Implementation of New Technologies in LMIC- Challenges and the need

Paul Ravindran

Christian Medical College, Vellore, India
Evolution in Radiotherapy Chain

- Imaging for localization and Planning
- Computerized Treatment Planning
- Treatment set-up & verification
- Treatment Delivery
Contents

• Commissioning Radiosurgery in India
• Implementing IMRT, VMAT & IGRT
• Commissioning IMRT in Myanmar
• Advanced Technologies in Brunei
• Challenges in Implementing the advanced technologies

The points expressed are my own experiences and the purpose of sharing is to improve the practice and certainly not to offend anyone
Starting of Radiosurgery in India in 1995
- Challenges

• From 2D conventional treatment to 3D Stereotactic Radiosurgery
• Understanding small beam dosimetry
• Beam data collection & configuration
• End-to-end testing
• Preparing the QA procedure
Starting of Radiosurgery in India - Challenges

• Used a Nuclear Medicine phantom with water filled for end-to-end testing for isocenter dose
• Used chemical dosimeter and ion chamber
• Could not obtain the dose distribution
Starting of Radiosurgery in India - Challenges

• Developed an in-house phantom to study the dose distribution in radiosurgery
• Can insert film or place TLDs
Starting of Radiosurgery in India - Challenges

- Financial resources to get expensive dosimetry equipment
- Convincing the admin on the need for physics equipment
- Learning resources, practical training and education
Implementing IMRT in our clinic in India 2004 - Challenges

- Better off with dosimetry equipment
- Used PTW water phantom for data collection
- In-house phantoms for IMRT end-to-end testing
- Fluence verification with film and perspex slab phantoms (in-house)
Implementing IMRT in our Clinic in India 2004 - Challenges
Implementing IGRT, and VMAT - 2010-11

• Most dosimetry equipment in place
• Increased confidence in implementing
• Had a smooth implementation
Implementing Gating / DIBH

- An error in purchase order resulted in providing only one set of RPM
- Purchased gating and RapidArc
  - But no license for RA – gating
TrueBeam - 2017

• New TrueBeam installation underway
• Excellent machine
• Teething problems – Delay in some spares arrival
• No license for 2D-2D and 3D-3D match was supplied for order placed prior to 2016
My experiences in other South East Asian countries - Myanmar

- Great desire to embrace the new technology
- Had the opportunity to commission and implement the first IMRT treatment
- Keen to learn new techniques
- New technologies being implemented both by the government and private hospitals
Klystron failed and needed Replacement

- Spares needed to be imported
- Significant delay in receiving the klystron – took about 21 days
- No local support for maintenance at that time.

Klystron being replaced
Commissioning the dosimetry equipment

- Octavius 4D system for IMRT QA
- No local technical support
- Had to depend on support from Hong Kong or Thailand

Octavius 4D with 729 detector array
Implementation of 3D CRT and IMRT

- Commissioned the planning system
- Trained the physicists on
  - Treatment planning for 3D and IMRT
  - Patient specific QA with Octavius 4D

1D water phantom
Issues

• Access to spares
• Lack of trained service engineers
• Lack of structured training programs for
  • Radiation oncologists
  • Medical physicists
Implementation of new technology in Brunei

- High income country
- First radiotherapy centre in the country
- Hired all key professionals to start the program
- State of the art linear accelerators
High end linear accelerators – TrueBeam and an EDGE

- Extremely robust linacs
- The vendor had in-house trained service personnel
- Training was needed, but not an issue
- Importing spares and technical support were key issues
Commissioning for Stereotactic Radiosurgery

• Edge radiosurgery linac
  • 6D couch
  • HD MLC
  • Cones
  • Optical Surface Monitoring System (OSMS)
  • Calypso electromagnetic positioning system

EDGE linac with Calypso system
Issues at Brunei Darussalam

- No issue with funding
- Needed to develop a national radiation safety policy
- Need to have trained local manpower
A survey on Medical Physics Education in South Asia

Response to type of training programs available in their Institution
Medical Physics Education

Survey by Dr Tomas Kron et al on Medical Physics aspects of cancer care in the Asia Pacific region from 2008 to 2014

Highlighted the status of certification, education and clinical training of medical physicists. It was noted that senior medical physicists with 10 years plus experience was only 20%. Hence there is a lack of human resources for training in the region.
Results of survey of medical physics workforce and survey of medical physics education and training in the RCA region - IAEA

<table>
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<th>Country</th>
<th>Number of courses in medical physics at masters (MSc) level</th>
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No formal Medical Physics training Cambodia, Mongolia, Myanmar and Vietnam
Conclusion

• Implementation of new technologies is hampered by
  • Resources – particularly in public hospitals
  • Issues with equipment servicing
  • Delay in importing spares
  • Access to technical support
  • Lack of trained personnel
  • Lack of training resources
Thank you very much for your patient listening