The Clinical Imaging Revolution

From Physics Experiment to Lifesaving Technologies

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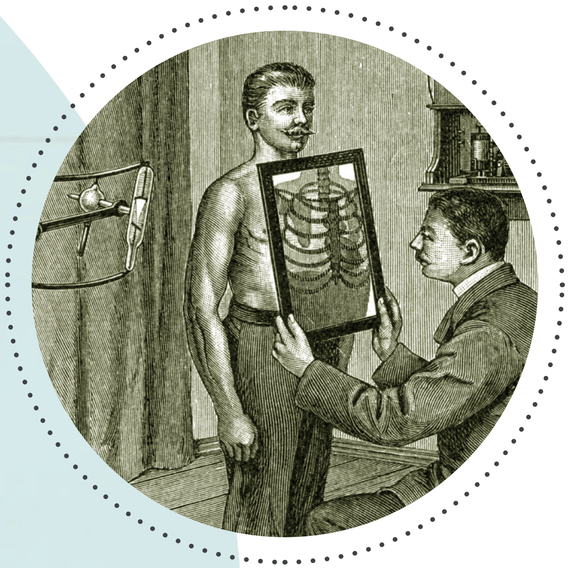
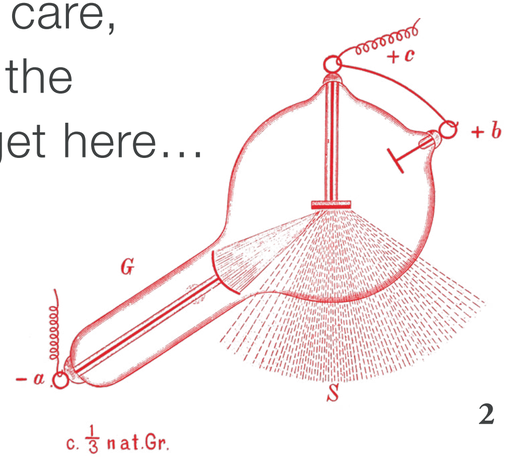


Clinical imaging has revolutionized healthcare,

enabling clinicians to improve patient care, deliver better outcomes and improve the patient experience. But how did we get here… and where is the future headed?



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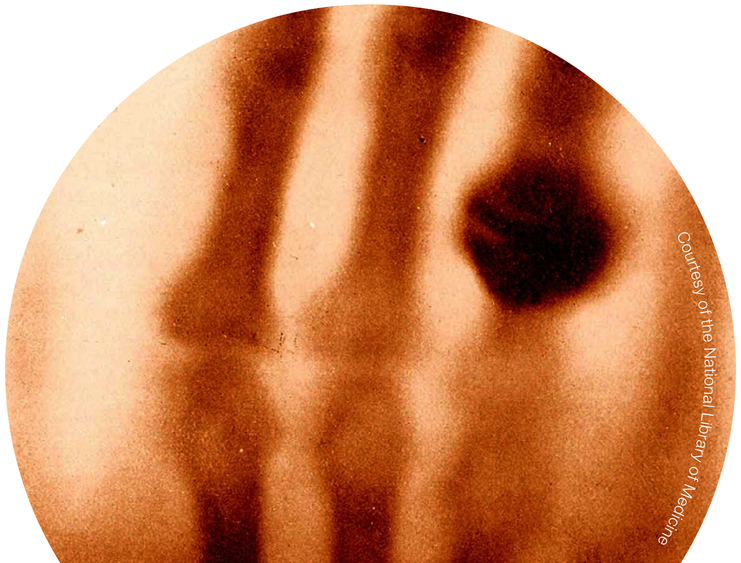
The revolution begins...

1895

Experimenting with a new technology using **ionizing radiation**, physicist Wilhelm Röntgen imaged the bones—and wedding ring—in his wife's hand.[1]



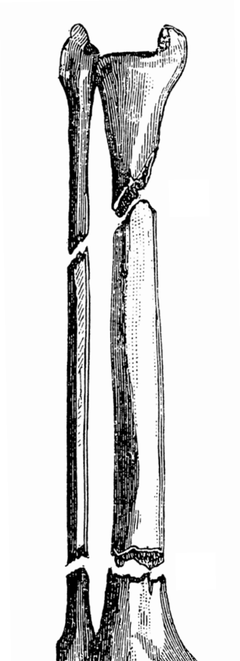
Courtesy of the National Library of Medicine

1896

The **clinical potential is realized** as radiographs show:

- A glass splinter lodged in the finger of a 4-year-old[2]
- A Colles fracture in a student at Dartmouth College[3]

At the same time, numerous reports of **radiation-linked injuries** begin appearing in the scientific and lay literature.[4]



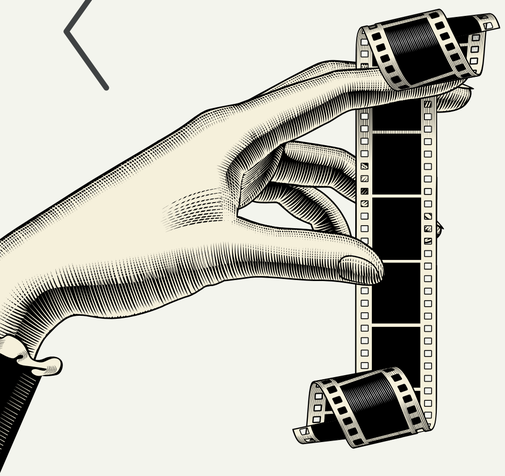
World War I

Marie Curie drives a truck with **portable x-ray equipment** into the battlefields of France. X-rays also help doctors:

- Visualize and treat shattered bones
- Record the effects of gas gangrene
- View tuberculosis and other lung lesions
- Perform barium studies of the gastrointestinal tract

1920s

Film replaces glass plates for visualizing radiographic images[5]

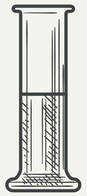


1930s

Implementation of radiation **safety procedures** like lead aprons and lead gloves[6]

"X-ray" becomes a **commercial advertising catchphrase**[7]

1940s



"Atomic cocktails" help visualize the thyroid and other organs[8]

The long-term **risks of radiation exposure** begin to be quantified[9]

1950s

The use of **ultrasound** to diagnose gynecological patients begins[10]

The first **fiber-optic semi-flexible endoscope** is patented[11]

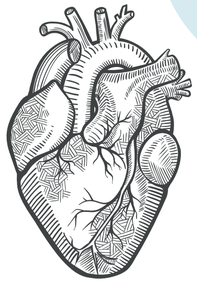
1960s

The first endoscope is used to **examine a patient's stomach**[12]

1970s

- Inventors of computed tomography (CT) imaging receive **Nobel Prize**[13]
- The first positron emission tomography **(PET) camera is developed**[14]
- The **first MRI body scan** is performed on a human[15]
- Professor Heinz Lemke is the first to describe the **concept of PACS**[16]

1980s



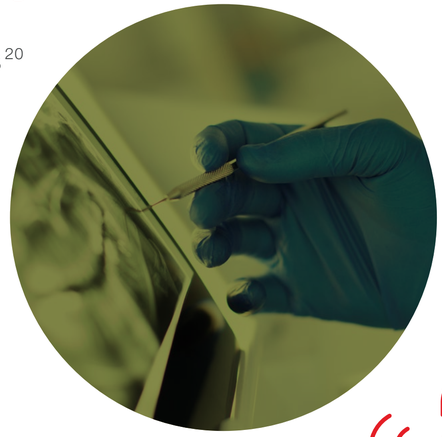
Use of **electron beam tomography** begins[17]

1990s

- Commercial CT scanners deliver **64 slices per rotation**[18]
- Prenatal ultrasounds become **routine**[19]

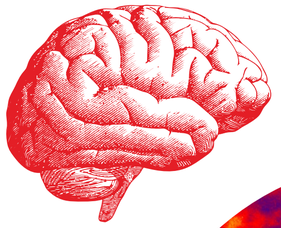
2000s

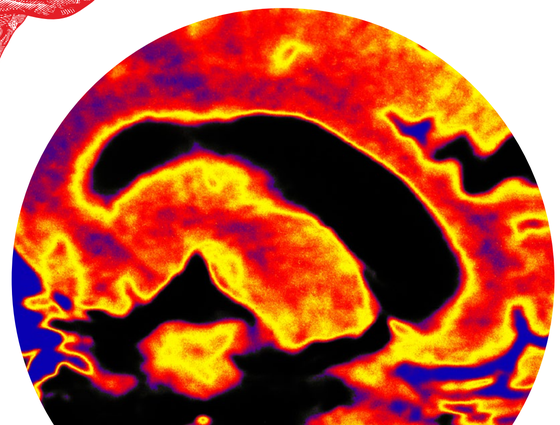
Digital sensors begin replacing film in most clinical settings[20]



Today

CT, MRI and ultrasound enable detailed visualization that **almost duplicates an actual organ**[21]





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Medical imaging today… complex, siloed, non-standardized.

Healthcare data will top

2.3 ZB

by 2020[22]

Healthcare data is growing at

48%

per year[23]

More than

70%

of healthcare data is imaging data

Why?

Imaging modalities are performed more frequently, with increasing detail, using more advanced technologies.

More imaging standards, practices, guidelines, regulations[24]

- Health Information Privacy and Accountability Act of 1996
- Health Information Technology for Economic and Clinical Health Act 2009
- National Institute of Standards and Technology (NIST)
- Food, Drug, and Cosmetic Act, Section 510(k)
- Mammography Quality Standards Act
- American College of Radiology technical standards and practice guidelines
- Digital Imaging and Communications in Medicine (DICOM) 1993
- Integrating the Healthcare Enterprise (IHE)

Multiple non-standard data formats

- DICOM
- PDF
- JPG
- MPEG
- PNG

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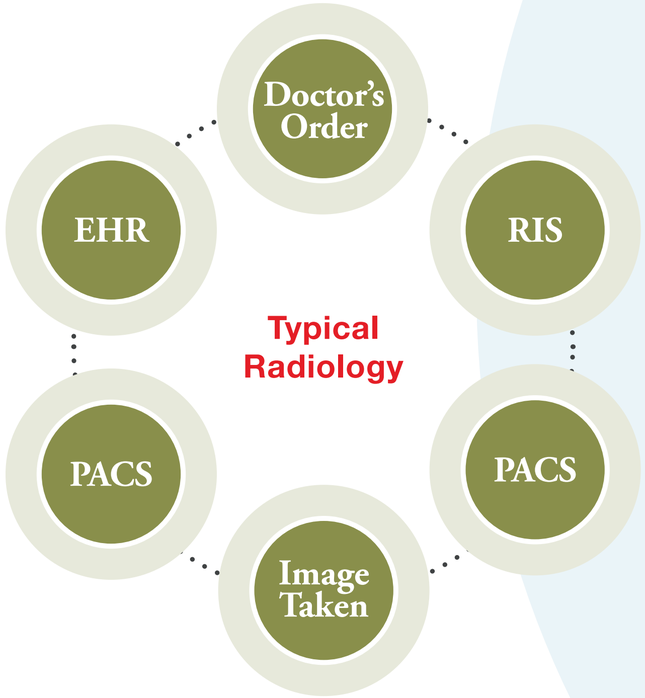
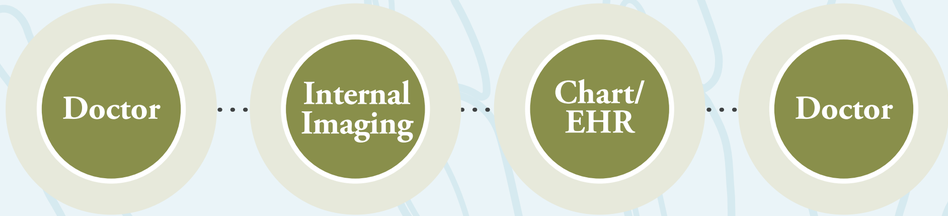
Lack of standard imaging workflows



Typical Other "Ologies"



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No signs of slowing…

Global annual patent applications for medical devices

tripled

in 10 years[25]

Technology cycle times reduced by

50%

in 5 years[26]

Connected devices will number more than

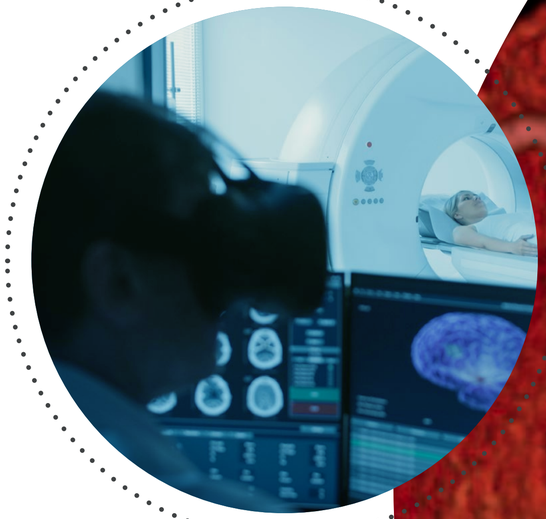
3x

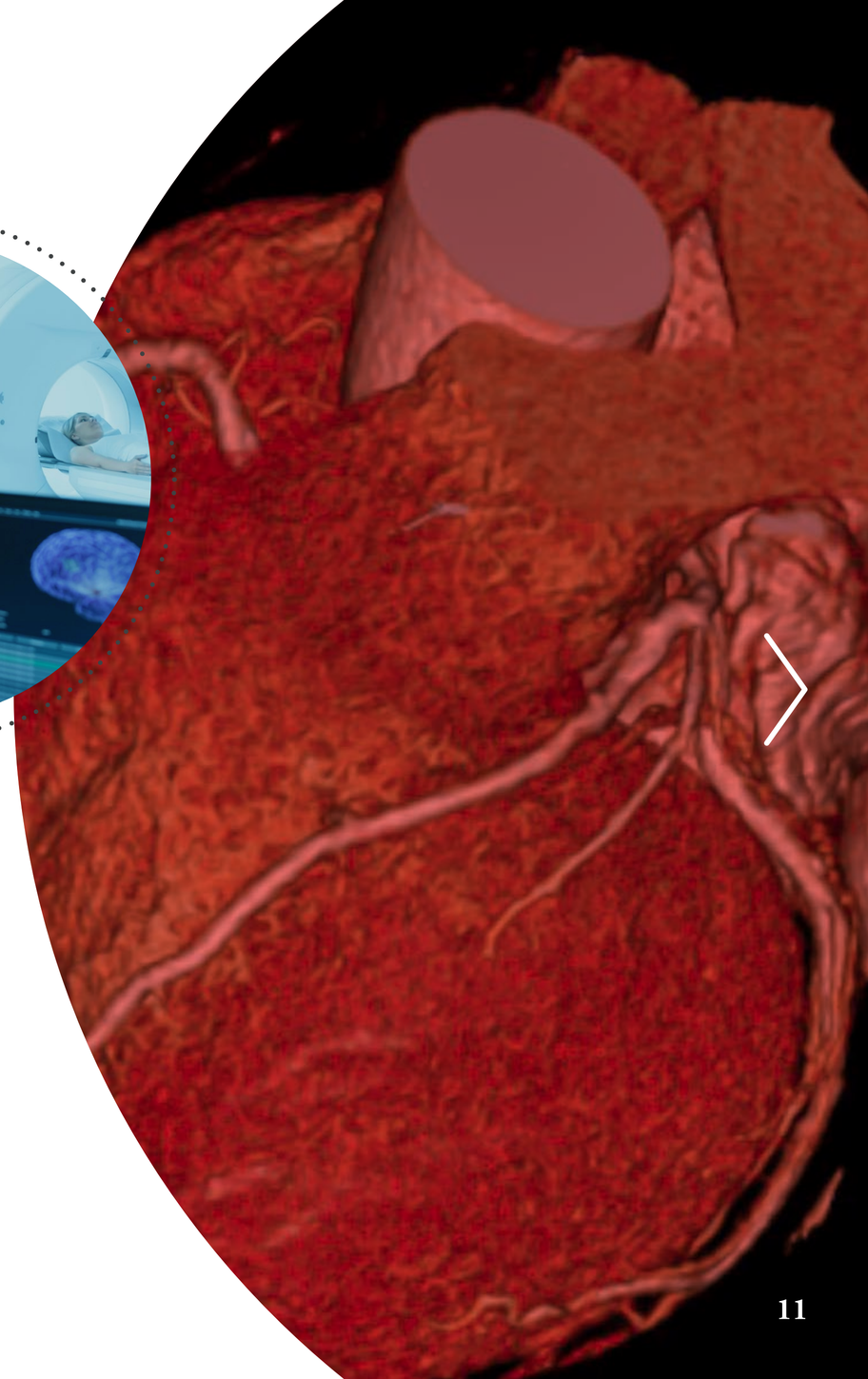
the world's population by 2021[27]

How to make imaging simpler?

"It is essential to enable an ordinary confluence of data towards centralized repositories; such Big data should be enriched with proper clinical annotations and released with full awareness of the patient, who should be placed at the center of the diagnostic workflow."[28]

The technology medical imaging outlook:

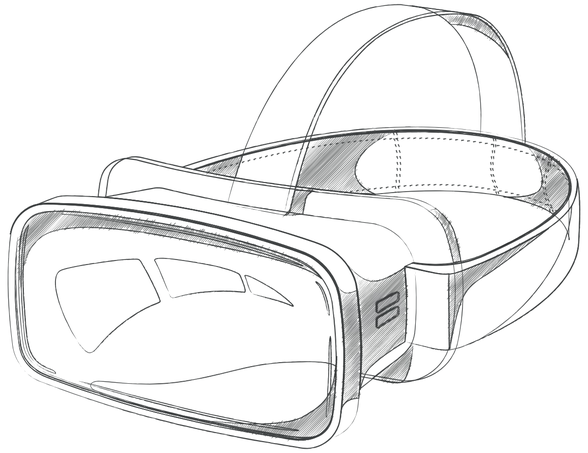




What we're watching on the imaging horizon…[29]

- **AI and ML:** Enabling new treatment paradigms that have the potential to transform the way healthcare is conducted
- **Blockchain:** Giving patients access to and control of their data via secure distributed storage outside healthcare institutions
- **3-D visualization, virtual reality and image-guided intervention:** "Seeing" patients with greater precision for more effective treatments and better clinical outcomes

Read the White Paper



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Logicalis helps healthcare organizations improve clinical workflows and better achieve patient-centered goals. NetApp delivers hybrid cloud storage and data management solutions for your enterprise imaging strategy.

Schedule an Imaging Workshop

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HIMSS

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