Non-invasive and minimally invasive medical devices

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Definitions

• A *minimally invasive* medical procedure is defined as one that is carried out by entering the body through the skin or through a body cavity or anatomical opening, but with the smallest damage possible to these structures.¹)

• Diagnostic techniques that do not involve the puncturing of the skin or incision, or the introduction into the body of foreign objects or materials are known as *non-invasive* procedures.²)

1) https://www.sciencedaily.com/terms/minimally_invasive_procedure.htm
Non-invasive and minimally invasive medical devices

• benefits for patients:
  – lowering the risk of infection,
  – reduce trauma,
  – accelerate the recovery,
  – reduce the costs of hospital stays and medical treatments.
Healthcare Expanditures in Europe

- Increase of Healthcare Insurance/National Healthcare system expenditures
- Increase of medical staff workload

Healthcare Expanditures in Africa

Potential for Providing Medical Care

**PM new generation**

New trends in their research and development - miniaturization

93% smaller than conventional pacemakers

Ultra low-power circuit design delivers an estimated average 12-year battery longevity.

Physical characteristics
Volume 0.8 cc
Length 25.9 mm
Outer diameter 6.7 mm (20.1 Fr)
Mass 1.75 g
Evolution of blood glucose monitoring
Non-invasive measuring of blood glucose

Research for easy and less-invasive way to measure glucose daily:

• tears,
• airway mucus,
• sweat,
• saliva or
• the interstitial fluid of subcutaneous tissue
Non-invasive measuring of blood glucose

An electronic skin patch that senses excess glucose in sweat and automatically administers drugs by heating up microneedles that penetrate the skin.

See also: Hyunjae Lee et al., A graphene-based electrochemical device with thermoresponsive microneedles for diabetes monitoring and therapy, Nature Nanotechnology, 2016
ICT in Healthcare

- Accessibility to information and communication technologies (ICT) provides an opportunity to facilitate acquisition of health data from wide populations, their use in research, analytics and finally in improving the outcomes of health care.
Self-Management and Telecare

IoT in Health Care

- Global connectivity
- Personal mobile devices
- Digital society

Source: NetSecurity.org
IoT in Health Care

• IoT promises to be the most disruptive technological revolution since the advent of worldwide web (Source: IEEE)

• The Internet of Medical Things (IoMT) is the collection of medical devices and applications that connect to healthcare IT systems through online computer networks. Medical devices equipped with Wi-Fi allow the machine-to-machine communication that is the basis of IoMT. IoMT devices link to cloud platforms such as Amazon Web Services, on which captured data can be stored and analyzed. IoMT is also known as healthcare IoT. (Source: TechTarget)
Challenges in IoMT

- Interoperability
- Standardization
- Users’ acceptance
- Cost
- Reimbursement
- Data analytics
- From statistics to personalized medicine

Integration strategy

- Generation of new **big data** on patient health and behaviour by portable and wearable medical devices or gadgets of patients’ own choice
- Enabling use of existing databases from the Health care system - **connectivity**
- Enabling use of data for **advanced analytics** (data mining)
- Generation of new **knowledge**
Thank you for your attention!

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