الهندسة الطبية في المملكة العربية السعودية

Biomedical Engineering in Saudi Arabia

نزيه شجاع العثماني

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Presentation Outlines

- What is Biomedical engineering?
- Branches of Biomedical engineering
- Engineers and doctors
- Biomedical Engineers in hospitals

Biomedical engineering?

- “Biomedical engineers apply

  engineering principles and materials technology to healthcare.

  This can include

  - Researching,
  - Designing and developing medical products, such as joint replacements or robotic surgical instruments,
  - Designing or modifying equipment for clients with special needs in a rehabilitation setting, or
  - Managing the use of clinical equipment in hospitals and the community”

Prospect UK website

The UK's official graduate careers website

What is Biomedical Engineering?

- "biomedical engineers work at the intersection of engineering, the life sciences and healthcare.
  - These engineers take principles from applied science (including mechanical, electrical, chemical and computer engineering), physical sciences (including physics, chemistry and mathematics) and apply them to biology and medicine.
  - The goal is to better understand, replace or fix a target system (including human body systems and functions) to ultimately improve the quality of healthcare."

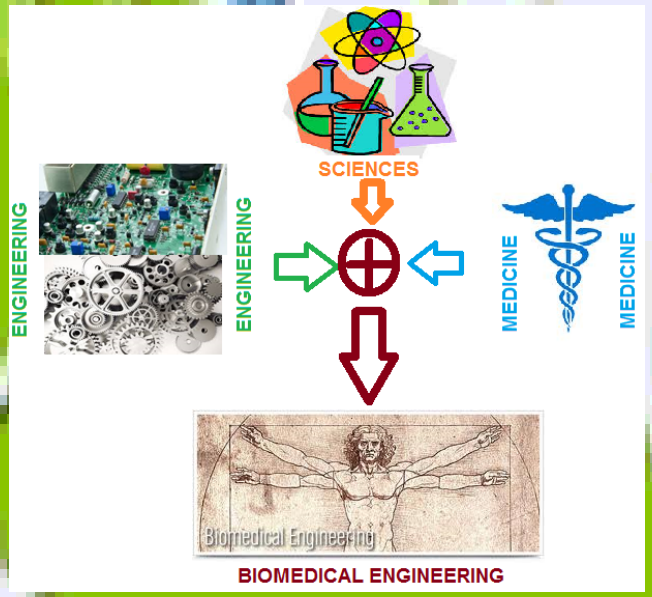
Engineering in Medicine and Biology, USA

What is Biomedical Engineering?

- **Biomedical Engineers** "Apply knowledge of engineering, biology, and biomechanical principles to
  - the design, development, evaluation of biological, health systems and
  - products, such as artificial organs, prostheses, instrumentation, medical information systems, heath management and care delivery systems"

US Labor Office

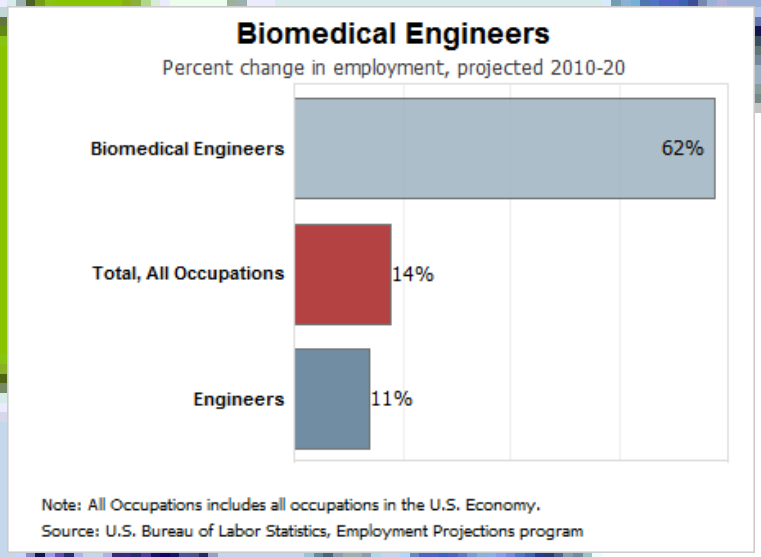
Biomedical Engineering



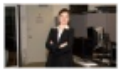
Applying Technology principles in designing systems/processes that help in diagnosing, treating, and replacing body functions as well as assist the health industry

What do they say about BME career?

- "Biomedical Engineering is the best paid job in USA for 2012" CNN Money
- "Biomedical engineering is the 2nd best paid job in USA for 2013" Wall Street Journal
- Biomedical Engineering is expected to be top demand profession till the year 2020 US Bureau of Labor Statistics



Best Jobs in America

Rank		Job title	Median pay	Job growth
1		Biomedical Engineer	$87,000	61.7%
2		Clinical Nurse Specialist	$86,500	26%
3		Software Architect	$121,000	27.6%
4		General Surgeon	$288,000	24.4%
5		Management Consultant	$110,000	29.1%
6		Petroleum Geologist	$183,000	21.2%
7		Software Developer	$88,700	27.6%
8		IT Configuration Manager	$95,800	28.5%
9		Clinical Research Associate	$95,100	36.4%
10		Reservoir Engineer	$179,000	17%

- CNNMoney/PayScale's top 100 careers with big growth, great pay and satisfying work,
- http://money.cnn.com/pf/best-jobs/

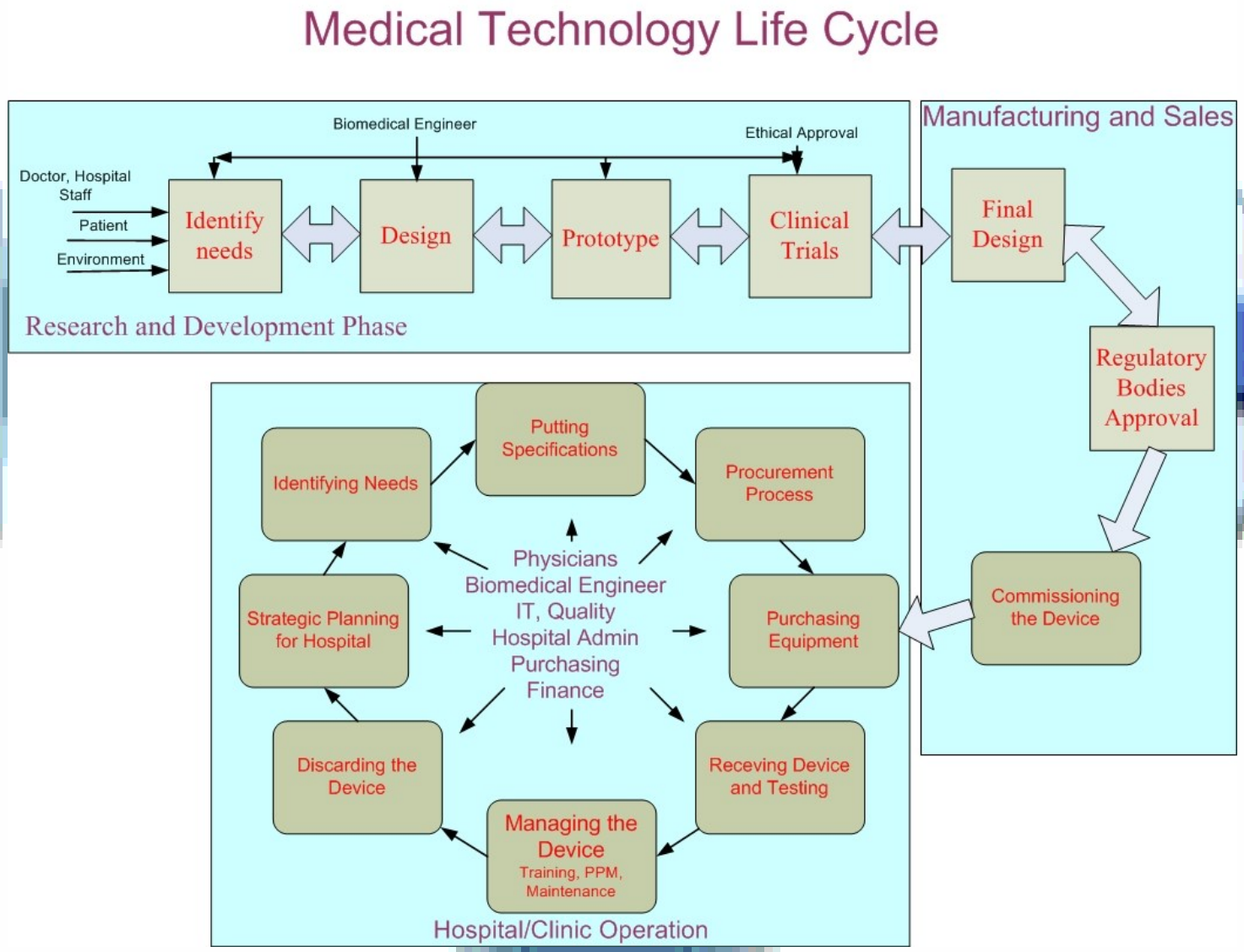
Branches of Biomedical Engineering

- Technology + Medicine results in branches of BME
  - Electronics +Medicine =Bio-Electrical Engineering
  - Instrumentation +Medicine=Bio-Instrumentation
  - Mechanical + Medicine=Bio-Mechanical Engineering
  - Information Science+ Medicine=Bio-informatics
  - Biological Sciences+ Medicine=Bio-engineering
  - Chemical+ Medicine=Bio-Chemical Engineering
  - Signal Processing+ Medicine=Bio-Signal Processing
- Other Branches:
  - Rehabilitation Engineering
  - Tissue Engineering
  - Clinical Engineering

Biomedical Engineering in Saudi

- Several institutes around the Kingdom provide programs in Biomedical Engineering:
  - King Abdulaziz University, College of Engineering, Electrical and Computer Engineering Department (Biomedical Option).
  - King Saud University, Applied Medical Sciences.
  - University of Dammam (Girls only), College of Engineering, Biomedical Engineering.
  - King Faisal University (Girls only), College of Engineering, Biomedical Engineering.
  - Several institutes have two year diploma programs for biomedical technicians.

Biomedical Engineers Role in Medical Equipment life Cycle



What Biomedical Engineers Do in Hospital?

- Asset management
  - BME maintains a file (e-file) for every device in the hospital containing all data related to the hospital
  - performs regular maintenance, monitors quality of device management and operation
  - Follows up with spare parts ordered and vendors serving special equipment on warranty or contract.
  - Monitors the stock for parts needed regularly for the operation of some machines.
  - Follows up with regulatory bodies for recalls and modifications on devices

BME contribution in different Teams

- Planning future purchases
  - BME has the big picture about the equipment needs/status in different areas of hospital, as well as equipment to be discarded.
  - BME has data relating the operation of a device with the maintenance cost as well as vendors.
  - BME data/experience contributes to proper planning for hospitals.
- Putting specifications, requesting proposals
  - Physicians know the clinical specifications for the device. Engineers know the technical specifications as well as resources available in the hospital for proper pre-installation needed for different machines.
- Evaluating vendors
  - BME has a record of performance for all vendors and has the background to compare technical specifications across different vendors.
- Testing received equipment
  - Newly received devices need to be tested to verify that they are in accordance to the hospital orders and safe to use.
- Discarding of units
  - BME performs cost analysis for devices in operation to determine which devices need to be replaced
  - BME ensures safe disposal for devices.

Complementing not Competing

Legal

Finance

Human Recourse

Biomedical Engineers

IT

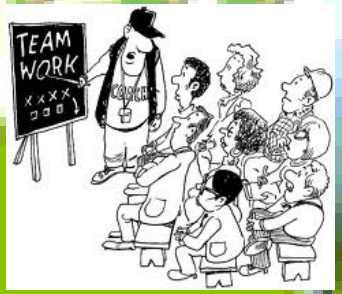
Nursing

General Maintenance

Administration

Quality

Others



Collaborate not compete

Patient First

Challenges Facing BME

- Biomedical Engineering is not maintenance, it is much more.
- Become part of planning, decision making through qualified professionals and independent departments.
- Registering at SCFHS and SEC
- Slipping away from public sector
- Limited training opportunities
- Multi-disciplinary nature limits scholarship opportunities and SCFHS registration
- Bridging programs for technicians
- Job openings for upcoming female engineers

Recommendations

- MOH:
  - Establish a new Biomedical Engineering Division to merge planning, purchasing, and maintenance of medical devices together.
- SSSBE+ private sector partnership towards effective training opportunities
- Empower BME engineers to be part of decision on early stages
- Incentives in public sector to retain talent
- Work with SCFHS and SEC to resolve licensing issues
- Add classification of Biomedical Engineers (males and females) in Health Specialties Job classifications and MOH self support program
- More collaboration within bodies working in areas related to Biomedical Engineering

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