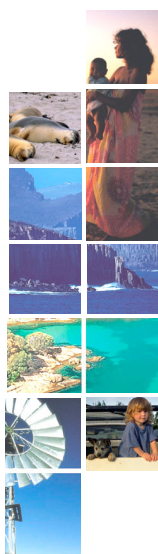


# Darwin: a virtual simulation and outreach centre (non-satellite radiotherapy centre)

Michael Penniment, Angelo Katsilis, Royal Adelaide Hospital

## INTRODUCTION

Rural and remote population centres in Australia have difficulty accessing specialist medical treatment, this is particularly evident in the case of cancer patients and in particular, to the 50% of cancer patients who ideally should be offered radiation treatment. Radiation Therapy is an expensive treatment to establish but per patient treated, represents one of the most cost effective forms of cancer management available with a per patient treatment cost of approximately \$2 per patient, per visit. The oncology problem takes many forms. This talk will focus on the issues related to our patients in the Northern Territory.



- **Geographic.** Darwin is the only capital city without a radiation therapy unit and patients are four hour flight from the capital to the nearest treatment facility in Adelaide. Communities remote to Darwin face an even greater challenge.
- **Social.** Oncology management, in particular radiotherapy, represents the most complex end of high technology in medicine treatment. There is limited community experience or visibility of the treatment that awaits the patient.
- **Political.** There is a core requirement of a population base of 600,000 to justify a Radiation Oncology centre. However, there are two centres in Tasmania, one in the ACT highlighting the interplay between population requirement and the needs of local communities.
- **Economic.** This is a problem on many levels for the patient. Radiation treatment may require two months away from home and job. There are inconsistent rules around Australia in regards to transport reimbursement, for example, in some centres living 199km vs 201km from a centre will be the difference between full funding and no funding for transport and accommodation costs. There is also the economic costs to the community. As stated, radiation oncology per treatment and per year of life saved is exceedingly cheap, whereas patients requiring even simple palliative management in hospital, represent an enormous cost to the community. One fraction of radiotherapy has a greater than 80% chance of relief of bone pain.
- **Psychological.** The patient faces a dislocation for more than 6–7 weeks in many occasions. They are away from their family, their home and their job at a time when they are also suffering from a major illness.

The Royal Adelaide Hospital Radiation Oncology Department provides services to many rural and remote communities, specifically country South Australia, Western New South Wales and the Northern Territory. The challenge was to provide optimal and holistic service for patients from all outlying regions. We wish to not only look at reduction at the length of time the patient is away from home, and this will represent



the main focus of this talk, however, we will also have made efforts to improve community education with weekly meetings with doctors in local communities, in particular, the Northern Territory, regular clinics in the centre and talks to community health workers. We have become involved with the local health team, building links to palliative care, district nursing, etc. We have also looked to improve patient education and an example is our current development of a video information package for Indigenous patients suffering from cancer.

In order to limit the time away, we have pre-planning clinics and weekly patient discussion telemedicine conference with the Northern Territory and other centres.

We have commenced remote CT planning in the Northern Territory. This can be adapted to virtually any modern CT scanner but it requires significant QA and IT input as well as state of the art 3D conformal planning in the major centre. A lower level of information could be transferred into old 2D technology, but this would then represent treatment to the patient that was quite basic and would be tangibly inferior in terms of the side effects of treatment, as well as the ability to take the tumour to a higher dose and hence, a better chance of cure. In other words in establishing this protocol we wish to deliver the best available treatment to the Northern Territory patient, making available 3D conformal radiotherapy, the equal of any such treatment in Australia.

## PROPOSAL

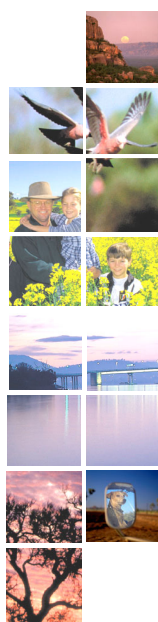
At the Royal Adelaide Hospital, we endeavoured to find a way to reduce the amount time rural patients spend away from home. As little could be done to reduce the length of treatment, the only option was to reduce the time between their initial planning appointment and “day one” of treatment.

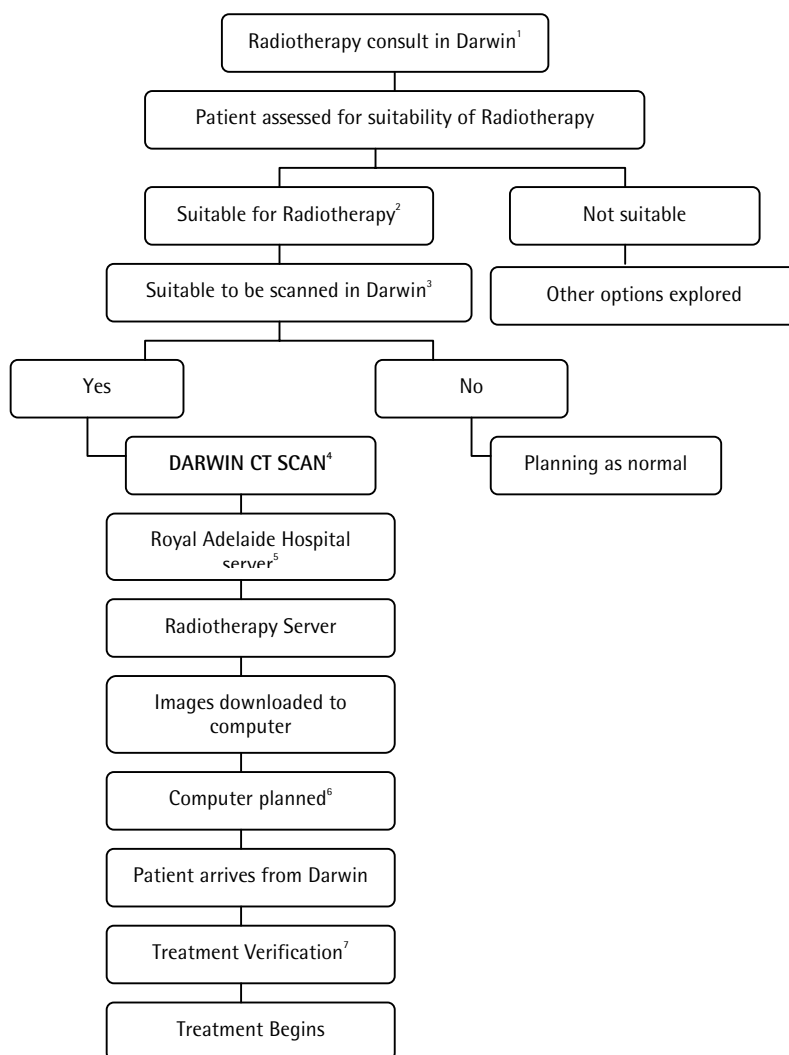
As with most departments world wide, the use of a simulator as a planning tool is diminishing, with CT scans becoming the only visit patients may need prior to their treatment appointment.

The proposal: Scan patients using a CT scanner located in their home town, namely at Royal Darwin Hospital, thus enabling the patient to stay home until the day before their treatment is due to commence.

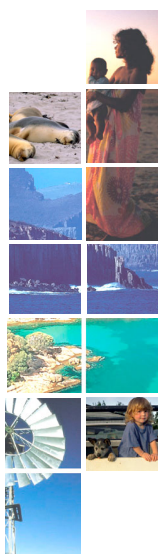
## SETTING UP VIRTUAL SIMULATION IN DARWIN

We convened a multi-disciplinary meeting between Radiation Therapists from Adelaide, CT radiographers from Darwin, Radiation Oncologists, and Medical Physicists. It was decided that the CT radiographers from Darwin would come down to Adelaide and be trained in scanning requirements for radiotherapy patients, with emphasis on setup protocol, reproducibility and immobilisation. This would allow for expediency and timely service to the patient, as opposed to waiting for scheduled visits by a Radiation Therapist.





1. Radiation Oncologist visits Darwin on regular basis to conduct new case clinics in order to assess patients for radiotherapy treatment.
2. A decision is made as to whether or not the patient can be CT scanned in Darwin. Suitability is determined by:
  - i. Immobilisation requirements—any mould room visits, patient will come down to Adelaide.
3. Suitable patients are scanned at Royal Darwin Hospital.
4. Images are then sent to the Royal Adelaide Hospital via a computer link with Darwin.
5. The images are then loaded to the Hospitals network server, which in turn is uploaded to the radiotherapy network server. From here the CT images can be loaded into the planning computer.
6. Once the Oncologist has arrived back in Adelaide, a planning volume can be placed on the CT slices/images.
7. Once the radiotherapy planning is complete, the patient arrives in Adelaide (usually the day before).



At this time, a medical physicist, using a phantom, created a density correction table so that the planning computer was able to convert the electron densities from the CT scanner in Darwin, to patient densities. He also performed a check of the table top sag and checked scanner geometry.

## SYSTEM TEST

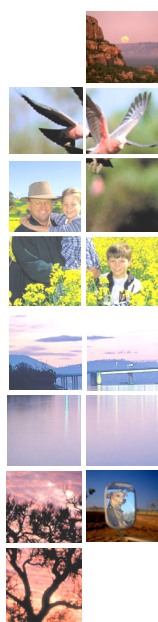
To test the proposed system, a Radiation Therapist accompanied the Radiation Oncologist to Darwin for the next clinic. The Radiation Therapist took the opportunity to aid with the scanning of all the radiation therapy patients.

Current radiotherapy CT protocols were adapted for use in Darwin. These included guidelines on positioning, scan limits, optimal slice thickness, recording of setup details, specific contrast requirements, as well as contact details of people at the Radiation Oncology Department at the Royal Adelaide to help with any questions that may arise.

## FUTURE

This program required a small amount of funding of the order of \$10,000–20,000. This came from Royal Adelaide Hospital funds and enabled setting up of IT links, checking the accuracy of the treatment with a well established QA physics program and training of the local Darwin radiographers. Applying the same program in other centres could be performed however additional funding sources would be required. We applied for a MSOAP grant to look to strategically improve, study, and then report on methods to enhance rural oncology patients treatment. This however, failed as the local communities did not initiate the extra support. The MSOAP program however did not highlight that this was a requirement. Therefore communities who are concerned about their access to cancer care need to be proactive and we would support them. The Federal Government has highlighted that there is funding that will be made available in a strategic fashion to improve cancer care.

There are two models for establishing a Radiation Oncology Unit in Darwin. The Federal Government funding would help make a private centre viable. This would be linked essentially to a business centre in another state. Radiation Oncology at its most basic level is marginally cheaper to establish but significantly different in terms of the range of treatments that can be made available, the ability to deliver higher dose and hence, cure. Normal tissue side effect, are also worsened, this is easy to ignore as they take many years to develop. The model that we would favour for the Northern Territory is that of “hub and spoke” where the NT becomes part of one of the most advanced cancer centres in the southern hemisphere. There is technological experience to integrate the unit seamlessly, as if essentially simply down the corridor from the main centre. There are also extra benefits in terms of economy of scale. Physics and biomedical engineering staff can remotely diagnose many of the ongoing QA and mechanical problems in the major centres and allow saving in terms of ground staff. QA however, will not be compromised and the unit will represent a gold standard of remote treatment technology; the unique geography making it the world’s best model.



Practitioners and all staff servicing the Northern Territory need also to be cognisant of the disadvantaged and Indigenous population. There is a rewarding challenge to integrate with local health care workers to educate and guide a patient through treatment to a successful and happy result for the patient themselves and the community.

A “hub and spoke” model also provides potential to service the wider island community and South East Asian basin provided it is demonstrated to provide service of the highest order. The Royal Adelaide Hospital continues to work and respond to local Northern Territory and country South Australia, Western New South Wales communities and wishes to improve their care in every way possible. We would also like to work further with Government and funding bodies to support our work.

## CONCLUSION

We would recommend that a centre is established to study models of service for oncology to rural Australia. This follows the recommendation of the “Cancer in the Bush” seminar (Canberra 2000) and would allow a centre such as the Royal Adelaide to construct surveys of consumer and health profession satisfaction as well as carefully measuring outcomes statistics including the utilisation rate of treatment in regional areas as well as inpatient days, morbidity and mortality. This is along the lines of the designated National Breast Care Centres. Many of the efficiencies developed, will be applicable across a number of other areas of specialised medicine.

## PRESENTERS

**Michael Penniment** is a Radiation Oncologist at the Royal Adelaide Hospital. He has an interest in improving oncology services and performs regular clinics in Darwin, Port Lincoln, Mount Gambier, Broken Hill and the Riverland. This interest is carried through in his position as a member of the Education Board of the Australian and New Zealand College of Radiologists.

**Evangelos (Angelo) Katsilis** is a Radiation Therapist at the Royal Adelaide Hospital. Angelo graduated from the University of South Australia in 2000 after completing the undergraduate degree of Bachelor of Medical Radiation (Radiation Therapy). He completed his professional development year and attained his statement of accreditation in 2001 from the Australian Institute of Radiography, of which he has been a member since a student.

Angelo is currently attaining his fellowship to the institute, in his final year of postgraduate studies in the Master of Medical Radiation program, and is the chairperson for the South Australian state branch of the Australian Institute of Radiography. Angelo’s specific areas of interest are related to research and in particular the specialised techniques and the improvement of patient services (rural and remote).

