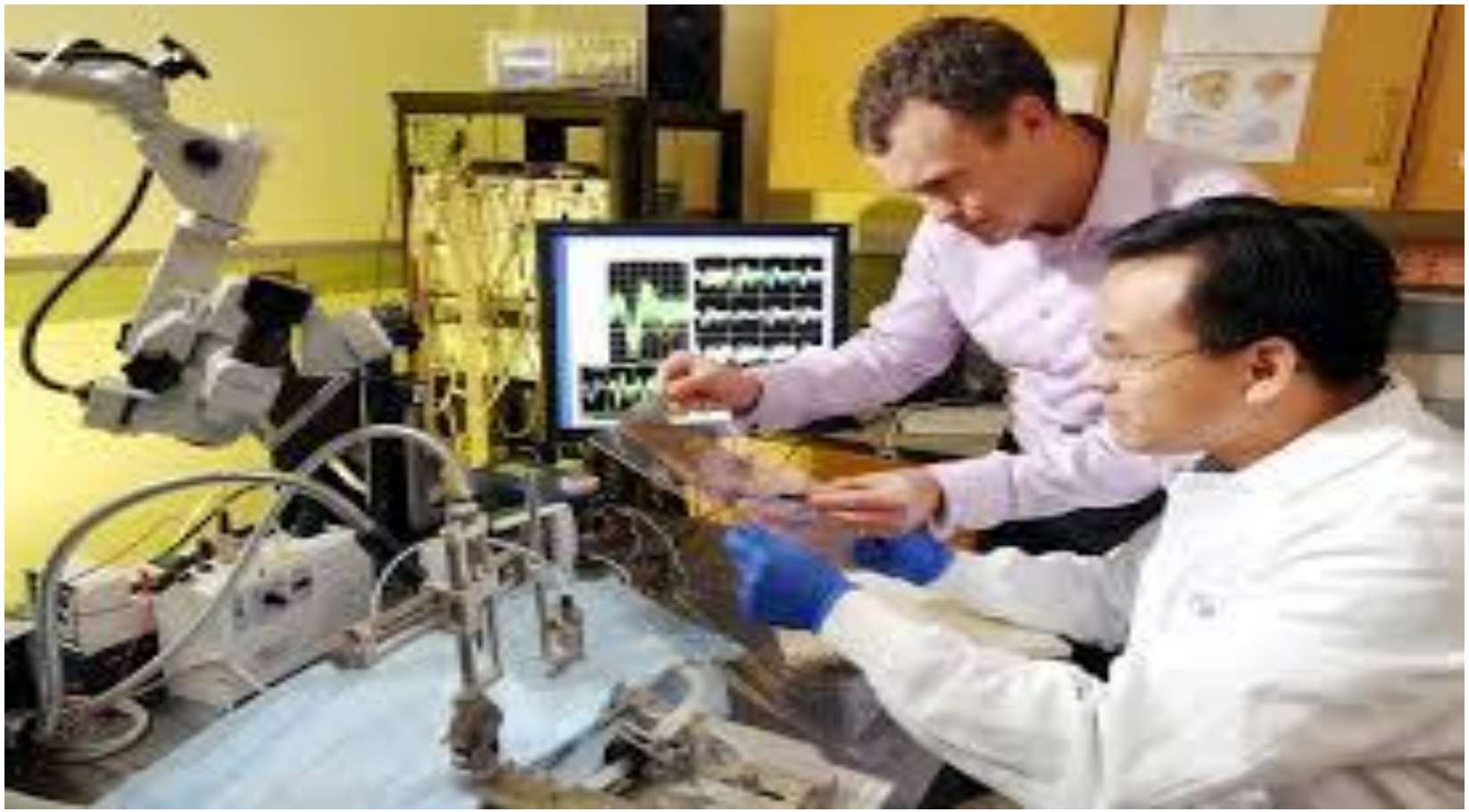
What is a Clinical/Biomedical Engineer?

- A Clinical/Biomedical Engineer is a professional who applies engineering principles and techniques to the field of healthcare and medicine. Their primary focus is on designing, developing, implementing, and maintaining medical equipment and systems to improve patient care, diagnosis, and treatment.
- These engineers work closely with healthcare professionals, such as physicians, nurses, and technicians, to understand their needs and develop innovative solutions to address clinical challenges. They may be involved in the design and development of medical devices, diagnostic equipment, prosthetics, rehabilitation equipment, and healthcare software systems.

Why we need Biomedical Engineer in the hospital?

Biomedical engineers play a crucial role in hospitals for several reasons:

- **Medical Device Development and Maintenance:** Biomedical engineers design, develop, and maintain medical devices used in hospitals, such as MRI machines, CT scanners, infusion pumps, and prosthetic devices.
- **Equipment Calibration and Quality Assurance**: Biomedical engineers are responsible for ensuring that medical equipment is calibrated correctly and functions properly. They conduct regular inspections, maintenance, and quality assurance tests to prevent malfunctions and ensure accurate diagnosis and treatment.

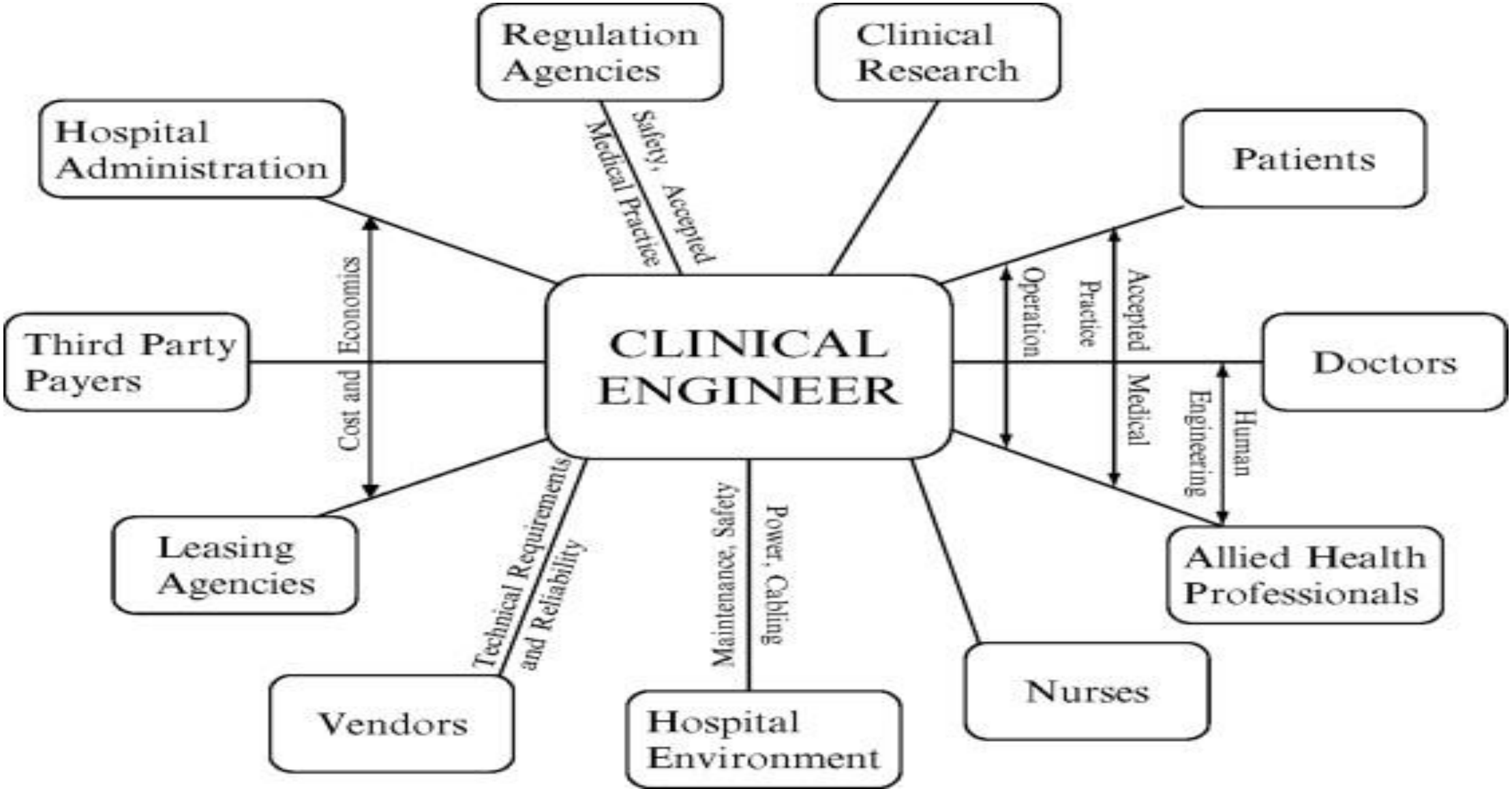


- **Integration of Technology:** Hospitals are increasingly reliant on technology for patient care and management. Biomedical engineers help integrate various technologies into hospital systems, such as electronic health records (EHRs), medical imaging systems, and telemedicine platforms, to improve workflow efficiency and patient outcomes.
- **Patient Safety:** Biomedical engineers contribute to patient safety by identifying and mitigating potential risks associated with medical devices and equipment. They conduct risk assessments, implement safety protocols, and provide training to healthcare staff on the safe use of medical technology.

- **Research and Innovation:** Biomedical engineers are involved in cutting-edge research to develop new medical technologies, treatments, and therapies. Their innovative solutions address unmet clinical needs and advance the practice of medicine, ultimately improving patient care.

- **Technical Support and Training:** Biomedical engineers provide technical support to healthcare professionals on the use, maintenance, and troubleshooting of medical equipment. They also offer training and education programs to ensure that hospital staff are proficient in operating complex medical devices effectively.

Interactions of Biomedical Engineer in the hospital



Typical pursuits (career) of biomedical engineers include:

1. Supervision of a hospital clinical engineering department that includes clinical engineers, and BM equipment technicians (BMETs).
2. Pre-purchase evaluation and planning for new medical technology. (Doctors do that now).
3. Design, modification, or repair of sophisticated medical instruments or systems. E.g. MRI or CT.

4. Inspection of all incoming equipment (i.e., both new and returning repairs).

5. Cost-effective management of a medical equipment calibration and repair service. E.g. CT, C-arm yearly calibration.

6. Supervision of the safety and performance testing of medical equipment performed by BMETs.

7. Coordination of outside engineering and technical services performed by vendors. E.g. installing an MRI system.

8. Training of medical personnel in the safe and effective use of medical devices and systems.

9. Input to the design of clinical facilities where medical technology is used, e.g., operating rooms (ORs), intensive care unit, etc.

Medical Device Classification

Medical Device Examples

Anesthesia workstation

I

III

Infusion pump

II

Hemodialysis machine

Defibrillator

III