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L' innovazione dirompente nell' anno 2021

I dispositivi attesi in Cardiologia

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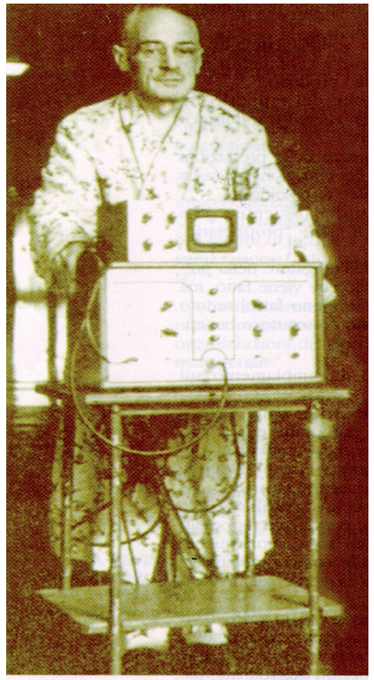
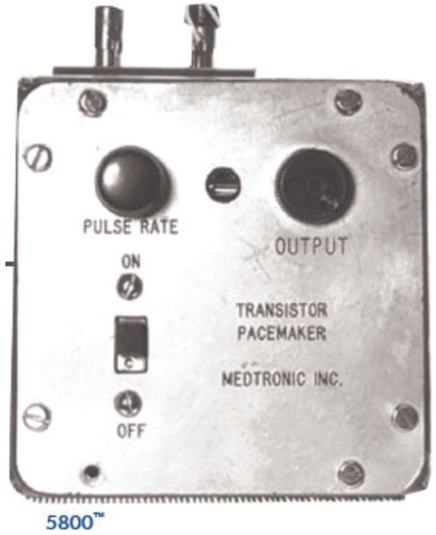
Dal primo pacemaker esterno (1958).....

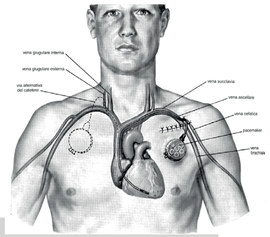


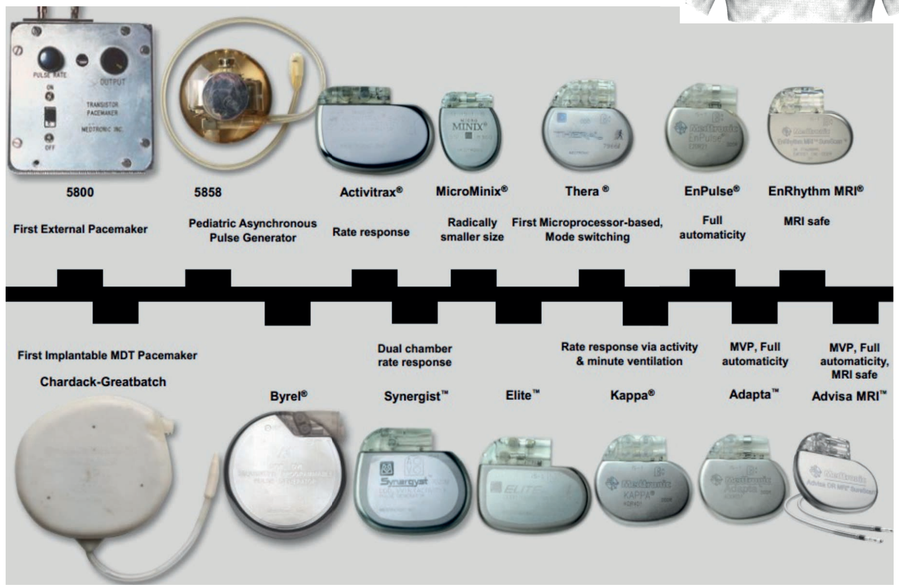
Negli anni '50 il Pacemaker era alimentato da corrente esterna



Nel 1958 Earl Bakken produsse il primo prototipo di Pacemaker a batteria

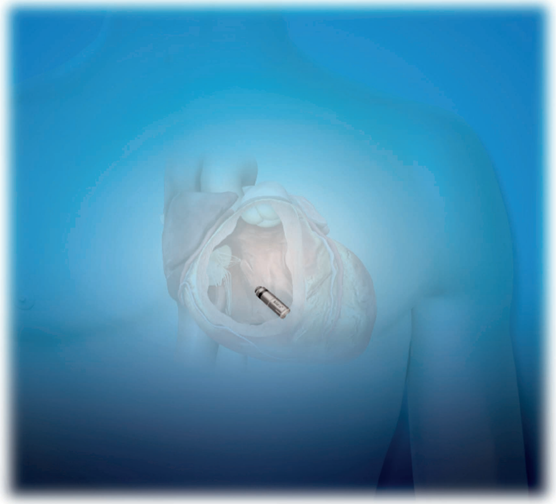
- Tasca pre-pettorale o sottomuscolare;
- Accesso venoso per via cefalica, ascellare o succlavia

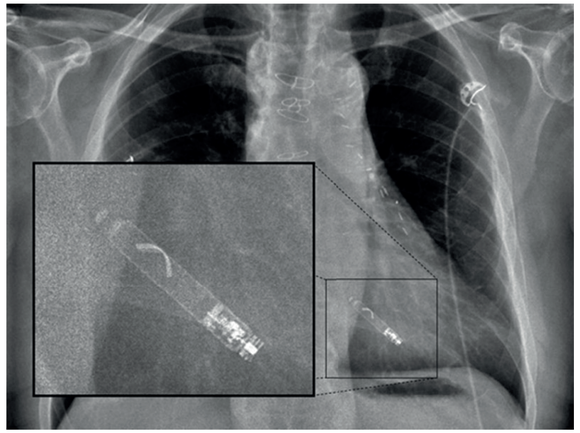




Attuali dimensioni: 40x40x7mm; peso 20 gr; volume 10 ml
Moneta da 2 euro: 26x26x2.2mm; peso 8,5 gr; volume 1,2 ml

…al Pacemaker miniaturizzato e completamente intracardiaco





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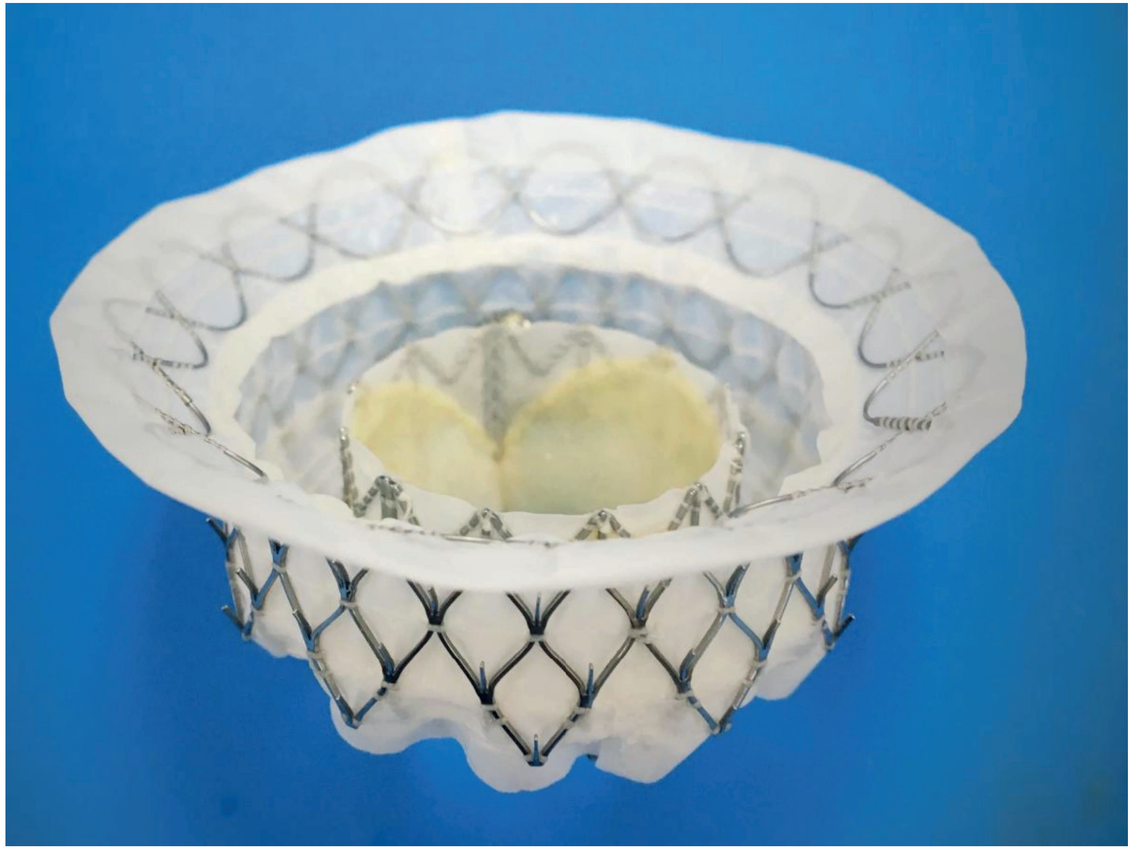
Transcatheter Mitral and Tricuspid Valve Interventions

The Medtronic Intrepid TMVR system has been utilized in the pivotal APOLLO Trial. The study plans to analyze the safety and efficacy of the Intrepid system in up to 1,200 patients with severe, symptomatic MR. The results are expected no earlier than 2021.



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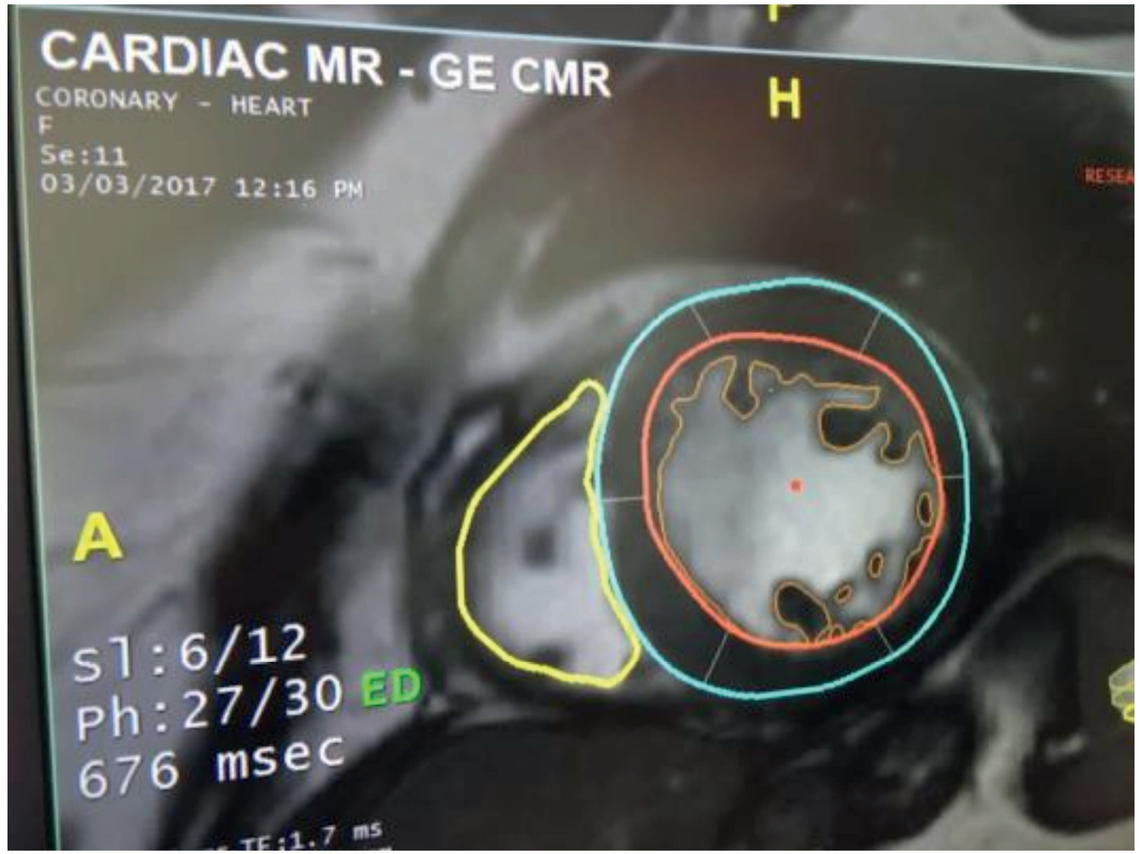
Wearable Technologies Aid Patient Monitoring

An example of a wearable cardiac tracking device. It is worn like a **normal ring** on a finger and interfaces with a **smartphone app** via a wireless Bluetooth connection to track ECG readings and alert a patient if an arrhythmia is detected.

Artificial Intelligence and machine learning

Example of artificial intelligence automation for cardiac MRI using an AI app: the **images have been countoured, anatomy labeled and all quantification automated by the Artificial Intelligence**, greatly reducing post-processing time.



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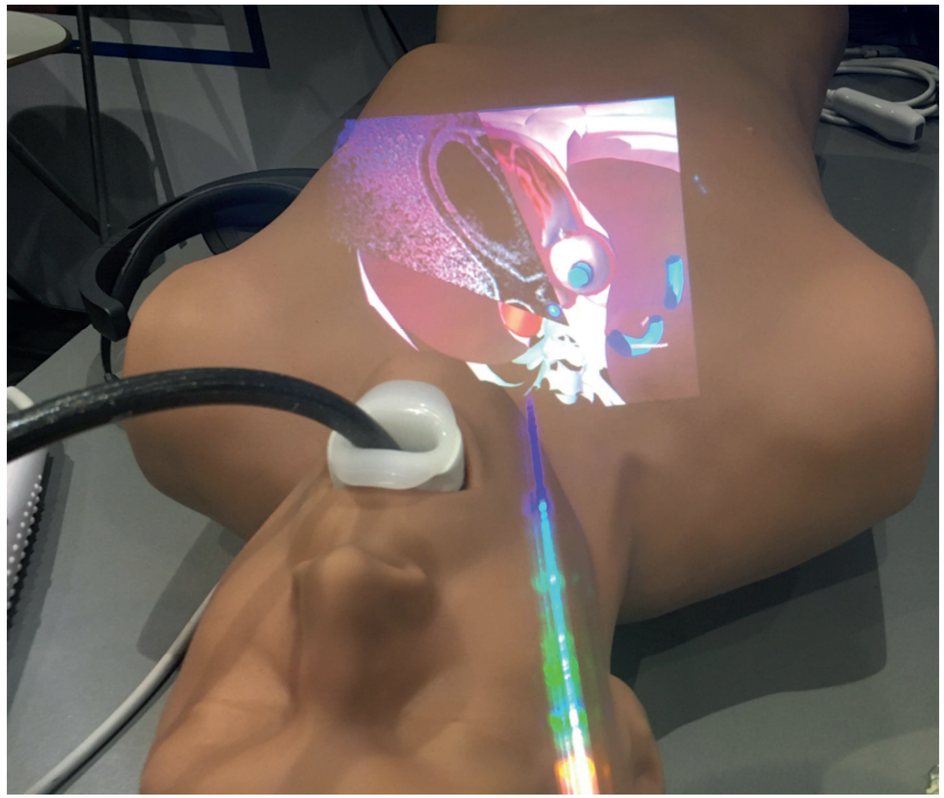
Virtual and Augmented Reality in Cardiology

Augmented reality being used for transesophageal echo cardiac imaging training



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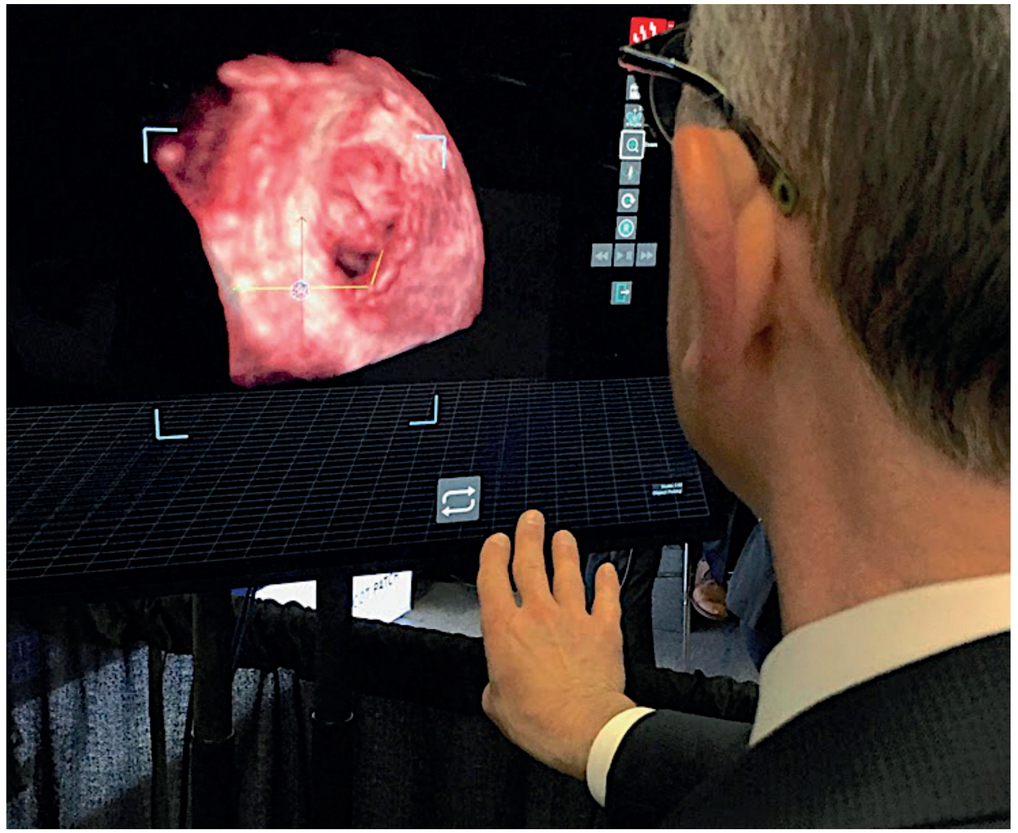
Holographic Procedural Navigation in the Cath Lab

Echopixel created a technology that allows live transesophageal echo (TEE) 3-D imaging to be converted into live holograms on a special screen that does not require glasses. An operator using hand movements turns and slices through a dynamic image of a heart valve



Robots in the Cath Lab

The Robocath R-One robot being used to perform PCI. This system uses a lead-lined cockpit in the cath lab for the operator to perform the procedure outside of the radiation field, sitting down and without the need to wear lead protection.

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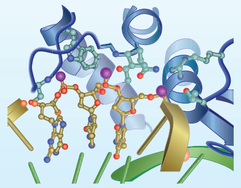
European Heart Journal (2020) **41**, 3884–3899

From traditional pharmacological towards nucleic acid-based therapies for cardiovascular diseases

ASO drugs Stereochemically modified single-stranded complementary DNA/XNA complexed with target RNA and RNAse H

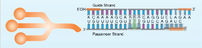


RNAse H mediated target mRNA cleavage

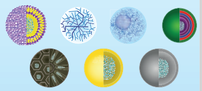
efficient and specific silencing of target gene

Targeting tools

Coupling to a ligand for receptor-mediated uptake into target organ cells (eg GalNAc – dependent hepatocyte targting)



Encapsulation into a nanoparticles suitable for targeting



target cell entry via endolysosomal pathway

Common Determinants of Clinical Efficacy

Side effects
Freedom from innate or adaptive immune activation by the "foreign" nucleic acid (xeno-nucleic acids), no thrombopenia

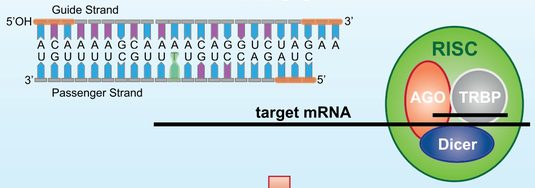
Specificity
Highly specific drug-target interaction to avoid influence upon partially homologous off-target sequences

Targeting
Efficient penetration of target organ endothelial barriers and target cell membrane

Stability
Stability of drug-carrier complex in the blood circulation and of the drug-target complex (e.g. RISC) in the target cells

siRNA drugs

Complementary RNA from engineered double-stranded siRNA forms highly stable complex with RISC



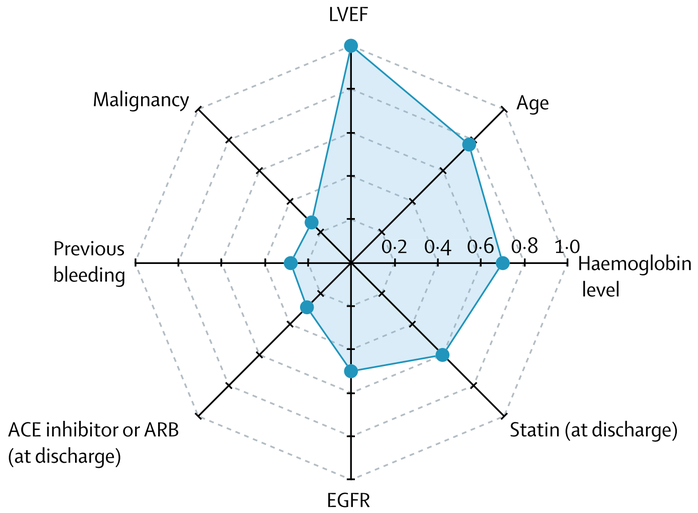
few RICS complexes efficiently cleave specific target RNA

efficient and enduring silencing of target gene e.g. PCSK9

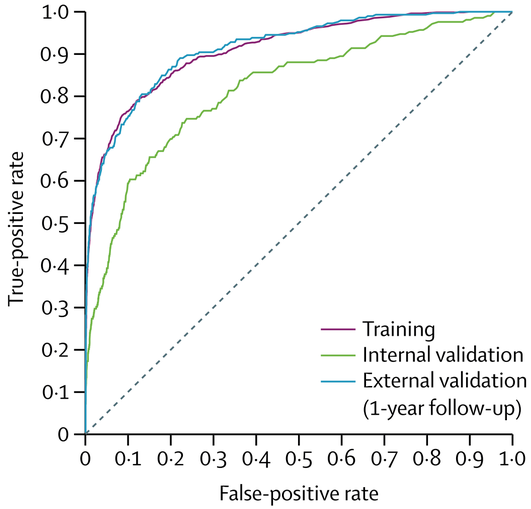
Lancet 2021; 397: 199–207

Machine learning-based prediction of adverse events following an acute coronary syndrome (PRAISE): a modelling study of pooled datasets

Background The accuracy of current prediction tools for ischaemic and bleeding events after an acute coronary syndrome (ACS) remains insufficient for individualised patient management strategies. We developed a machine learning-based risk stratification model to predict all-cause death, recurrent acute myocardial infarction, and major bleeding after ACS.



All-cause death



The Doctor, Luke Fildes 1887

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Grazie 1000!!

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