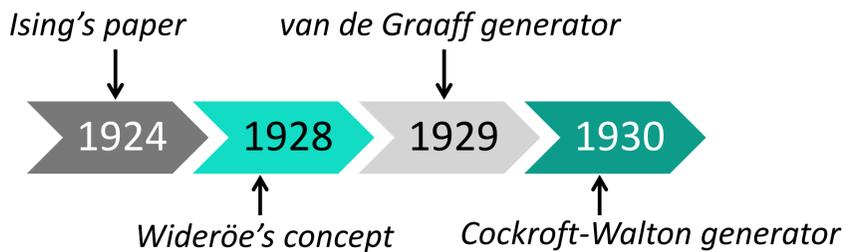




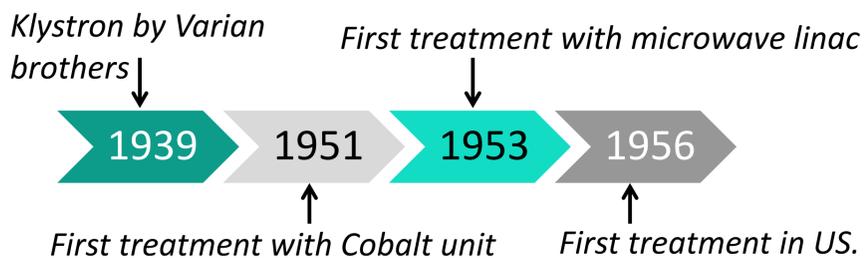
Linear Accelerators in Medicine

The history of external beam devices

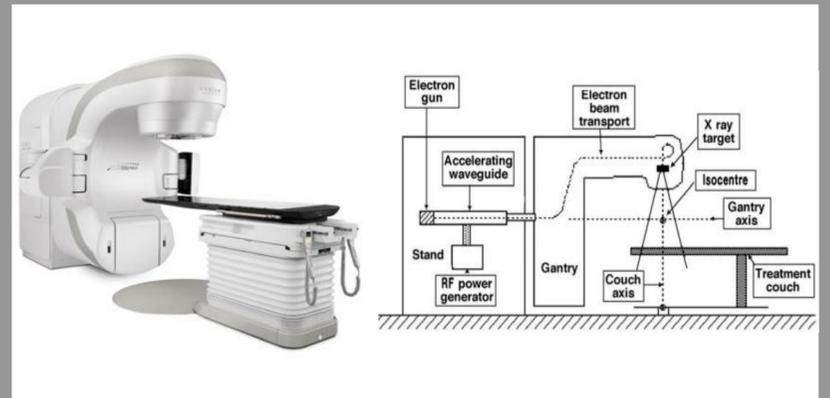
A linear accelerator is a device that uses high Radio-Frequency electromagnetic waves to accelerate charged particles. The concept for the first Linac was proposed by Gustav Ising, and the first successful machine was constructed by Rolf Wideröe in 1928.



Radiation therapy started to develop rapidly after the end of World War II. The first linear accelerator operating with klystron was made in 1946. The first patient treatment took place in Europe in 1953 at Hammersmith Hospital in London.



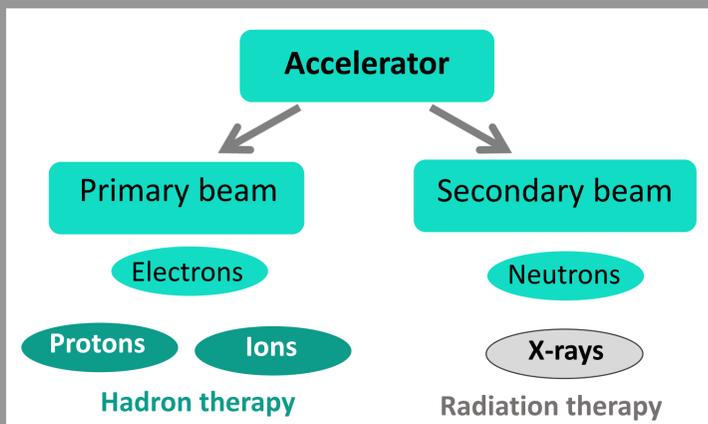
Parts of a modern linear accelerator (Linac)



- Gantry
- Gantry stand or support
- Modulator cabinet
- Patient support assembly (i.e. treatment table)
- Control console.

External radiation therapy is a non-invasive technique using an external source to irradiate patients. It uses ionizing radiation generated by a linear accelerator to kill malignant cells.

What kind of particles do we use?

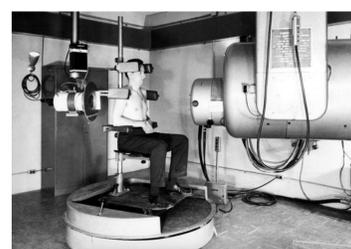
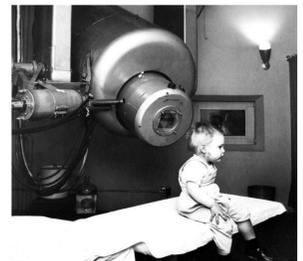


In case of neutrons and X-rays the gantry system focuses the primary beam onto a target where high energy particles are produced as a result of the collisions.

There are approximately 14000 linear accelerators (Linac) in medical use for radiation therapy. This number is constantly growing.

Development of Linacs

During the past 40 years medical linacs have become extremely sophisticated in comparison with the machines of the 1960s.



The second generation could use low energy photons, had smaller size and isocentric mounting with 360° rotational movement of the gantry.

Nowadays a wide range of beam energies, dose rates, field sizes and operating modes are available. The accuracy of dose delivery have improved.



Several beam modifying accessories are available. Imaging systems are mounted on the Linac for better patient positioning. The system is fully computer controlled.

BME, D. Tatai-Szabó, C. Pesznyak

Acknowledgements & references

www.news.stanford.edu

<http://www-naweb.iaea.org>

www.varian.com

www accuray.com

Back to the future: the history and development of the clinical linear accelerator, Thwaites DJ, Tuohy JB;

Physics in Medicine and Biology

https://en.wikipedia.org/wiki/Linear_particle_accelerator

Coordinated Support Action in the H2020

EURATOM NFRP12 Support for careers in the

nuclear field (2016-2017)