Palliative Radiotherapy and Appropriate Technology for Developing Countries

Prof Barry J Allen PhD DSc
President IUPESM, Past-President IOMP&AFOMP

Prof Hu Yimin PhD
President CSMP

Prof Boris Rubinsky PhD
Graduate School, University of California at Berkeley, USA

bja1940@optusnet.com.au
Set up by International Union of Physical and Engineering Sciences in Medicine (IUPESM) in 2006 to:

• ascertain the health technology and training needs in developing countries (DC),

• determine the appropriate technology and training to satisfy those needs,

• assist in obtaining funds from international organisations to allow this to happen.
Evaluation of Health Technology Services

Mekong Delta, Vietnam
Philippine Provinces
Vanuatu
Western China

Visits to rural health centres, district, regional and city hospitals.

Reports published at www.iupesm.org

NEW!!! Health & Technology Journal
Needs

Following these “on the ground” reviews of rural health technology, it was abundantly clear that the rural populations of these countries would continue to be *denied adequate medical care* unless a change of more cost-effective approach was introduced.

This new approach is Telemedicine.
Challenges

• How can clinics and hospitals provide care to those who need it when there are fewer and fewer qualified resources to handle the growing patient volume?

• How can hospitals and clinics maintain in the face of increasing cost pressures and lower reimbursement rates?

• How will the most practical radiation treatments quickly find their way to the patients who need them most?
Telemedicine (TM)

• An essential technology to bring higher levels of expertise and service to the rural areas in developing countries (DCs).
• Via mobile phones and internet.
• City hospital skills can be translated to rural health centres.
• TM would support palliative care centres in the provinces.
• Telemedicine is a key enabling technology used in all aspects of healthcare.
• Provides regional hospitals with access to the major centers where specialist advice is available.

Objectives
– Improve efficiency and service delivery
– Reduce patient and clinician travel across the region
– Support earlier diagnosis & treatment
– Training and monitoring
Remote Imaging & Therapy

Patient at remote site

Via the Internet

Data

TelectroVision

Data Processing and Analysis Facility

Image

Doctor at Remote Site

Via the Internet

Therapy

PC
Remote breast cancer probe uses ultrasound imaging

Acquisition device

Mobile device (buffer)

Processing server
Palliative Care

- Chemotherapy: biphosphonates
- Surgery: stabilize weight bearing long bone
- Analgesics: non-steroid anti-inflammatory drugs, non-narcotic and narcotic analgesics
- External Beam Radiotherapy: local and wide field
- Bone seeking Radionuclide Therapy
Remote radiotherapy by TM

- Telemedicine facilitates decentralized radiotherapy services
- Allows remote treatment planning and quality assurance of treatment delivery.
- Pre-requisite: telecommunication system between satellite units and the main radiotherapy clinic.
- Requirements of a telemedicine system in radiotherapy is influenced by the level of support needed.
- Palliative radiotherapy is the greatest need with the lowest complexity.
Palliative Radiotherapy

- WHO reports that >80% of cancer patients present with incurable end stage cancer.
- Palliative radiotherapy must be addressed with priority.
- First Workshop on Palliative Radiotherapy in Developing Countries held in Ho Chi Minh City, Vietnam 2008.
- The real need for cancer therapy in DCs is palliative!
Guiding Principles for PRT

• Accurate anatomical localisation of the symptomatic tumour deposit.
• Simple treatment techniques and field arrangements.
• Short hypo-fractionated treatment regimes.
• Moderate dose treatment to achieve a good predictable response and treatment toxicity to a minimum.
• Patient’s overall life expectancy effects the treatment aims and duration.
Multidisciplinary Care and Telemedicine

- Multidisciplinary team activity is needed for PRT.
- TM enables central specialists to provide remote expert advice.
- Patient history, examination & assessment by local health worker.
- Relay information to specialist at the central site.
- Transmit images for viewing and specialist diagnosis.
- Remote treatment planning and field marking for PRT.
- A central MP and RO can support many remote PRT facilities.
- TM allows the central specialist to assist non-specialists to deliver effective palliative patient care at the local level.
External Beam Radiotherapy

Radiation sources
• The traditional source has been Co-60.
• Linacs preferred for curative therapy, but this may not be the case for PRT, especially in DCs.

Similar physics for Co-60 & 6 MV Linacs.
• Radiation beam parameters (eg beam edge sharpness, penetration, scatter/dose uniformity, contour and inhomogeneity corrections, dose to bone).
• Machine parameters (eg dose rate, patient to collimator distance, isocentre height, gamma rays vs x-rays).
Comparative costs for Co-60 and Linacs

Relative to linacs:

• Capital costs ~ 4 times lower for Co 60(?).
• Running costs are ~10 times lower.
• Down time ~ 8 times lower.
• Maintenance and QA ~ 7 times lower.
• Cost per dose fraction 2-3 times lower.
• Power costs ~ 10 times lower.
## Technical costs for cancer treatment

<table>
<thead>
<tr>
<th>XBRT</th>
<th>Type</th>
<th>Cost ($US)</th>
<th>Ratio</th>
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<tr>
<td></td>
<td>Palliative simple</td>
<td>1250</td>
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<tr>
<td></td>
<td>Palliative complex</td>
<td>2000</td>
<td>2</td>
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<tr>
<td></td>
<td>Curative Breast</td>
<td>5800</td>
<td>5</td>
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<tr>
<td></td>
<td>Curative Prostate</td>
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</table>

Simple palliative radiotherapy is indicated for rural locations with remote dose planning and monitoring.
2008 workshop on PRT for DCs in Ho Chi Minh City

Consensus

• ~ 80% of DC cancer patients present with incurable stage 4 cancer; how many do not present?
• Opiates not generally available for pain relief.
• Radiotherapy is a cost-effective means of reducing pain and improving quality of life.
• Availability of PRT is grossly inadequate in DCs.
• Co60 & 6 MV linacs have adequate dose-depth distributions for PRT.
• Co60 has important operational and cost saving advantages.
• Low annual running costs for low complexity PRT compared with complex curative radiotherapy.
Recommendations

- Palliative care centers in provincial hospitals.
- Telemedicine between provincial and city hospitals first, then with district hospitals and health stations.
- Low complexity PRT to be offered first.
- Co60 sources are preferred for PRT in rural areas.
- Centers for breast and cervical cancer screening.
- Centers to select curative cancer patients for treatment at the city hospitals.
- Over time, palliative care centers should evolve to provide curative treatment care closer to home as well.
- Research into the further development of telemedicine should be encouraged.
That's all folks!!!
Current TM & AT Projects

Cancer therapy

- Remote dose planning for radiotherapy in Lae, Papua New Guinea with Radion Inc.
- Palliative radiotherapy in Vietnam.
- Electroporation - microsecond electric field pulses to ablate volumes of undesirable tissue. 250 ca patients treated; operate by car battery in DCs. Clinical work in Australia.

Ultrasound

- Remote fetal ultrasound in Vanuatu.
- Cell phone based medical imaging with the Al-Quds University for breast cancer detection.
Cell phone

• Medical diagnostics to connect to and build databases for remote diagnostics.
• Sensor monitoring with Mexico on detection of hydration in the brain. For use with newborn and accident victims.

Other concepts

• New low power electric energy solution with the Hebrew University.
• Sterilization of fluids and drug – new technologies can preserve milk for seven days without refrigeration.