First Global Forum on Medical Devices

IAEA / PACT Advisory Group
Increasing access to radiotherapy in low-resource countries (AGaRT)

Professor Graeme Morgan
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The Burden of Cancer

New cases of cancer annually

Millions of deaths in 2002

WHO (2003)
OUR GOAL:

- Forge strategic partnerships with international organisations, private sector and NGOs
- Develop Joint Programme with WHO
- Mobilise new resources
- Make technologies more suitable and affordable

Placing cancer on the global health agenda

Using radiotherapy as an anchor to build self-sustaining national cancer control programmes in developing countries

improving cancer survival in developing countries
WHO - IAEA PACT programme

PACT = Programme of Action for Cancer Treatment

- National Cancer Control Programme
- Education
- Prevention
- Screening
- Diagnosis – Radiology, Nuclear medicine, Pathology
- Treatment – Surgery, Radiotherapy, Chemotherapy
- Palliative Care
- Cancer Registry

PACT Model Demonstration Sites
- Vietnam
- Sri Lanka
- Yemen
- Albania
- Tanzania
- Nicaragua
Why Radiotherapy?

• Over 50% of cancer patients need radiotherapy

• Need for radiotherapy greater in LMIC as most patients are late stage or palliative

<table>
<thead>
<tr>
<th>Selected sites</th>
<th>Proportion recommended for RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral cavity</td>
<td>0.78</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>0.80</td>
</tr>
<tr>
<td>Stomach</td>
<td>0.68</td>
</tr>
<tr>
<td>Larynx</td>
<td>1.00</td>
</tr>
<tr>
<td>Lung</td>
<td>0.76</td>
</tr>
<tr>
<td>Prostate</td>
<td>0.60</td>
</tr>
<tr>
<td>Breast</td>
<td>0.83</td>
</tr>
<tr>
<td>Cervix uteri</td>
<td>0.58</td>
</tr>
<tr>
<td>Corpus uteri</td>
<td>0.46</td>
</tr>
<tr>
<td>Bladder</td>
<td>0.58</td>
</tr>
</tbody>
</table>

• Surgery or chemotherapy are not a substitute for radiotherapy in most cases

Barton 2006
Advisory Group on increasing access to Radiation Therapy: AGaRT

Objective
- Increasing access to radiotherapy in low and middle income countries
- Complete, integrated solutions for radiotherapy which are affordable, safe, reliable, effective and suitable for low-resource settings

Composition
- Users from developing countries
- International Organisations: IAEA, WHO, IEC, World Bank
- Scientific and professional societies
- Manufacturers of diagnostic and radiotherapy equipment
IAEA’s Overall Goal

Cooperate with its Member States to:

- Introduce or expand existing infrastructure and capacity in radiotherapy in a sustainable manner

- Improve or accelerate widespread access to effective radiotherapy services as an essential part of multidisciplinary cancer care and NCCP

This doesn’t mean machines alone! There’s more emphasis on trained professionals and quality of radiation and clinical services.
Basic Radiotherapy Clinic: ~ $3 - 5M

Essential Equipment and Staffing

Buildings: $0.7 - 1.0M
- A megavoltage bunker
- A shielded room for simulator
- A high dose rate brachytherapy (HDR) bunker
- A mould room, dosimetry planning/physicist room etc
- Patient waiting areas, nurse station, reception etc

External beam therapy equipment $1.5 - 2.5M
- A single energy megavoltage unit
- A simulator, preferably a computed tomography (CT) simulator
- A computerized treatment planning system (TPS)
- Film processing equipment, Patient immobilization devices etc
- Beam measurement and QA + physics equipment

Brachytherapy HDR or LDR equipment $0.3 - 0.5M
- A brachytherapy afterloader, An X ray C-arm
- A computerized TPS and full range of applicators
- Quality assurance physics equipment

Personnel $0.5 - 1.0M
- Two or three radiation oncologists, Two or three medical physics staff, Seven RTTs
- Three oncology nurses, One or two maintenance technician/engineer
Challenges in providing radiotherapy

1. **Procurement and Cost of RT Equipment**
   - Complexity and price of new cobalt units is increasing
   - Increasing cost of replacing sources – Cobalt & brachytherapy
   - Logistic & security problems with source transportation
   - Modern linac units often unaffordable and less appropriate for the conditions – stable electricity supply

2. **Limitations in delivery, operation & maintenance of RT equipment**
   - Challenging working conditions (climate, power and water supply etc)
   - Limited warranty & service contracts
   - Instabilities in manufacturers’ local representatives
   - Lack of trained maintenance engineers & physics staff at RT centres
Challenges in providing radiotherapy

3. Human Resources
   • Lack of qualified staff and radiotherapy experience
   • Lack of training opportunities, learning centres and Centres of Excellence
   • Lack of training for new equipment / training of the wrong staff / no continuous training / brain drain

4. Policy and infrastructure
   • Lack of minimum safety standards
   • Lack of basic infrastructure (transportation, water and energy supply, ..)
   • Slow bureaucratic procedures – customs clearance
   • Basic equipment is procured without provision of funds essential for servicing, maintenance & spare parts
   • Incomplete systems ordered/delivered & interfacing issues
### Standard conditions for equipment and service contracts

- Pricing to include long-term service for LINAC machines and source change for teletherapy and brachytherapy units

**Affordable radiotherapy equipment with guaranteed functionality e.g. for 10 years**

- Develop Code of Conduct with vendors
- Compile equipment packages & develop turn-key solutions

<table>
<thead>
<tr>
<th>Megavoltage Treatment Unit</th>
<th>Simulator (X-ray or CT)</th>
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<tbody>
<tr>
<td>Brachytherapy Unit</td>
<td>Treatment Planning System</td>
</tr>
<tr>
<td>Dosimetry equipment for QA</td>
<td>Shielding blocks and Port films</td>
</tr>
<tr>
<td>Immobilisation devices</td>
<td></td>
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</tbody>
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Standard conditions for facility design and maintenance

- Standards in addition to IAEA’s guideline
  - Suitable, appropriate and affordable technologies
  - Highly reliable and safely operating radiotherapy equipment
  - Compliance at national level with safety, security and quality standards
- Preliminary considerations:
  - Remote surveillance and remote repair
  - Specification of failure rate (down time)
  - On site spare parts for quick replacement
  - Availability of back-up electricity supply
  - Standardised treatment rooms designed for one energy including change from COBALT to LINAC
**Need for Radiotherapy:** Cumulative total of 100 million cases in developing countries by 2020!

- Cancer increase greater in LMIC and need for RT will also be greater in LMIC

- Of 150 million new cancers by 2020
  - 100 million in LMIC
  - 60 million will need RT

- Over 84 million will die of cancer in the next 10 years - 75% in LMIC

**Distribution:**
- 50% Asia
- 30% La America
- 20% Africa
For More Information

Visit us:

http://cancer.iaea.org

Or write to:

pact@iaea.org

Thank you!