"Small" history of medical devices / medical technology

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Medical technology is the application of engineering principles and rules in the field of medicine. Here, for example, engineers work interdisciplinarily with physicians and nursing staff to develop medical devices to improve the diagnosis, therapy, nursing care, rehabilitation and quality of life of sick or even healthy individuals.

Medical devices, in turn, are products intended by the manufacturer for medical use in humans. The primary effect of such medical devices is physical, the use of which is regulated by the Medical Devices Act and verified by the BfArM. Medical devices include implants, products for injection, infusion, transfusion and dialysis, human medical instruments, software, catheters, pacemakers, dental products, dressing materials, visual aids, X-ray equipment, condoms, medical instruments, laboratory diagnostics, products for conception control and in vitro diagnostics. In vitro diagnostic products include reagents, reagent products, kits, sample containers (such as the Petri dish), equipment and other products intended for in vitro examination of samples from the human body. Therefore, it is not surprising that there are over 500,000 different types of medical devices and in vitro diagnostics on the European single market (as of 2017).

Therefore, the economic importance of the so-called "MedTech industry" in Germany should not be underestimated. The industry employs a total of over 215,000 people here, each of whom also secures 0.75 jobs in other sectors. The total turnover of the MedTech sector in 2020 was around 34 billion euros. The export ratio is around 65 percent. 93 percent of MedTech companies employ fewer than 250 people. The medtech sector is considered particularly innovative, as evidenced by the fact that a large proportion of sales are generated with products that are no more than 3 years old.

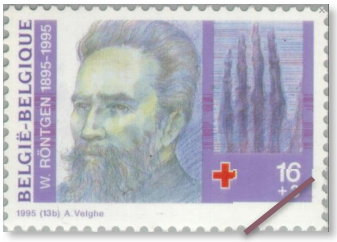
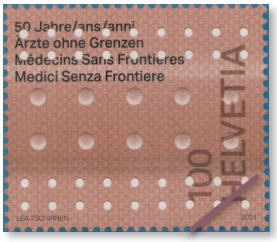
The following is a list of some milestones in medical technology (= medical devices that are "mass produced" or routinely used after their "discovery"). The list is naturally highly incomplete, as each medical field has its own milestones. Even the beginning in 1874 is arbitrarily set, e.g. prostheses already existed in ancient Thebes.

1874: First germ-free wound dressing: Sir Joseph Lister is the first to describe a method of producing a germ-killing wound dressing with "Lister's carbol gauze".

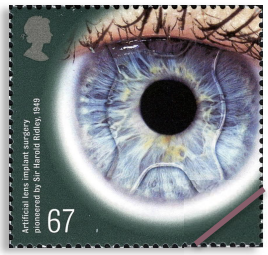
1895: First X-ray images: The X-ray image of Bertha Röntgen's left hand, taken by her husband Conrad Röntgen, is considered the birth of radiology.

1922: First plaster with a gauze layer: It can thus be used for the first time to treat open wounds. The plaster is based on the zinc oxide plaster Leukoplast, which had already been invented by Dr. Troplowitz in 1901.

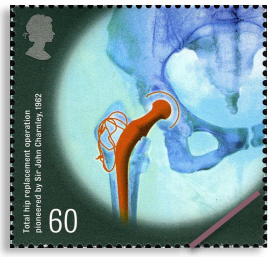
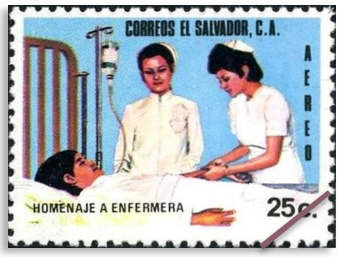
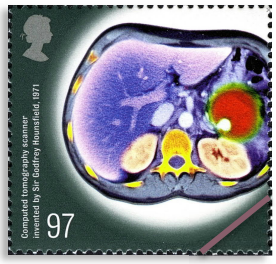
1929: First artificial respiration: Philip Dinker develops the "iron lung", a method of artificial respiration. Here, positive and negative pressure in a metal chamber move the patient's chest. This supplies the lungs with oxygen.

			
Lister´s Karbolspray (GB 1965)	*Röntgenbild einer Hand (B 1995)*	*Pflaster (CH 2021)*	*(Künstl.) Beatmung (DDR 1977)*

1945: First dialysis treatment: The drum dialysis machine with cellophane tubing as dialysis membrane by Willem Kolff in Kampen (Netherlands) brings a breakthrough in renal replacement therapy.
1949: First artificial eye lens: British physician Sir Nicholas H. L. Ridley inserts the first artificial intraocular lens into the eye as a replacement for the lens clouded by cataracts.
1951: First syringe pump: The first syringe pump for a permanent infusion is introduced to the market.
1952: First artificial heart valve: Charles A. Hufnagel implanted the first artificial heart valve in the aorta of a patient with aortic valve insufficiency.

			
Dialyse (A 1990)	*Grauer Star OP (GB 2010)*	*Spritzen(pumpe) (LB 2010)*	*Herzklappen (IL 2013)*

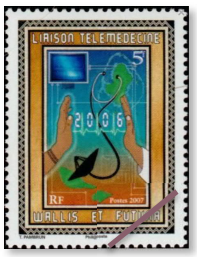
1958: First pacemaker: On October 8, 1958, Rune Elmquist and Åke Senning implanted the first fully integrated pacemaker in Stockholm. They opened the patient's chest and sewed the electrodes directly onto the heart muscle.
1959: First total hip endoprosthesis: Sir John Charnley implants the original model of the modern hip implant. Initially consisting of a metal head and a Teflon cup, the Teflon was later replaced by polyethylene.
1962: First flexible indwelling vein cannula: Bernd Braun, a physician from Melsungen, Germany, develops the first flexible indwelling vein cannula, the "Braunüle®", which is still named after him today.
1971: Development of computer tomography: The English engineer Godfrey N. Hounsfield (born 1919) develops the first computer tomograph (CT). Interestingly, he works for the British company EMI (which produced records and electronic components at the time).

			
Herzschrittmacher (A 1983)	*Hüftendoprothese (GB 2010)*	*Venenkanüle (SLV 1975)*	*Computertomographie (GB 2010)*

1977: First balloon dilatation (PTCA): German physician Prof. Andreas Grüntzig performs the first balloon dilatation (PTCA). Here, a thin catheter is inserted into the groin, advanced to the narrow points in the coronary vessels, and then a balloon installed at the tip of the catheter is inflated. The constrictions are dilated under the pressure of the balloon.
1977: First implantation of a multichannel cochlear implant (CI): on December 16, 1977 in Vienna by Prof. Kurt Burian. The technical pioneering work was done by the couple Ingeborg and Erwin Hochmair at the Technical University of Vienna. The implant had 8 channels, a stimulation rate of 10,000 pulses per second per channel, 8 independent current sources and a flexible electrode with an insertion depth of 22 to 25 mm into the cochlea.
1980: Defibrillator: Prof. Michel Mirowski successfully used the first automatic implantable defibrillator in a human.
1989: First stent implantation with balloon catheter: Richard Schatz, M.D., and Julio Palmaz, M.D., develop a novel stent design that is no longer made from a wire but from a slotted tube, making it balloon-expandable.

			
Ballondilatation (D 2006)*	*Cochleaimplantat (AUS 1987)*	*Defibrillator (CA 2011)*	*Stent (IL 2013)*

1998: Deep brain stimulation (THS) for Parkinson's disease: Based on earlier non-clinical applications, deep brain stimulation, also called brain pacemaker, was approved in 1998 for the treatment of Parkinson's patients. It involves attaching two electrodes to the brain and inserting a pulse generator under the collarbone. Today, THS can also be used to treat severe depression and obsessive-compulsive disorder.
2000: First telecardiology application: The first wireless home monitoring system using cellular technology is implanted. It transmits important cardiac data over long distances between doctor and patient, facilitating diagnosis and treatment.
New "products still to be developed" in the field of medical technology:
In 2012, proof was provided that the CRISPR/Cas gene scissors also work in mammalian cells, meaning that human cells can also be modified at the genome level. This marked the beginning of the resurgence of gene therapy. The first successes in treating sickle cell anemia with the gene scissors were recorded at the University of Regensburg.
The creation of a functional artificial hand, was made possible in 2013 by the development and implantation of increasingly sophisticated prostheses using mechatronics. No comparison to the "Iron Hand of Götz von Berlichingen" (see Last but not least). At the same time, neuroscientists have succeeded in reproducing the process that goes from imagining moving an arm to moving it and transmitting the sensations to the brain. This so-called bionics is also a broad field of research in medical technology in the area of sensory organs (e.g. eye).

			
Tiefe Hirnstimulation (IL 1988)	*Telemedizin (Fuerteventura 2007)*	*Gentherapie (Monaco 2003)*	*Bionik (GB 2015)*

In regenerative medicine or transplant medicine, much is currently being made of 3D bioprinting technology, which should make it possible to print entire organs that can then be transplanted (see article on page 18).

**The stamp does not show a balloon dilatation but a cardiac catheter, for whose "discovery" Mr. Forssmann received the Nobel Prize in Medicine in 1956. This technique is essential for balloon dilatation.*

Quellen: *https://www.bundesgesundheitsministerium.de/themen/gesundheitswesen/medizinprodukte/definition-und-wirtschaftliche-bedeutung.html; https://de.wikipedia.org/wiki/Medizintechnik; https://www.dlr.de/rm/en/desktopdefault.aspx/tabid-8017; https://www.bvmed.de/*