From 2D to 3DCRT to IMRT/VMAT:

The role of education in transitioning to modern radiotherapy techniques

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Disclaimer

I am a medical physicist employed by Varian Medical Affairs

The Access to Care Cape Town radiotherapy training programme is a collaboration between the University of Cape Town, Cape Peninsula University of Technology and Varian Medical Affairs

The programme also include courses offered by RadiQa/HUMANITAS and Planning for Africa as training collaborators
Evolution of RT: 2D vs 3DCRT vs VMAT
The risk: Ideal world vs. real world

More complex techniques
→ Increased need for accurate dose and positioning
→ Increased need for quality assurance
→ Increased need for training

Need to deliver the right dose to the right place – every time
Aim of RT: Dose to the **target**, protect the **normal tissue**

VMAT: Good

2D: Some part of the tumour not receiving the ideal dose
Impact on tumour dose with slight error in positioning (8mm)

2D: Good setup, Tumour reasonably covered by radiation dose

2D: Bad setup, Tumour still reasonably covered by radiation dose

2D: Higher dose to bowel

VMAT: Good setup, Tumour well covered by radiation dose

VMAT: Bad setup, Tumour missed, cancer grows

VMAT: Much lower dose to the bowel
Radiotherapy is a highly technological, fast changing medical field.

Challenge: Training requirements in LMIC is different to HIC


Africa 1998: 155 RT Units
- 60% Co-60
- 2D palliation

Africa 2013: 278 RT Units
- 30% Co-60
- Primarily 2D palliation, Except Egypt and RSA

Africa 2020: 397 RT Units
- 16% Co-60
- 119 machines <=5 years,
  - 3DCRT, IMRT, VMAT, IGRT

1935: Schematic 200 W RT
1960: Linac 2D
2000: Linac, IMRT
2022 Challenge: Protons
2020: Linac 3D-CRT
2000/10: 1950/60

Thariat, 2012; Abdel-Wahab 2013; Zubizaretta, 2014, DIRAC 2020
Access to Care Cape Town Radiotherapy training programme

• Created in 2014

• Collaboration between Varian Education and two Cape Town based universities
  - University of Cape Town – Radiation Oncology and Medical Physics training institution
  - Cape Peninsula University of Technology – Radiation Therapy Technicians (RTT) training institution

• Training facilitated at Groote Schuur Hospital, State sector Academic Hospital in Cape Town, South Africa

• AIM: Create short course training programs focusing on the practical skills required for already qualified radiotherapy professionals to safely move to more advanced techniques
Stepwise approach to training

**Modern Radiotherapy Principles**
- 3DCRT Radiotherapy Principles (3DCRT)
  - 17 contact days over 4 months
  - LäraNära pre-course online learning
  - Procurement and departmental design, radiation shielding and quality management
  - Patient imaging, contouring, planning and position verification for 3DCRT treatment
  - Prostate, gynae and breast cases
  - Clinical protocol development

**Intermediate to Advanced Radiotherapy Techniques**
- Introduction to Advanced Techniques (I2A)
  - 6 contact days over 3 months
  - LäraNära pre-course online learning
  - Machine and planning options for treatment using field in field, IMRT and VMAT techniques
  - Prostate, gynae and breast cases

- Advanced Physics and Planning (P&P)
  - 6 contact days, combined with I2A course
    - Physics, commissioning and quality assurance for advanced RT
    - IMRT, dual isocentre VMAT and SIB
    - Breast, gynae and head and neck cases

**Targeted Training**
- Top to Toe (T2T): General RT Technical Planning Skills
  - 6 Weekend sessions over a year
  - Technical planning skills required to plan 3DCRT, IMRT and VMAT for brain, H&N, breast, thoracic, abdominal, craniospinal and prostate lesions

- Top to Toe: Stereotactic Radiotherapy (T2T:SRT) Technical Planning Skills
  - 4 Weekend sessions over a year
  - Technical planning skills for hypo-fractionated RT to small targets including brain, spine and lung

- Paediatric RT for LMIC
  - 5 contact days
  - Clinical decision making for paediatric cancers in LMIC, anatomy, imaging, planning and assessment of RT plans
Remote teaching model: 2020

- Online learning platforms
- Didactic Lectures: Zoom/Recordings
- Alternative platform teaching: VERT™
- Treatment Planning: Remote vApps
- Practical Demos: Streaming/Recordings
- Mentorship Online
- Outlook
Course attendance 2015 - 2021

Total number of teams per country:
- **1**
- **2-3**
- **4-5**
- **6-9**
- **>10**

A2C training base
This is a worldwide effort