

PASI15

WG3: Medical applications
review from PASI13

Rob Apsimon

(Tom Kroc, George Coutrakon)

General comments

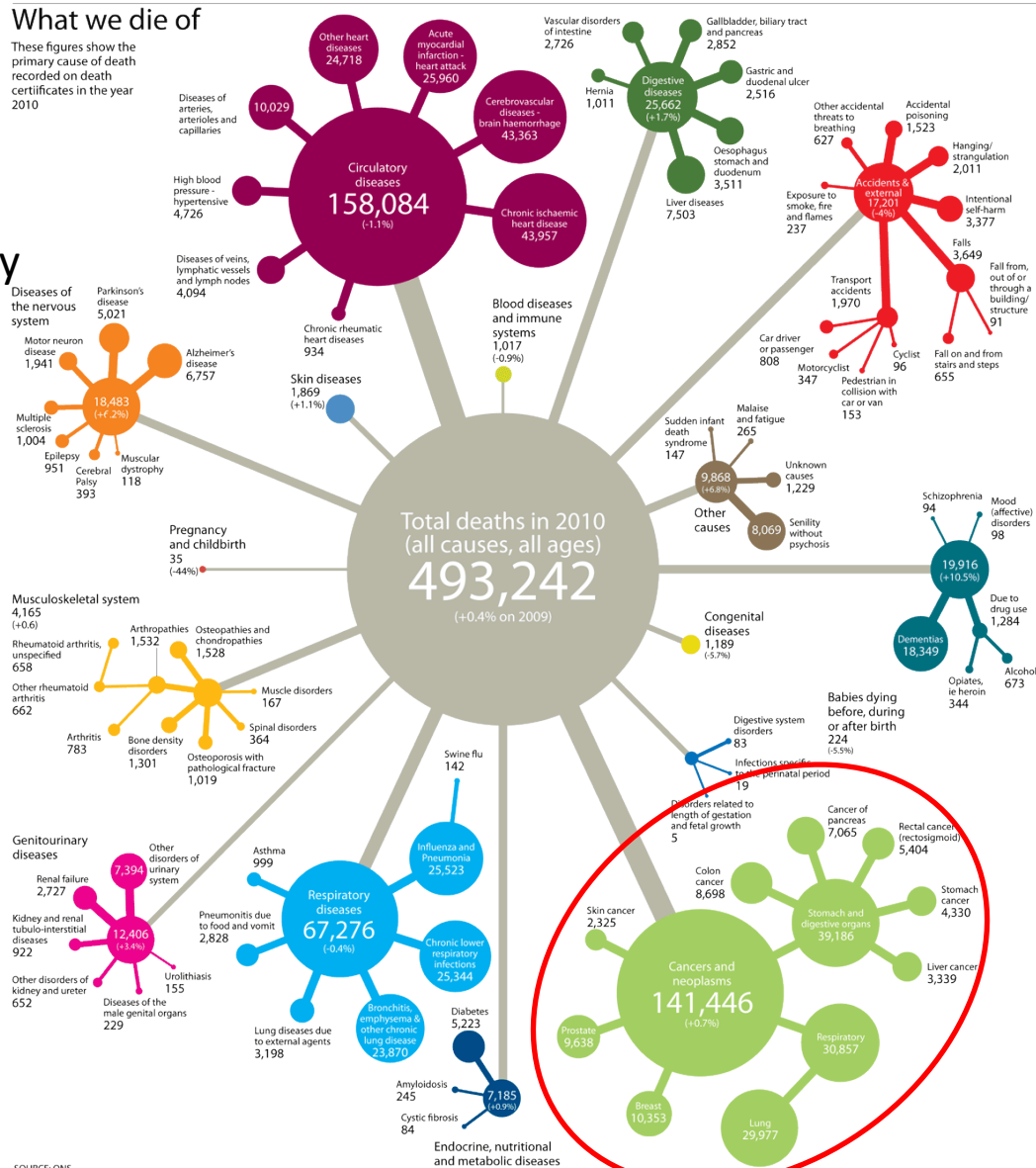
- First PASI workshop with a dedicated medical applications working group
 - Emphasis from previous workshops to focus on medical applications
- Apparent disparity between US and UK approaches to medical applications
 - Aim to focus on areas of common interest
 - Attempt to establish collaborative efforts in some areas
 - Discuss short-term and mid-term goals for collaboration on medical applications.

Cancer stats: UK

- 1 in 3 deaths caused by cancer (in 2010)
- 40% of cancer cures from radiotherapy
- ~300 linacs for X-rays >130,000 treatments per year
- 1 60 MeV eye treatment with protons (Clatterbridge)
- 2 x 250 MeV Varian centres under construction
- Other centres envisaged:
 - - IBA (Wales)
 - Proton therapy centres:
 - Christie, Manchester (in 2018)
 - UCLH, London (in 2019)

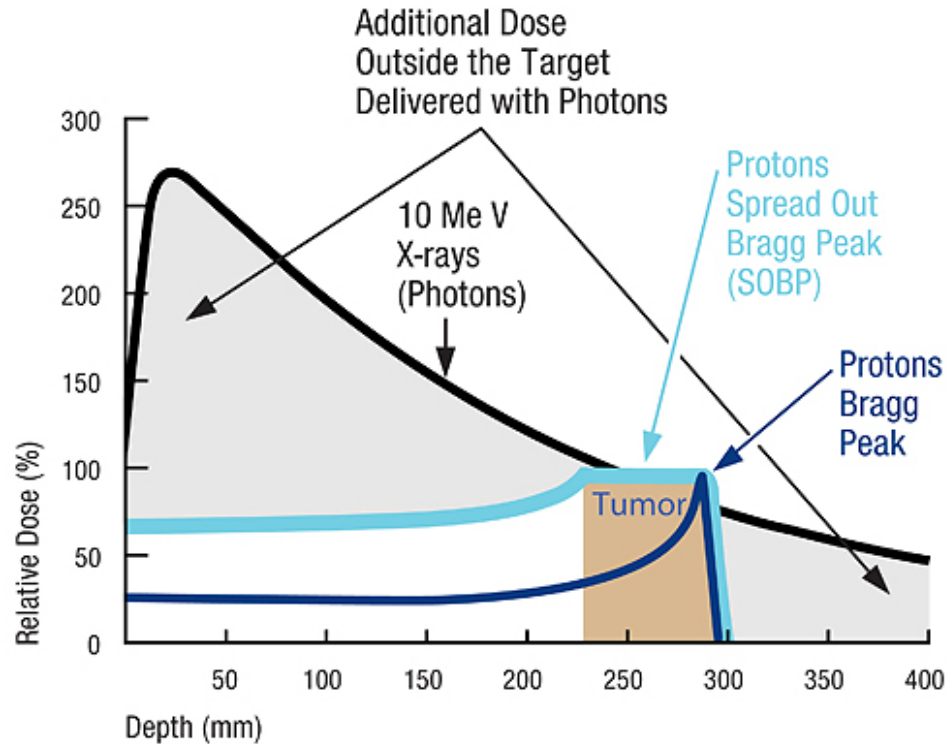
What we die of

These figures show the primary cause of death recorded on death certificates in the year 2010



Why proton therapy?

A Comparison of the Dose Distribution for Proton and X-ray Beams



Radiotherapy stats for the UK

'Radiotherapy Services in England 2012', DoH

- 130,000 treatments, most common age around 60 yrs
- 2.5 million attendances
- More than half of attendances are breast/prostate

X-rays

- 265 linacs in clinical use
- Almost all machines IMRT-enabled, 50% IGRT (Image-Guided)
- Each machine does >7000 'attendances'
- 147 more linacs required due to increasing demand

Protons

- 1x Scanditronix 62 MeV, Clatterbridge, operating
- 2x Varian ProBeam (3 rooms each), NHS, Christie Hospital and UCLH, 2018
- 1x ProNova SC360 (2/3 rooms), University of Oxford, 2018
- 3x IBA ProteusONE, Newport (Wales), Newcastle + ?, 2017
- 1x AVO LIGHT, London Harley Street, 2017

Cancer care

- 40% curative treatments utilise radiotherapy
- 16% cured by radiotherapy alone

UK main proton therapy activities

- EMMA, PAMELA (completed) – FFAG demo and study
- NORMA (completed) – FFAG study for protons/pCT
- OMA (funded) – EU training/research on medical accelerators (www.oma-project.eu)
 - UK: Halo monitors, radiobiology, high-gradient acceleration, imaging calorimeters, SC gantries
 - collaboration with PSI, CERN, TERA, GSI etc.
- Christie Research Beamline (funded) – test facility for proton medical research
 - Radiobiology, high-gradient linacs, dosimetry, etc. (see Karen Kirkby's talk)
- PRAVDA (funded) – Si tracker detector for pCT, includes extensive simulation
- PROBE – booster linac for imaging (see my talk)
- Laser-driven proton acceleration – Gabor lenses, post-acceleration, radiobiology etc.
- FETS proposal – 3-20 MeV for future FFAGs, gantries, isotopes etc.
- BNCT – (p,Li) neutron production for therapy, facility being upgraded

US main medical accelerator activities

- Clinical
 - Radioisotopes
 - Cyclotron based systems
 - Therapy
 - Proton – growing, but concern of cost/benefit on part of insurance co's.
 - Ions – none
 - Neutrons – one remaining, but healthy
- Industry
 - Radioisotopes
 - 5 US groups working on Mo-99
 - Investigating new avenues, Ac/Bi
 - Proton Therapy
 - While Loma Linda was a success clinically, it failed to commercialize the accelerator system
 - 16 proton therapy facilities operating in the US (one closure)
 - 15 more planned to open in the next 2 years
 - Cyclotrons are winning
 - US hardware providers: have at least substantial interests in 4 out of 5 (Mevion, ~~ProTom~~, Varian/Accel, ProCure/IBA)
- National Labs
 - Ion Therapy – planning, component development

WG3 agenda

Session 1 (Wednesday 16:00 – 17:30):

ProBE: Proton Boosting Extension for Imaging and Therapy - Rob Apsimon

Proton CT in the US - George Coutrakon

Session 2 (Thursday 09:00 – 10:40):

UK overview of Proton Therapy - Karen Kirkby

US overview of Proton Therapy - Chris Beltran

Proton Therapy - Mark Pankuch

NorthStar Radioisotope Production - James Harvey

Session 3 (Thursday 11:00 – 12:30) – Joint session with WG4:

Laser-driven, high-brightness proton and neutron sources - Ceri Brunner

Solid State Proton Acceleration - Arun Persaud

NORMA FFAG - Sam Tygier

Session 4 (Thursday 13:30 – 15:30) – WG3 Roundtable discussion

Session 5 (Friday 09:00 – 10:40):

Ion Therapy - Tom Kroc

Applications of FETS - Stephen Gibson