PLANNING FOR THE BEST

Tripartite National Strategic Plan for Radiation Oncology 2012 - 2022

The Royal Australian and New Zealand College of Radiologists
The Faculty of Radiation Oncology

Australian Institute of Radiography

ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine

About the Radiation Oncology Tripartite Committee

The Tripartite Committee is a peak group in Radiation Oncology, representing the three key professions involved in radiotherapy:

- The Faculty of Radiation Oncology (FRO), The Royal Australian and New Zealand College of Radiologists (RANZCR)
- Australian Institute of Radiography (AIR)
- The Australasian College of Physical Scientists and Engineers in Medicine (ACPSEM)

As a key forum for collaboration between the radiotherapy professions, the main objectives of the Tripartite Committee are:

- To represent a key forum for collaboration between the radiotherapy professions in the areas of quality, standards workforce and public interest
- To act as an important liaison point for the Department of Health and Ageing, and its committees and working groups
- To communicate key sector priorities to the Government and to the public
- To maintain good communication between FRO, AIR, ACPSEM

Acknowledgement

The Royal Australian and New Zealand College of Radiologists has received funding from the Australian Government Department of Health and Ageing for the Tripartite Committee to undertake a project to develop a new Tripartite National Strategic Plan for Radiation Oncology (Australia).

Disclaimer

The information provided in this document is of a general nature only and is not intended as a substitute for medical or legal advice. It is designed to support, not replace, the relationship that exists between a patient and his/her doctor.

The opinions and or views contained in this document are those of the Tripartite Committee. Although the Australian Government Department of Health and Ageing funded the development of this work, it does not endorse the views, opinions, standards or information expressed in this document.

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Approved by:
Radiation Oncology Tripartite Committee

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Letter from the Radiation Oncology Tripartite Committee

After extensive consultation and twelve months of work we are pleased to present 'Planning for the Best: the Tripartite National Strategic Plan for Radiation Oncology (Australia) 2012-2022'.

It is a decade since the Tripartite Committee undertook a similar strategic planning exercise that triggered the Baume Inquiry. Since then Australian governments have collaborated with the Radiation Oncology Reform Implementation Committee to address many of the issues identified in the 2002 Inquiry.

Much has been achieved, yet there are outstanding and emerging issues which are identified in 'Planning for the Best: the Tripartite National Strategic Plan for Radiation Oncology (Australia) 2012-2022'. As of today only four-fifths of Australians who need radiotherapy treatment receive it. This gap must be closed.

The Plan describes the way forward, and addresses the strategic issues important for the delivery of safe, high quality and accessible radiation oncology. The plan does not represent the views of governments across Australia.

Governments, professional groups, those involved in advocacy, and patients, must work together to ensure that the gaps in radiotherapy services are closed. We urge that action is taken through the implementation of the 93 recommendations emerging from this Plan. These provide an opportunity to save lives and to prevent Australian radiation oncology services falling behind those of comparable countries.

We commend the Plan to you.

Yours sincerely,

on behalf of the Radiation Oncology Tripartite Committee

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Preface and Acknowledgements

The Tripartite Committee is the peak group representing the three key professions in the radiation oncology sector: Radiation Oncology, Radiation Oncology Medical Physics and Radiation Therapy. The Tripartite Committee is a conjoint committee of the Faculty of Radiation Oncology (RANZCR); the Australian Institute of Radiography (AIR); and the Australasian College of Physical Scientists & Engineers in Medicine (ACPSEM).

The Tripartite National Strategic Plan for Radiation Oncology sets out to inform the radiation oncology sector by reviewing:

- The current strategic issues in the sector;
- The contemporary data and forward projections on key resources;
- The trends likely to affect the sector;
- Strategic objectives and recommendations.

Over the past decade, since the 2001 Tripartite National Strategic Plan for Radiation Oncology and the 2002 report of the Baume Inquiry 'A vision for radiotherapy', a number of developments have taken place in the radiation oncology sector. The Tripartite Committee agreed that a re-evaluation of Australia-wide and sector-wide issues was timely. The focus of the 2012 Plan is firmly placed on identifying current issues that impact on radiation oncology and considering their likely progression over the next decade.

A key aspect in the development of the Plan was engagement of clinical leaders and experts from across the professions of Radiation Oncology, Radiation Therapy, Radiation Oncology Medical Physics and other healthcare groups; jurisdictional and Commonwealth policy-makers; planners, decision-makers and consumers.

The scope of the Plan was formally established by the Tripartite Committee to include: trends in the sector, quality matters, standards, workforce, resources, rural and regional access issues, Indigenous access issues and research issues. The timeframe for the Plan is 2012-2022. The Plan approaches radiation oncology from a national perspective. Information specific to jurisdictions is provided only where it is considered particularly relevant or informative.

The areas outside the scope of the Plan were also agreed by the Tripartite Committee and these are: review of agreed benchmarks and parameters for workforce, equipment or service utilisation; consideration of structural configurations and workflows within individual radiation oncology departments or services; review of requirements associated with specific cancer types; review and critique of work undertaken by specific organisations.

The Tripartite Committee is indebted to the many individuals and organisations who have contributed to the development of this Plan. We are grateful for their time and expertise. A full list of contributors is included below.

The opinions and or views contained in this document are those of the Tripartite Committee. Although the Australian Government Department of Health and Ageing funded the development of this work, it does not endorse the views, opinions, standards or information expressed in this document.

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The Royal Australian and New Zealand College of Radiologists has received funding from the Australian Government Department of Health and Ageing for the Tripartite Committee to undertake a project to develop a new Tripartite National Strategic Plan for Radiation Oncology (Australia).

The Tripartite Committee would like to acknowledge the contributions made by individuals and organisations as part of the stakeholder consultation to inform the development of the Plan and as experts advising the content of the Plan. The committee extends our gratitude to all those who took the time to make a submission.

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Special Mention

We are very grateful for the extra time and advice provided by Prof Michael Barton and Prof Graeme Morgan, their assistance was invaluable.

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Tasmania Department of Health and Human Resources
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Northern Territory Department of Health and Families
Western Australia Department of Health – Medical Workforce
Tasmania Department of Health and Human Resources – Workforce
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New South Wales Ministry of Health – Strategy and Resources
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Executive Summary

In this section

Introduction

A strong radiation oncology sector is indispensable for an effective cancer control strategy. Radiotherapy contributes 40% of cancer cures and will remain a vital component of cancer care.

Radiotherapy can be used to treat almost all cancers, anywhere in the body. Radiation oncology has a major positive impact on local cancer control and is a highly effective therapy for the control of cancer symptoms such as pain. A key advantage of radiation oncology is that it is an effective and non-invasive anti-cancer treatment without any major associated mortality risk.

To prepare Australia for the increasing cancer incidence, expansion of radiation oncology services should be enacted in a planned and sustainable way. Over half of all new cancer patients need radiotherapy. Currently, access to radiation oncology services remains a problem for many Australian patients.

At least 18,000 cancer patients will not receive potentially beneficial radiotherapy treatment in 2012. This number will grow to 24,000 in 2022 if current issues are left unaddressed.

Those patients who miss out on clinically appropriate radiotherapy treatments can be adversely affected. The consequences can include compromised health outcomes, premature death, inadequate symptom control, reduced quality of life and increased suffering.

Radiation oncology is distinguished by several important characteristics: integrated multiprofessional practice; reliance on custom-built facilities and specialised equipment; and out-patient treatment regimens.

Past experience indicates that fiscal constraints can hamper effective policy approaches. In this context, the well-established cost effectiveness of radiation oncology is a strong incentive for policy action. Active engagement and collaboration between the professions, consumers and government is necessary for implementation of all initiatives and policies.

Australia must act now to maintain existing gains in the provision of quality radiation oncology services and to meet current and future demand among cancer patients.

Equity of access to high quality care for all Australian cancer patients underpins 'Planning for the Best: the Tripartite National Strategic Plan for Radiation Oncology (Australia) 2012-2022'. The Plan includes a series of recommendations in the areas of quality, resources, access and research to deliver timely, affordable and world-class radiation oncology services to Australians.

Ongoing investment in radiation oncology must remain a national priority.

Radiation Oncology Services in Australia - Key Issues

Issues impacting on the quality of service provision

- Fragmented planning of specialist oncological services, radiation oncology infrastructure and workforce;
- Variability in access to timely radiotherapy treatments across both geographic locations and cancer types;
- Lack of implemented and permanent national initiatives focused on quality and safety, including:
  - Radiation Oncology Practice Standards for facilities are not mandatory;
  - There is no nationally implemented minimum radiation oncology dataset to guide planning;
  - There is no incident monitoring system across Australia that is appropriate for radiotherapy;
  - Australian Clinical Dosimetry Service is funded only as a pilot.
- Problems persisting with the timely and safe introduction, evaluation, uptake and patient reimbursement for modern techniques and technologies in radiation oncology.

Resources to support the delivery of services

- The current numbers and trends in the availability of workforce and linear accelerators (linacs) are not sufficient to meet the target optimal utilisation rate of 52.3% of new cancer patients either in 2012 or in 2022;
- There is a lack of effective coordination between bodies responsible for workforce, resources and infrastructure planning;
- A critical barrier for patients to access radiotherapy is their proximity to radiation oncology facilities;
- Appropriate imaging and specialised radiotherapy techniques (such as IMRT) are not cohesively incorporated into service plans and infrastructure planning;
- Ongoing resourcing for the national program of equipment replacement within agreed lifespans is essential to ensure that radiotherapy equipment is kept current.

Access to services for rural and regional patients

There are multiple barriers for rural and regional cancer patients to access services:

- The availability of quality and timely cancer care;
  - Financial burden of cancer and its treatment has a disproportionate impact on patients based on their geographical location;
  - Travel to receive treatments and the associated social burden;
  - Opportunities in communications technology still waiting to be harnessed to improve care and patient convenience;
- Rural and regional radiotherapy centres face challenges with recruitment and retention of workforce;
- Lack of effective coordination in service planning and workforce development for rural service provision.

Access to services for Aboriginal and Torres Strait Islander patients

Indigenous Australians have unique needs with respect to radiation oncology for the following reasons:

- Different patterns of cancer incidence compared to non-Indigenous Australians;
- Later diagnosis and lower survival;
- Continued disadvantage in accessing treatments;
- Cultural considerations;
- Limited data and research on Indigenous cancer care, particularly in metropolitan settings.

Research and academia as foundations of future practice

Research in radiation oncology provides direct clinical benefit to patients (measurable outcomes, used in diagnosis and treatment).

- Radiation oncology research in Australia lacks capacity and resources,
    - This limits capability for developing and implementing advances in patient care, and for workforce training and development;
    - There is disparity of research funding for radiation oncology compared to its clinical benefit to patients;
    - The impact of this may be greater in regional and rural facilities
- Research in radiation oncology is different to pharmacological based research in that:
    - Randomised clinical trials are more difficult;
    - Lack of clinical data collection to evaluate technologies;
    - Novel methodologies are required to evaluate new technologies;
- There is further potential for collaboration between the various research groups, institutions, professions and individuals involved in cancer research.

2012-2022 Strategic Directions and Objectives for the Radiation Oncology Sector

Strategic Direction	Objective	Defining Success
Providing a quality radiation oncology service	*The current and future standard is a world class radiation oncology service with robust quality systems and standards in place.*	A nationally planned approach to the radiation oncology sector, which takes into account the needs of all cancer patients, their families and carers, which is characterised by: • A forward-looking strategy to deliver improved radiation oncology services; • The availability of radiotherapy to all patients for whom it is clinically appropriate which can be accessed in a timely manner; • A patient-centred, evidence-based and multidisciplinary approach to care; • Ongoing evaluation of quality assurance, patient quality of life and survivorship • Continuous quality improvement; • Engendering leadership and fostering a culture of quality.
Resourcing the radiation oncology sector	*The radiation oncology workforce and infrastructure are appropriate to meet current and future cancer incidence.*	A prospectively planned and nationally coordinated radiation oncology service across Australia, which includes: • Cancer incidence is the basis for planning; • Workforce and infrastructure are planned together in a coordinated way; • Workforce training is aligned with service demand projections and supported appropriately; • A National Cancer Action Plan which includes radiation oncology is adopted; • Jurisdictional radiation oncology action plans are developed, maintained and integrated with the National Cancer Action Plan; • Closer consultative collaboration between governments, policy-makers, service providers, patients and the professions to ensure most effective use of resources; • Innovative models of quality service provision are developed to improve efficiencies.

Strategic Direction	Objective	Defining Success
Supporting rural and regional access to radiation oncology services	*Rural and regional patients have timely and affordable access to radiation oncology services.*	A nationally coordinated and focused approach to improving rural and regional patients' access to radiation oncology services, including: • Comprehensive, quality cancer care is available to patients, which includes a national patient travel and accommodation scheme; • Models of care are locally tailored and appropriate to rural and regional areas; • Strategies in place that recognise and ameliorate the financial and social impact of cancer on patients and carers in rural and regional areas; • Innovative approaches to patient care are implemented, evaluated and supported.
Supporting Aboriginal and Torres Strait Islander access to radiation oncology services	*Aboriginal and Torres Strait Islander patients have access to radiotherapy services offered in a culturally appropriate and respectful way.*	A focus on improving Indigenous patients' outcomes in cancer control and radiotherapy specifically, including: • Better data collection on Indigenous access to oncological services; • Assessment of specific barriers to service access; • Evidence-based strategies to improve access to treatments; • Improved engagement between the hospital system, local communities and community-controlled Aboriginal and Torres Strait Islander health services.
Research and academia as foundations of future practice	*World class research is part of the core business of radiation oncology services.*	Australia is an international leader in radiation oncology research that improves patient outcomes: • Local research that results in evidence based and timely implementation of new treatment techniques and technologies; • Increased funding allocation to radiation oncology research that is commensurate with its contribution to cancer control; • Dedicated radiation oncology research equipment and staff time are included into national service planning; • Access to clinical radiation oncology equipment time for (translational and implementation) research is factored into facility service planning; • Integration of radiation oncology treatments into comprehensive electronic medical records (EMR); • Research is recognised as part of core business for all radiotherapy facilities; • Multidisciplinary research teams are established, incorporating discovery, translational and implementation research.

Policy Approaches to Radiation Oncology

Policy approaches to ensure that national demand for radiation oncology services is met should be:

- Prospectively planned, coordinated nationally to effectively use resources and provide access for all patients;
- Differentiated to distinguish the different radiotherapy techniques and tumour streams, providing targeted approaches;
- Integrated across service providers, jurisdictions and medical disciplines and aligned with the National cancer reform directions to address silos in the system;
- Innovative to take advantage of technological and organisational developments internationally and between disciplines;
- Focused on quality across all domains including patient access, health outcomes, data, service provision and survivorship and
- Patient centred with consumer involvement at all levels of decision-making.

List of Recommendations

Providing a quality radiation oncology service

A forward-looking strategy to deliver improved radiation oncology services

Importance of planning

1. Planning of radiation oncology services must be based upon achieving the agreed optimal target utilisation of radiotherapy for new cases of cancer (currently set at 52.3%).
2. The commitment needs to be made now so that the target optimal utilisation rate for radiotherapy can be met by 2022.
3. Radiation oncology service planning needs to occur:
    - 3.1. Regularly on a long-term basis and coordinated at a national level.
    - 3.2. With reference to other cancer therapies.
    - 3.3. Ensuring that patients have clinically appropriate and affordable therapies.

Keeping pace with radiotherapy techniques and technologies

4. Health technology assessment processes at all levels must be improved so innovations that provide value for both the cancer patient and the health system are effectively implemented.
5. There needs to be a sustainable financial model for the introduction of new radiotherapy techniques and technologies based on comparative effectiveness.
6. A radiation oncology registry of treatments and outcomes needs to be established to provide data capture and post-market surveillance.

Harmonisation of legislation

7. Regulatory legislation and processes should be harmonized across jurisdictions.

Minimum radiation oncology data set

8. A minimum radiation oncology dataset must be established, implemented and incorporated into a future national cancer data set.
9. All radiation oncology services must comply with the requirements of a radiation oncology national dataset and provide data.

The availability of radiotherapy to all patients for whom it is clinically appropriate which can be accessed in a timely manner

Timely access

10. Planners, decision-makers and service-providers must ensure that radiation oncology services have the capacity for patients to receive radiotherapy within clinically appropriate timeframes.
11. National targets for timely access to radiotherapy (as recommended by National Health and Hospital Reform Commission) should be set and services should be reporting against these targets.

Financial impact on patients, families and carers

12. The financial impact of accessing cancer treatment should be minimized to ensure that optimal treatment is available to all patients.
13. Legislative issues must be resolved to allow out-patient radiation oncology to qualify for private health insurance

A patient-centred, evidence-based and multidisciplinary approach to practice

Empowered consumers

14. Patients, carers and families need to be empowered such that:
    - 14.1. They are provided with current, relevant and evidence-based information regarding radiotherapy.
    - 14.2. Information is available in languages other than English, where appropriate.
    - 14.3. Any costs associated with treatments are clearly described prior to treatment.
    - 14.4. Current radiotherapy waiting times information is made publicly available.
15. There needs to be a central information resource on radiation oncology that is:
    - 15.1. Reliable and appropriate
    - 15.2. Readily accessible in all geographic locations

Radiation oncology practice standards

16. The Radiation Oncology Practice Standards must be mandatory.
    - 16.1. A mechanism for oversight of compliance with the Standards needs to be established and funded.
    - 16.2. The professions to regularly review and keep the Standards contemporary.

Evidence based multi-disciplinary oncology practice

17. Multidisciplinary Team management is the gold-standard of cancer care and must be supported by services, professionals and planners.

Clinical peer-review audit

18. Peer-review practices should be supported and increased to minimise process variation and ensure that treatments comply with best practice.

Ongoing evaluation of quality assurance, patient quality of life and survivorship

Quality assurance for safety and quality care

19. A national framework for quality assurance should be developed to make radiotherapy more consistent and to ensure patient safety.

Dosimetry

20. The Australian Clinical Dosimetry Service must be made permanent to ensure safe delivery of radiotherapy.

Quality of life and survivorship

21. Patient survivorship must be a focus of cancer management.

Continuous quality improvement

A quality management system for radiation oncology

22. There must be a national reporting framework to identify issues associated with quality.

23. A formal benchmarking exercise across jurisdictions and radiation oncology facilities must be undertaken, including activity targets, waiting times and clinical patterns of care variation:

    23.1. Service and planning benchmarks must be agreed nationally

    23.2. Variability between services must be measured and reported

    23.3. Individual plans must be developed for services to meet the benchmarks

Incident monitoring

24. A national incident monitoring system specific to radiation oncology must be implemented.

Engendering leadership and fostering a culture of quality

25. Quality management and leadership must be included in all professional training programs.

Resourcing the radiation oncology sector

Cancer incidence is the basis for planning

26. The nationally coordinated radiation oncology planning must consider:

    26.1. Projected cancer incidence;

    26.2. Target optimal utilisation rate;

    26.3. Regional and rural service access;

    26.4. Projected changes in demographics.

Workforce and infrastructure are planned together in a coordinated way

27. Establish a system for facilities to regularly report on their activities to inform coordinated planning.
28. Implementation of new technology must consider workforce implications.
29. Overcapitalized radiotherapy services, such as brachytherapy and radiosurgery, should be rationalised.
30. New facilities should be planned with the capacity to allow expansion and service continuity.
31. All facilities must have adequate information and communication technology infrastructure and expertise.
32. Workforce planning should consider the need for multidisciplinary care and adequate supply of allied health and support services.
33. Australia needs 267 linacs by 2022 to achieve the optimal utilisation rate of 52.3% (approximately an extra 100, in addition to the replacement of current fleet).
34. Governments must have a plan for the number of new linacs that will come into use over the next ten years.

    34.1. Coordinated across the public and private sectors;

    34.2. Aligned with workforce training and development;

    34.3. Developed in close consultation with the professions and consumers;

    34.4. Taking into account the lead time of 2-5 years for starting an operational service.
35. Services should be planned to operate with 10% additional capacity such that surges in demand can be met without increasing the waiting times for treatment.
36. Development of sustainable fellowship programs for Radiation Oncologists must be a key priority to ensure the development of important clinical and research skills.
37. Develop workforce strategies offering enhanced career pathways for Radiation Therapists (RT):

    37.1. Support advanced practice and role evolution for RTs;

    37.2. Explore assistant roles in radiotherapy.

38. The Radiation Oncology Medical Physicists (ROMP) workforce crisis requires an urgent and multi-faceted response:

    38.1. Australia must have a nationally self-sufficient ROMP workforce by 2022;

    38.2. support promotion of a physics career to school students and undergraduates;

    38.3. increase and streamline funding for TEAP positions, and embed into the radiation oncology workforce profile;

    38.4. strengthen recruitment strategies to attract and retain the ROMP workforce;

    38.5. urgently develop innovative models of service provision that do not compromise quality;

    38.6. a national workforce summit must be held by June 2013 to get consensus on the implementation of workforce solutions.

39. Develop plans to support professionals returning to full-time and part-time work.

Workforce training is aligned with service demand projections and supported appropriately

40. Governments to match the funding contracts for training positions in both public and private accredited facilities to the length of the training programs.

41. Accreditation and training processes that allow for:

    41.1. Increased trainee numbers in the three key professional areas i.e. Radiation Oncology, Radiation Therapy and Radiation Oncology Medical Physicists;

    41.2. Embedded funding for clinical supervisors, preceptors and training network coordinators to adequately support the training programs; and

    41.3. Continued professional education and development for those in the workforce;

    41.4. Support of training in rural and regional areas.

42. To establish innovative models of training such as:

    42.1. Virtual and simulated learning programs;

    42.2. Nationally coordinated training networks to enable optimal utilisation of resources.

A National Cancer Action Plan which includes radiation oncology is adopted

43. There needs to be a National Cancer Action Plan developed, implemented and maintained for Australia:

    43.1. In consultation with the professions and consumers;

    43.2. Encompassing radiation oncology as a core element of quality cancer care.

Jurisdictional radiation oncology action plans are developed, maintained and integrated with the National Cancer Action Plan

44. Jurisdictions must develop, regularly review, evaluate and update 5-year action plans for radiation oncology and these must be coordinated nationally.

45. Financing options for establishing and resourcing services should be explored and must ensure access to radiation oncology services is safeguarded;

46. To ensure that infrastructure is used efficiently:

    46.1. Business process review must be undertaken regularly;

    46.2. Business process improvement must be part of standard practice;

Closer consultative collaboration between governments, policy-makers, service providers, patients and the professions to ensure most effective use of resources

47. Establish and strengthen radiation oncology networks where smaller centres are linked to major centres.

48. The existing national ROHPG capital replacement program must be maintained and regularly updated to reflect changes in radiation oncology practice.

Innovative models of quality service provision are developed to improve efficiencies

49. There should be ongoing horizon scanning for new radiotherapy techniques and technologies, to inform facilities planning;
50. Essential role of imaging in radiation oncology must be acknowledged:
    - 50.1. Regulatory constraints such as licensing must be remedied;
    - 50.2. Training and expertise of professionals must be enhanced;
    - 50.3. Funding for planning and treatment of patients must support evidence-based practice;
    - 50.4. The role of the Diagnostic Imaging Medical Physicists needs to be recognised and supported.
51. The use of essential radiotherapy techniques must align with best practice:
    - 51.1. At least 30% of radiotherapy patients should receive IMRT treatments;
    - 51.2. Benchmarks for other essential radiotherapy techniques should be developed and services should publicly report against these.

Supporting rural and regional access to radiation oncology services

Comprehensive, quality cancer care is available to patients, which includes a national patient travel and accommodation scheme

52. Adequately funded and equitable national patient transport and accommodation assistance schemes must be in place.
    - 52.1. Financial support should demonstrate a relationship between the subsidy and reasonable transport and accommodation expenses.
    - 52.2. The transport and accommodation support schemes should be simplified and disparities between jurisdictions should be addressed.
53. A comparative study of costs of providing treatment and out of pocket expenses across various private and public facilities should be developed
    - 53.1. to benchmark the costs related to radiotherapy and reimbursements or rebates;
    - 53.2. to provide governments with the necessary data to ensure equity.

Models of care are locally tailored and appropriate to rural and regional areas

54. Design models of care appropriate to the regional area and its population needs, including linkage to major radiation oncology centres;
55. Adopt a national planning approach (facilities, workforce and services) with input from regional and rural stakeholders;
56. Regional facility development should focus on patient care outcomes and experiences;
57. Establish access to specialist services through the Cancer Care Network and links between regional and comprehensive metropolitan cancer care services
58. Accommodate needs for future expansion and uptake of technology in regional facility planning and development

Planned workforce strategies are developed to support the expansion of radiation oncology services to regional and rural areas.

59. Strategies are developed to recruit trainees and radiotherapy professionals of regional and rural origin
60. Increased training opportunities in rural and regional centres; increased funding support for prioritisation of rural training placements
61. Incentives and bonuses to attract and retain rural and regional staff
62. Staffing models that support professional development, professional collaboration and research activities
63. Increased flexibility of decision-making and funding responsibilities in regional centres for specific strategies for staff retention
64. Individual regional facilities should develop areas of expertise, including research, and specific competencies in techniques and technologies to increase competitive attractiveness of rural work.

Strategies in place that recognise and ameliorate the financial and social impact of cancer on patients and carers in rural and regional areas

65. Actions to be taken such that financial consideration by rural and regional patients and carers do not influence decisions regarding treatments:
    - 65.1. Where it does not exist already, there should be expansion of arrangements for publicly funded patient access to private regional radiotherapy treatment and review of the eligibility criteria for the same.
    - 65.2. Modified billing mechanisms in private facilities where payments and reimbursements are streamlined so that patients are only required to pay the gap payments, while the facility can maintain its operating cash flow.
    - 65.3. Costs of developing regional public facilities as opposed to providing publicly-funded access to an existing local private facility need to be considered.
    - 65.4. Reimbursement of out of pocket expenses incurred should be an option for those who are forced to pay more because of their place of residence.

Innovative approaches to patient care are implemented, evaluated and supported

66. A planned adoption of telehealth into radiation oncology services for consultation, care planning and follow up of patients
    - 66.1. Such adoption should focus on cancer care outcomes and patient experiences.
    - 66.2. Clinicians should be consulted to identify clinical needs and the best supporting technology.

Supporting Aboriginal and Torres Strait Islander access to radiation oncology services

Lack of and reduced access to radiation oncology is an important factor affecting the cancer outcomes for Indigenous patients. While acknowledging the fact that there is a need for a comprehensive approach, the recommendations below relate specifically to radiotherapy access. The recommendations below are based on the relevant research and responses received during the stakeholder consultation process.

Better data collection on Indigenous access to oncological services

67. Development and implementation of a national radiation oncology dataset should include data collection on Indigenous patients.

Assessment of specific barriers to service access

68. Further research to identify the reasons for the lower survival rates of Indigenous peoples diagnosed with cancer.
69. Additional research to identify issues and barriers for Indigenous patients living in metropolitan areas.

Evidence-based strategies to improve access to treatments

70. Indigenous patients must have access to radiotherapy as close to their community as possible.
71. Accommodation facilities for Indigenous patients and their families must be appropriate and available.
72. Education and information strategies about cancer including causes, prevention and treatment options must be developed for Indigenous patients.

Improved engagement between the hospital system and community-controlled Aboriginal and Torres Strait Islander health services

73. Planning for radiation oncology services must take into account specific access issues for Aboriginal and Torres Strait Islander patients.
74. Planning must be undertaken with reference to and in close consultation with the local Aboriginal community-controlled health services.
75. Specific strategies, including Aboriginal Liaison Officers at cancer centres, must be developed.
76. Initiatives to support Indigenous people to join the radiation oncology professions must be considered and encouraged.

Research and academia as foundations of future practice

Local research that results in evidence based and timely implementation of new treatment techniques and technologies

77. Specific support for radiation oncology research is required:
    - 77.1. Clinical and health systems research in radiation oncology that produces timely evidence of safety, efficacy and cost effectiveness of new techniques and technologies must be specifically funded through a dedicated funding stream.
    - 77.2. Expansion of research support in radiation oncology that advance our understanding of biological mechanisms translating into clinical practice through specific measures such as translational training fellowships, to maximise benefits for patients.
78. Patient awareness of clinical research needs to be increased:
    - 78.1. Health care consumers must be educated in the availability and importance of clinical research, leading to increased participation in clinical research.

Increased funding allocation to radiation oncology research that is commensurate with its contribution to cancer control

79. It is recommended that radiation oncology research funding is increased so that:
    - 79.1. Research processes are developed from current levels and are sustainable with adequate dedicated funding
    - 79.2. Additional translational research capacity enables faster identification and adoption of new techniques and technologies that improve efficiency
80. Workforce and equipment planning and implementation at site, jurisdiction and national levels must include the requirements to support research as an integral component of care delivery.

81. A small grants program must be introduced to develop projects to a level of national competitiveness.

Dedicated radiation oncology research equipment and staff time are included into national service planning

82. Infrastructure planning at jurisdiction, state and national level needs to accommodate research requirements.

Access to clinical radiation oncology equipment time for (translational and implementation) research is factored into facility service planning

83. Facility planning needs to accommodate research requirements including discovery, translational and implementation research.

Integration of radiation oncology treatments into comprehensive electronic medical records (EMR)

84. All treatment facilities must have the capability to collect comprehensive data sets including treatment details that can be shared through national collaborative research programs.
85. Strategies for data support and sharing between facilities must be in place.

Research is recognised as part of core business for all radiotherapy facilities

86. The importance of research positions needs to be recognised:
    - 86.1. research career path must be developed
    - 86.2. radiation oncology services should support research activities within their facilities
    - 86.3. Programs should be developed (if not yet in place) that combine professional with academic (doctoral or masters) qualifications.
    - 86.4. Mentorship programs must be introduced to link experienced researchers with early career professionals.
87. The ethics and governance approval process needs to be streamlined to enable efficient collaboration.
88. Professions must build ethics and governance literacy amongst their members.
89. It is essential that healthcare consumers are involved in the development of trials and represented on decision-making bodies.

Multidisciplinary research teams established, incorporating discovery, translational and implementation research

90. Active cooperation and collaboration between various departments, jurisdictions, disciplines and manufacturers must be actively encouraged.
91. Clinical professionals must have protected time to conduct research.
92. International collaboration in research and participation in international research projects must be encouraged and supported.
93. Collaborative links between treatment facilities and universities need to be developed or increased (where already in place):
    - 93.1. Co-operation between universities and treatment facilities has to extend beyond teaching hospitals.
    - 93.2. Reciprocal support arrangements need to be established between universities and treatment facilities, whereby facilities provide clinical placements and universities provide research support to facilities.
    - 93.3. Support for the establishment of conjoint academic and clinical positions in all three professional groups.
    - 93.4. Research training and the creation of roles for practitioner-scientists must be fostered across the radiation oncology professions.

Demand for Services and Trends

In this section

Cancer and Radiation Oncology Services in Australia

Summary of the Issue

Ongoing investment in cancer control is a national priority.

Cancer control is a national health priority area. Cancer is estimated to be the leading cause of the burden of disease in Australia in 2010, accounting for 19% of the total burden[1].

Cancer has a major impact on the Australian community. At current incidence rates, one in three men and one in four women in Australia will be diagnosed with cancer by the age of 75. By age 85, the risk increases to one in two for men and one in three for women[1].

A key challenge for action to control cancer is that the term encompasses a diverse group of several hundred diseases. All cancers are characterised by changes to some of the body's cells which become abnormal and begin to multiply out of control. These abnormal cells can form an invasive (i.e. malignant) tumour. If the spread of these tumours is not controlled, they usually result in death[2].

Cancer is potentially one of the most preventable and treatable of today's common causes of death. The effects of decisions made on cancer control strategies have long lead times. What is done currently will have its impact over the next 5-15 years; this timeframe is even longer for measures aimed at prevention rather than treatment.

The impacts of cancer are not evenly distributed – the poorest areas and patients suffer the most.

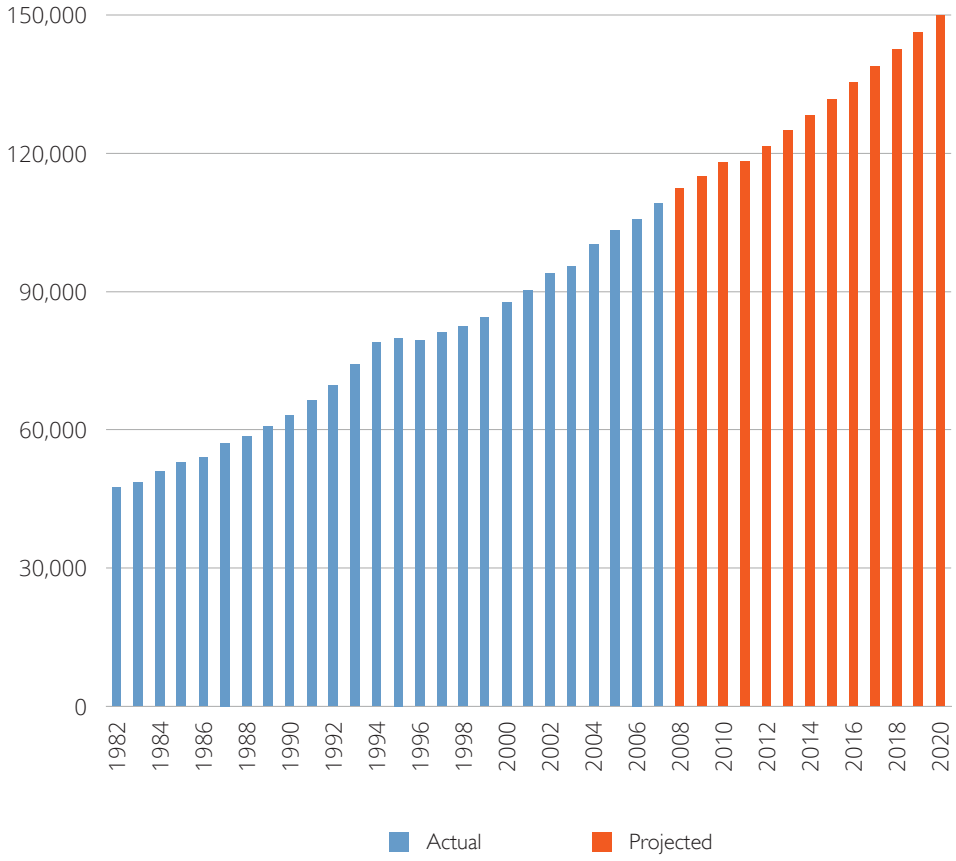
Research indicates that Australians living in lower socio-economic areas have higher mortality rates from cancers than those living in other areas[1]. Similarly, people living in remote and very remote areas of Australia have higher mortality rates from cancer than those living in more urbanised areas. Indigenous Australians have higher mortality rates than non-Indigenous Australians[1].

The scientific evidence points to the significant growth in cancer incidence and makes meaningful planning to meet this challenge essential.

The Australian population has been increasing and is expected to exceed 25 million by 2020. The population is ageing as a result of sustained low fertility and increasing life expectancy[3]. In the next few decades, population ageing is projected to create significant fiscal pressures and to have major implications for health, labour force participation, housing and demand for skilled labour. Slower economic growth associated with ageing, increased demand for age-related payments and services, expected technological advancements in health and demand for higher quality health services will add to these pressures[4].

Australia has some of the best internationally recognised high quality data on cancer incidence through the work of the Australasian Association of Cancer Registries (AACR) and the Australian Institute of Health and Welfare (AIHW). This data provides essential baseline information and allows for projections of cancer incidence. These projections are a mathematical extrapolation of past trends and are illustrative of the future changes that might reasonably be expected to occur[5].

Trend in number of new cases
(All cancers combined, projected to 2020)



Sources: Projected incidence[5]; historical incidence[6].

The age related increase in cancer incidence across Australia is significant. The number of cases of cancer diagnosed in Australia will rise over the next decade for both males and females, and is expected to reach about 150,000 in 2020[5] — an increase of almost 40% from 2007.

Radiation Oncology as Part of the Solution

A strong radiation oncology sector is the bulwark of an effective cancer control strategy.

Radiotherapy's contribution to the fight against cancer is significant. The impact of radiotherapy in cancer survival has been estimated at 40%, compared to 49% of patients being cured by surgery and 11% of patients for systemic treatments[7]. A key advantage of radiation oncology is that it is an effective and non-invasive anti-cancer treatment without any associated mortality risk.

In radiation oncology highly precise doses of radiation are used to kill cancer cells while minimising damage to the surrounding healthy tissue. Advances in radiotherapy techniques use the latest research in biology and physics and combine these with cutting-edge technology to deliver successful treatments.

Radiotherapy can be used to treat almost all cancers, anywhere in the body. It can be used alone or in conjunction with other treatments like surgery or chemotherapy. Radiotherapy has a major positive impact on local cancer control and is a highly effective therapy for the control of cancer symptoms such as pain. Radiation therapy allows organ conservation, may be a curative option for patients with inoperable disease, and may allow a curative approach for patients who have significant co-morbidity that precludes surgery.

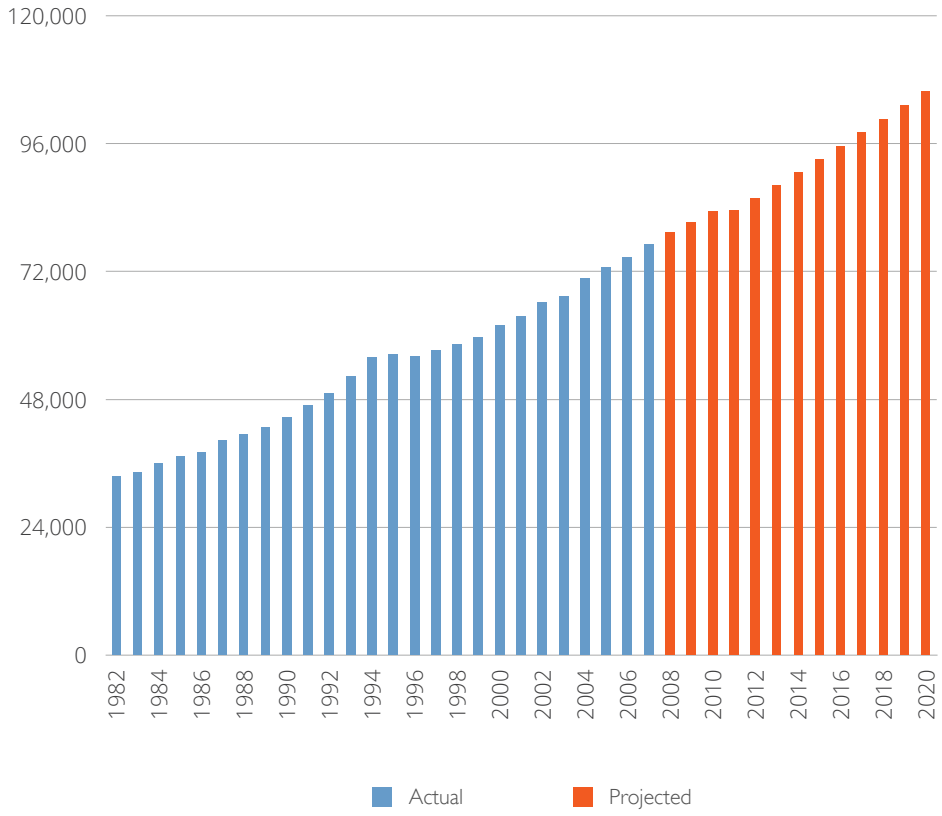
Radiotherapy can be accurately conceptualised as a biological intervention with profound effects at the cellular and molecular level, modulated through cellular signalling pathways and the immunological axis[8]. The majority of indications for external beam radiotherapy are to improve survival. In most of those indications radiotherapy is the treatment of choice and usually cannot be replaced by other treatments.

To prepare Australia for the increasing cancer incidence, expansion of radiation oncology services should be enacted in a planned and sustainable way.

In the past, the importance of and the ongoing need for radiation oncology were significantly underestimated. From 2002 onwards, governments across Australia implemented commendable initiatives to increase radiation oncology infrastructure. However, significant pre-existing infrastructure deficiencies combined with increasing demand for services, leave Australia with inadequate radiation oncology sector capacity to meet current and future need.

A robust benchmark for planning radiotherapy services on a population basis was set in Australia. The optimal radiotherapy utilization rate was calculated using an evidence-based technique and the target of 52.3% of all patients with notifiable cancer in Australia was estimated[9].

Number of patients requiring radiotherapy
(including new cases, re-treatment cases, non-malignant and non- reportable disease)



Sources: projected cancer incidence[5]; historical cancer incidence[6]; re-treatment cases, non-malignant and non-reportable disease[10]. Calculated on the basis of combining 52.3% of new cancer cases, 25% load for retreatment cases and 10% load for non-notifiable and non-malignant disease.

The known demand for radiotherapy treatments, combined with the complex nature of radiation oncology service provision makes prospective planning logical and essential.

Workforce has historically been a rate-limiting step in radiation oncology. Specific emphasis is urgently needed to match workforce strategies to service expansion plans to ensure that investment in workforce is used effectively and to grow the facilities infrastructure sustainably.

Access to radiation oncology services remains a significant problem for many Australian patients.

Having the optimal radiotherapy utilisation rate as a target allows comparison with actual rates to identify areas where improvements in the evidence-based use of radiotherapy can be made. It provides valuable data for radiotherapy service planning.

38% of patients with cancer will receive RT at some stage in their illness, i.e. the current average radiotherapy utilisation rate is about 38% [11], [12]. When patients miss out on radiation oncology, the patient outcomes suffer. Radiotherapy has a positive impact on local cancer control and control of cancer symptoms such as pain.

Access to radiation oncology services and remedying the current under-utilisation of radiotherapy treatments is an important priority for cancers control.

- At present, at least 14.2% of new cancer patients in Australia do not receive radiotherapy treatment mandated by evidence-based practice;
- This equates to at least around 18,000 cancer patients not receiving potentially beneficial radiotherapy treatment in 2012;
- In 2022, if the current under-utilisation rate is maintained, this would equate to around 24,000 cancer patients will miss out on radiotherapy[13].

Patients who miss out on clinically appropriate radiotherapy treatments can be significantly affected.

The consequences for patients who are not able to access radiation oncology when clinically beneficial include:

- Compromised health outcomes;
- Premature death;
- Inadequate pain and symptom control and
- Reduced quality of life and increased suffering.

Furthermore, patients can still face long waiting times for radiotherapy treatment, even some patients who require urgent treatment.

There are important differences between radiotherapy techniques, which are used to deliver specific health advantages in particular clinical circumstances. Patient access to radiation oncology services is key, so is patient access to the appropriate radiotherapy techniques.

Radiation oncology is distinguished from other areas of healthcare by several important characteristics.

Radiation oncology relies on a team of experts. This team management approach starts at the level of integration between radiation oncology, surgery, palliative care and medical oncology and extends to the core radiotherapy team, including Radiation Oncologists, Radiation Oncology Medical Physicists and Radiation Therapists. The radiation oncology team also includes engineers, cancer nurses and other allied health practitioners. Radiation oncology practice is strongly underpinned by a detailed knowledge of the biological effects and physics of radiation, the application of sophisticated imaging and treatment technologies, and extensive understanding of the diverse clinical behaviours, pathology and management of cancer.

Radiation oncology requires custom-built facilities and specialised equipment. Establishing a radiation oncology facility requires an up-front investment for the building of radiation-proof bunkers and the purchase of the necessary equipment (such as a linear accelerator and a CT scanner). Radiation oncology is a specialty dealing with rapidly changing technological advances largely directed at improving the accuracy and effectiveness of radiotherapy outcomes, including better control and cure of tumours, as well as reduction of side effects. Increasing use of high quality imaging to direct radiotherapy, newer types of radiation (such as heavy ions) and modern treatment techniques, such as Intensity Modulated Radiotherapy (IMRT), are changing the standard treatment methods. Radiation oncology facilities must include appropriate technological and information technology infrastructure to ensure quality service provision.

Radiation oncology is largely an out-patient service, but it cannot be delivered remotely. Research in radiobiology substantiates the benefits of fractionated radiotherapy for many patients. This is one of the main reasons why radiotherapy is usually delivered to patients in daily doses repeated over a number of weeks – it gives normal cells time to recover between treatments and allows a higher dose of radiation to be given to the cancer while the harm to normal tissue is minimized. This delivery method means that the patients have to be close to a radiotherapy facility for several weeks for their treatment.

Policy approaches to ensure that the national demand for radiation oncology services is met should be:

- Prospectively planned and coordinated nationally to effectively use resources and provide access for all patients;
- Differentiated to distinguish the different radiotherapy techniques and tumour streams, providing targeted approaches;
- Integrated across service providers, jurisdictions and medical disciplines to address silos in the system;
- Innovative to take advantage of technological and organisational developments internationally and between disciplines;
- Focused on quality across all domains including patient access, health outcomes, data, service provision and survivorship and
- Patient centred with consumer involvement at all levels of decision-making.

Action at the policy, service and professional levels aimed at meeting the rising incidence of cancer must be an ongoing effort. The needs of Australian patients are quantifiable and the contribution of radiation oncology to cancer care is well defined and evidence-based. There is a strong and urgent need to refocus the action agenda on closing the current radiotherapy service gaps, as well as identifying and acting on future needs.

Short-term fiscal considerations can hamper effective policy approaches in health care. The well-established cost effectiveness of radiation oncology is a strong incentive for policy action.

Radiation oncology is not only an effective but also a cost-effective cancer treatment: the cost per year of life gained from radiotherapy treatment in Australian dollars (1993 dollars) was reported to be A$7,186[14]. The addition of radiation therapy to breast conserving surgery has been shown to improve quality of adjusted life years (QALYs) at a cost of $28, 000/QALY[15] and the use of short-term, pre-operative radiation therapy for operable rectal cancer has been shown to increase QALYs by 39% at a cost of $25,100/QALY[16]. These costs are less than the threshold of $50,000/QALY commonly cited for cost-effective care[15].

Radiotherapy can be cheaper than other treatment modalities; the curative treatment of non-small cell lung cancer in Canada in 1995 was shown to be cheaper using radiation therapy (C$12,474) than with surgery[17].

Radiation therapy can be delivered to most patients as an outpatient service with resulting cost savings and improvements in patient convenience.

Active engagement of the professions and consumers is necessary for effective implementation of all initiatives and policies.

Experiences across multiple sectors, including health care and community development, demonstrate that successful implementation of policies and initiatives are reliant upon active engagement of key stakeholders.

The radiation oncology sector must build on its successes to-date in fostering collaboration between the professions, planners, funders and consumers to create ongoing conditions and forums for collective planning and decision-making.

Australia must act now to maintain existing gains in the provision of quality radiation oncology services and to meet current and future demand among cancer patients.

To guide action, the Tripartite National Strategic Plan for Radiation Oncology (Australia) 2012-2022 articulates important strategic directions and a series of recommendations to improve, expand and safeguard the provision of quality radiation oncology services across Australia.

To assist stakeholders in understanding the radiation oncology sector and its challenges, the Plan details key elements of providing a quality radiation oncology service across Australia, including:

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Trends Having an Impact on the Radiation Oncology Sector

Trends Across the Oncology Sector

Cancer care is a dynamic and evolving field, which encompasses the medical disciplines of surgery, radiation oncology, medical oncology and palliative care. Optimal provision of cancer treatments further relies on a diverse team of allied health professionals. One consequence of the interrelated and complex nature of cancer care provision is that trends within the broader oncology sector have impact on the delivery of quality radiation oncology services.

Increasing incidence of cancer and improved survival prospects for patients are key developments.

Approximately 60% of people diagnosed with cancer will survive more than five years after diagnosis[1] and this number will continue growing in absolute terms in line with the increases in cancer incidence[2]. One of the consequences of increased survival is a proportionate growth in the number of radiotherapy re-treatments required in instances when the cancer recurs. In the longer-term, improved patient outcomes also mean that an ever-growing number of cancer patients live long enough to develop second primary cancers that also require treatment.

Collaborative approaches to cancer care will continue to grow and strengthen.

Multi-disciplinary care is an important component of national and jurisdictional cancer care frameworks. Multidisciplinary teams (MDT) are an essential element of quality patient care delivery and the emphasis on multidisciplinary care is expected to continue and grow. Multi-disciplinary management of patients often results in increased referrals for radiotherapy treatments as it increases knowledge amongst other clinicians about the benefits of radiotherapy.

Consumer expectations and involvement in cancer control at all levels will increase.

The awareness of cancer and of the available treatment options among cancer patients, carers and their families has been steadily increasing. In addition to the stronger emphasis on information provision by health care professionals, consumers can now access a vast array of information (of variable quality) via the Internet. The role of the healthcare provider will increasingly be one of a partner, who explains and demystifies the vast quantities of information, as well as providing advice on the possible treatment alternatives. Patients will be increasingly knowledgeable about new radiotherapy techniques and technologies and will likely demand a greater number of treatment options and alternatives, including the integration of supportive and complementary therapies.

Investment in the development of systemic and targeted therapies will continue.

Ongoing translational research is investigating the use of new systemic therapies and targeted therapies that are specifically designed for specific tumour genotypes. Increasing use of tumour genetic testing is expected, allowing the design of treatment regimens that will be most effective for tumour subtypes. This may result in increasing indications for radiotherapy in some cancers and decreasing indications in others.

Continuing improvements in techniques and technologies are increasing the precision and accuracy of radiotherapy, allowing treatments that minimise the impact on healthy tissue and reduce treatment related morbidity. These advances are mediated through increased complexity of treatments and consequently are relatively more resource-intensive in the short term, but lead to long term savings. The following trends are expected to endure across the radiation oncology sector.

The rate of evolution in radiotherapy techniques and improvements in the delivery technologies will accelerate.

Recent radiotherapy innovations have led to increases in the precision of treatments, which allows improved outcomes and reduced treatment-related side effects. Notable developments to date are in the areas of intensity modulated radiotherapy (IMRT), stereotactic body radiation therapy (SBRT), 4D imaging, particle therapy and nanotechnology. Advances in imaging technology are further enhancing the targeting of radiotherapy treatments. An important development is the introduction of adaptive treatments that can be adjusted as tumour and patient characteristics change throughout the course of radiotherapy. Adaptive treatments improve patient outcomes (for example, the reduction of radiotherapy related side effects for bladder cancer) but can often require significant investment of time by the radiation oncology team[3], [4].

Radiation oncology is increasingly personalised.

Radiotherapy is by its nature a personalised treatment: every patient's plan is unique and tailored to their particular clinical circumstances and anatomy. It is anticipated that the introduction of tumour marker testing and molecular and biological imaging techniques will enable the already personalised radiotherapy treatments to be even more targeted. With the introduction of tumour marker testing, radiotherapy treatments and doses can be tailored to the specific tumour biology of each patient, for example, radiotherapy dose modification based on Positron Emission Tomography (PET) findings in prostate cancer[5] and radiotherapy volume modifications based on PET findings in head and neck cancer[6]. Molecular and biological imaging will allow improved patient selection for treatment (for example, select patients suitable for surgery in lung cancer, melanoma and oesophageal cancer)[7] and will reduce futile treatment in instances where cancer has already spread [8 - 10].

Models of care are evolving.

Service delivery and models of care are changing, with the focus shifting from the delivery of isolated treatments towards a multidisciplinary, coordinated approach to cancer care. This multidisciplinary patient management involves radiation, surgical and medical oncology as well as allied health services. The team considers relevant treatment options and agrees on treatment planning and supportive care for individual patients. Increasingly, radiation oncology centres are developing expertise in specific techniques and the treatment of specific malignancies. As a result, provision of radiation oncology services will increasingly rely on networks for collaboration and referral of patients to specific centres. Referrals to these specialist facilities will increase for certain diagnoses and complex treatments.

The use of technology to enable better communication and information transfer will intensify.

Radiation oncology uses some of the most advanced information technology infrastructure in the healthcare system to support its data and imaging needs. The need to use tele- medicine in patient management across Australia will increase dramatically as the number of cancer centres, particularly in regional areas, increases. With a mobile patient population, increasing numbers will present following initial treatment to a different radiotherapy centre and require re-treatment with radiotherapy or develop a second malignancy (requiring treatment with radiotherapy). Technological solutions to expedite the transfer the relevant imaging and previous radiotherapy treatment details to the treating radiotherapy centre will be important. This technology is already in use in Australia, although our use is significantly below that of other countries such as Canada. The utilization of telemedicine in radiation oncology is well below that of other medical specialists in Australia; however it is expected to intensify due to the changes in service provision and models of care.

The inflexible nature of funding arrangements for radiation oncology will increasingly be a rate-limiting step for services.

Radiation oncology professionals raised significant concerns during the stakeholder consultation about the current funding levels being inadequate to meet service needs and that the funding structures do not appropriately support the complexity of current treatments and are likely to be even more restrictive as new treatments emerge. This is anticipated to remain a challenge in the future.

Consumer awareness of radiotherapy and new techniques will continue to expand.

Consumer awareness of radiation oncology has historically been low. Increased access to information via the Internet is changing this. The current lack of a centralised patient information resource for radiation oncology means that sometimes the information accessed by consumers is inappropriate or not relevant in their clinical circumstances. In some instances, the information may relate to treatment techniques that are not available in Australia (such as proton therapy or heavy ion therapy). It is anticipated that awareness of radiotherapy treatments will continue to increase in the coming years as a result of the increasing availability of information via the Internet and the increased awareness through multidisciplinary care teams.

Interpreting Future Impacts of the Trends

Radiotherapy service planning should consider the changing demographics of the Australian population as well as increasing cancer incidence and prevalence of individual types of cancer. The impact of investment in cancer prevention and early detection will become more apparent in the coming years. The adoption of new radiotherapy treatment techniques and technologies into service delivery will be continuous and require investment in human and financial resources, but these treatment advances will improve overall patient outcomes. Personalised medicine will strain the health sector including radiation oncology as increased resources and planning time are required for this approach. However the improved quality of survivorship will result in long term economic gains. The management of radiotherapy waiting times will remain an issue. Further investment in telemedicine will reduce the need for face-to-face follow-up attendances and lead to innovative practices.

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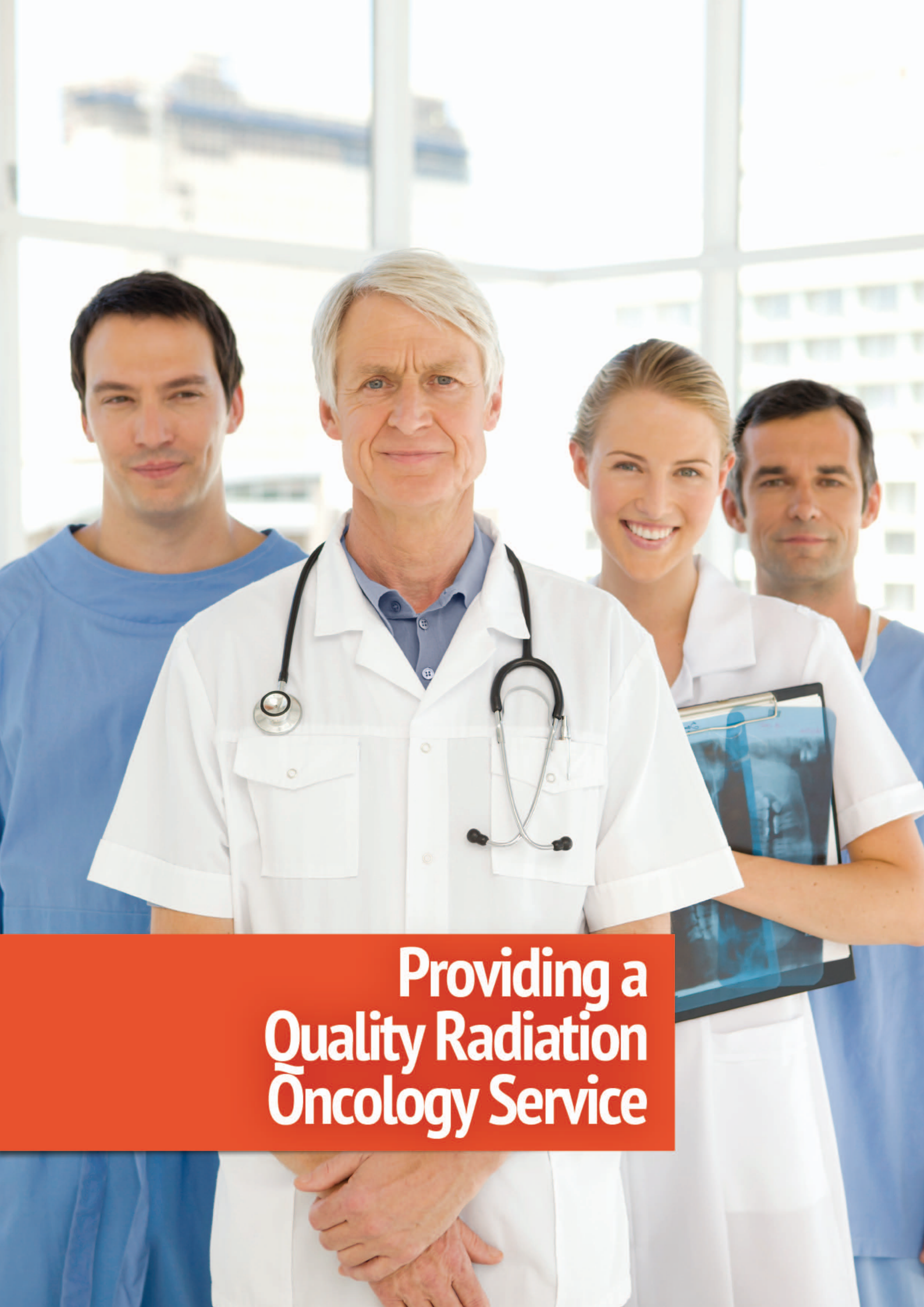


Providing a Quality Radiation Oncology Service

In this section

Introduction

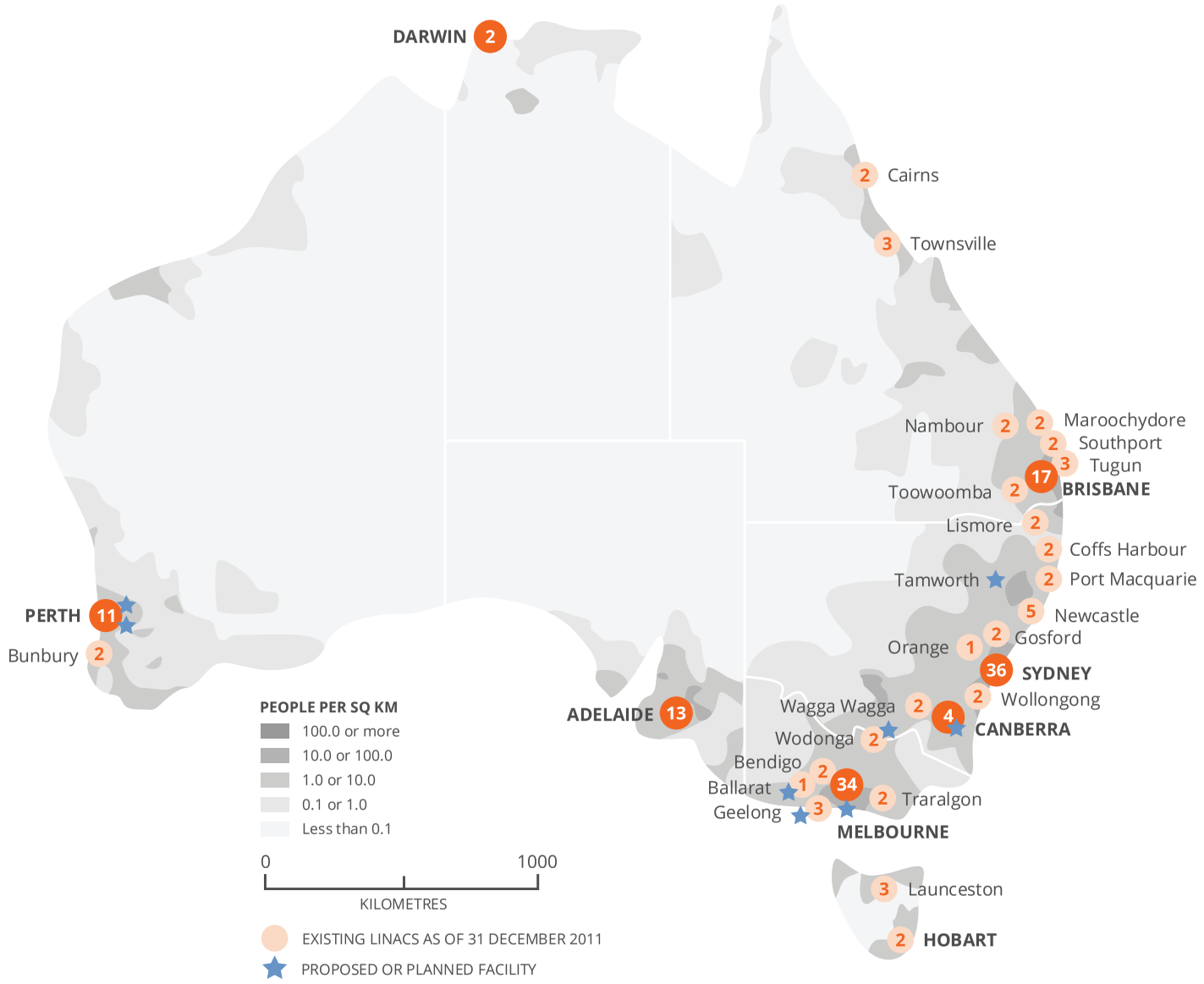
The Tripartite National Strategic Plan approaches radiation oncology from a 'needs of the nation' perspective. The questions posed in developing this plan are:

1. What is required to improve existing radiotherapy services?
2. What is required to ensure Australian patients who would benefit from radiotherapy are able to receive it?
3. What is required to ensure a world class Australian radiation oncology sector that will be able to meet the increasing cancer incidence?

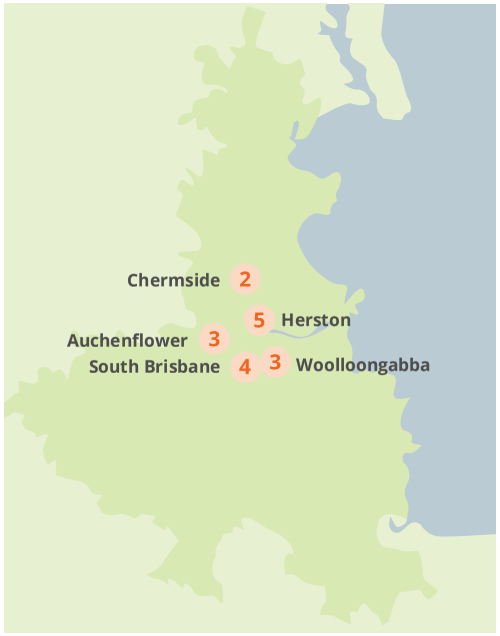
The aim of the resulting strategy, at its most fundamental, is to provide for all patients who could benefit from radiotherapy so that they can have timely access to optimum treatment for their disease. To facilitate this, professions and decision-makers need information and foresight to plan nationally, systematically, transparently and collaboratively. A part of planning is the issue of ensuring that the Australian radiation oncology services maintain the appropriate quality. Quality radiation oncology requires a high degree of quality control and quality assurance to ensure that services are safe, effective and are supported by appropriate infrastructure.

In the context of quality, medical quality is defined as the degree to which health care systems, services and supplies for individuals and populations increase the likelihood of positive health outcomes and are consistent with current professional knowledge[1]. The quality of medical services provided to the community is continually improving with the implementation of new technology, techniques and systems. Clinical quality improvement is an interdisciplinary process designed to raise the standards of delivery of preventative, diagnostic, therapeutic, and rehabilitative measures in order to maintain, restore or improve health outcomes of individuals and populations[1]. The standards of practice in radiation oncology reflect this approach[2].

Locations of Radiation Oncology Centres in Australia



ADELAIDE METROPOLITAN AREA



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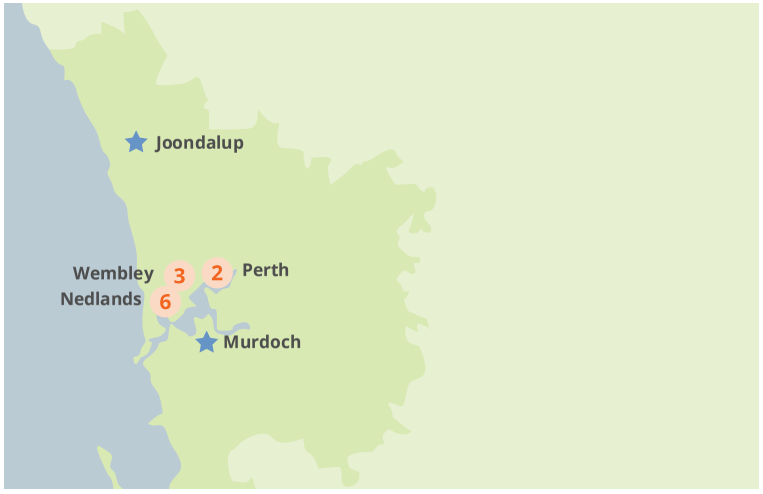

PERTH METROPOLITAN AREA

SYDNEY METROPOLITAN AREA

Key Issues

To ensure the provision of quality radiation oncology services the 'needs of the nation' are to be incorporated into the planning process in order to ensure that access is provided to all patients in Australia who require radiotherapy. The current situation is characterised by:

- Fragmented planning of specialist oncological services, radiation oncology infrastructure and workforce;
- Variability in access to timely radiotherapy treatments across both geographic locations and cancer types;
- Lack of implemented and permanent national initiatives focused on quality and safety, including:
  - Radiation Oncology Practice Standards for facilities are not mandatory;
  - There is no nationally implemented minimum radiation oncology dataset to guide planning;
  - There is no incident monitoring system across Australia that is appropriate for radiotherapy;
  - Australian Clinical Dosimetry Service is funded only as a pilot.
- Problems persisting with the timely and safe introduction, evaluation, uptake and patient reimbursement for modern techniques and technologies in radiation oncology.

Objective

The current and future standard is a world class radiation oncology service with robust quality systems and standards in place.

Defining Success

A nationally planned approach to the radiation oncology sector, which takes into account the needs of all cancer patients, their families and carers, which is characterised by:

- **A forward-looking strategy to deliver improved radiation oncology services** through the development of a National Cancer Action Plan which effectively and efficiently incorporates quality radiation oncology services and which includes planning for the implementation and evaluation of future technology and techniques; plans to address any jurisdictional regulatory differences which influence the adoption of radiation technology and which defines and refines the National Minimum Data Set.
- **The availability of radiotherapy to all patients for whom it is clinically appropriate which can be accessed in a timely manner** with evidence of this being reduced waiting times; the access of patients to treatment consistent with evidence-based radiotherapy utilisation rates for their disease; and that the financial impact on the patient, carers and families is affordable to all Australians.
- **A patient-centred, evidence-based and multidisciplinary approach to care** evidenced by the adoption of multidisciplinary teams for the management of each patient's cancer that is supported by peer review and the provision of consistent quality information to patients, carers, family and healthcare professionals all of which are consistent with the Radiation Oncology Practice Standards[2].
- **Ongoing evaluation with a strong emphasis on quality assurance, patient quality of life and survivorship** evidenced by the operation of a national dosimetry audit service, patient quality outcomes being reported by facilities, the survivorship of patients being measurably enhanced and reporting of issues affecting quality being effectively managed.
- **Continuous quality improvement** evidenced by on-going evolution of the Radiation Oncology Practice Standards and demonstration of compliance with these standards at a facility level, regular review of the Radiation Oncology Strategic Plan and implementation of a national radiation oncology incident reporting framework that provides sufficient detail to assure the safety of and improve the quality of the services offered.
- **Engendering leadership and fostering a culture of quality** through theincentivisation and development of a quality culture which cultivates leadership and by the inclusion of continuity planning as part of the implementation of the Radiation Oncology Strategic Plan.

A Forward-Looking Strategy to Deliver Improved Radiation Oncology Services

Importance of planning

A quality radiation oncology service is a multifaceted process involving several distinct groups of health experts, supporting staff, and is reliant upon custom-built facilities and an array of sophisticated equipment. In terms of time horizons, the training of the radiation oncology workforce and the implementation of the relevant infrastructure is a matter of years rather than months. Australia's cancer registries provide reliable data on cancer incidence and projections are regularly updated. As such, the demand for radiation oncology is a known variable – it has been methodically researched and set at 52.3% of all new cancer patients[12]. The known demand combined with the complex and interdependent manner of radiation oncology service provision make prospective planning logical and essential.

Compared to other specialties, radiation oncology is delivered in a relatively small number of facilities – 61 centres across Australia in 2011. Despite the small scale of the sector, planning occurs at both national and jurisdictional levels. Fragmentation in planning persists, despite being a key focus of the 2002 Baume Inquiry, particularly the variability in the state and territory cancer plans combined with an absence of a national cancer action plan. Endeavours to facilitate national coordination of radiation oncology service planning have been initiated through the Radiation Oncology Reform Implementation Committee (RORIC) which reports to the Australia Health Ministers' Advisory Committee. Some successes have been achieved but silos in decision-making and planning remain. Achieving a truly national approach to radiation oncology service planning, let alone cancer control planning, is challenging given the nature of constitutional relationships between jurisdictions. Submissions to the Tripartite Plan from the radiation oncology professionals highlight the need to further strengthen national planning coordination to reduce fragmentation of decision-making in radiation oncology.

Submissions to the Tripartite Plan suggested that the likely consequence of the status quo will include:

- Perpetuation of the 'winners' and 'losers' situation in terms of access to radiation oncology
- Extended waiting times for radiation oncology
- Patients continuing missing out on a potentially life-saving treatment
- Patients missing out on an effective palliative treatment to reduce their pain and suffering

The radiation oncology sector lacks elasticity because there is a maximum capacity limit set on each radiotherapy machine. Although efficiency gains are possible and should be pursued by service providers, these can only extend the capacity by a certain margin. Patient access to radiation oncology is a limitation in itself which restricts the impact of efficiency gains at a facility level. This is well-understood by the radiation oncology professionals and concerns were expressed in submissions to the Tripartite Plan, which can be summarised as follows:

- Lack of coordination and planning for the expansion of existing services to meet rising cancer incidence results in highly variable levels of patient access to radiation oncology services across geographic region;
- Poor coordination and planning between workforce and facilities in radiation oncology results in inefficiencies, such as fluctuations in workforce numbers;
- The potential of regional cancer centres being compromised because of inadequate workforce planning and of insufficient patient support schemes to access these facilities;
- Private sector infrastructure is not consistently taken into account in service planning;
- Lack of planning to ensure access to specific radiotherapy techniques.

There is a broad consensus in the radiation oncology sector that long-term planning, particularly coordinated at national level, holds the key to addressing current shortfalls and inefficiencies. In this context, the National Health Reform Agenda holds both promises and risks for radiation oncology. National planning is highly desirable to allow efficiencies in resource allocation across Australia and to accommodate the complexity of service planning and capital infrastructure in radiation oncology. The possible devolution of responsibility for facilities planning to the local health authorities would fragment an already weak system and put infrastructure further out of step with workforce planning. Providing a nationally agreed approach for radiation oncology services, and indeed for cancer services, would enable the local health authorities to confidently participate in planning the services provided to cancer patients.

Radiation oncology services should be planned with reference to other cancer treatments like surgery and chemotherapy. Ideally, radiation oncology treatment centres should be built within a cancer centre precinct[3] to facilitate easy patient access to a comprehensive multi-modality treatment. This approach has been strongly supported by the Commonwealth in the past several years by funding the establishment of comprehensive cancer centres around Australia.

A nationally coordinated and prospective planning for radiation oncology services is needed, based on cancer incidence projections and the target radiotherapy utilisation rates. The essential components should include:

- A collaborative process between decision-makers, professions and patients
- A partnership approach between the Commonwealth and the jurisdictions
- Sufficient facilities that are optimally located and have adequate treatment capacity to meet the needs of patients requiring radiation oncology services into the future
- Service provision models focus on enabling patient access to quality services while taking into account existing public and private infrastructure
- Radiation oncology workforce planning is aligned to facilities planning
- Services are planned to enable patient access to the full range of radiotherapy techniques

Overall, Australia requires a National Cancer Action Plan which effectively and efficiently incorporates quality radiation oncology services.

Keeping Pace with Radiotherapy Techniques and Technologies

Radiotherapy aims to destroy cancer cells but avoid damage to the structure and function of nearby healthy tissue. Improvements in the quality and effectiveness of radiotherapy invariably stem from advances in the technology. The underlying principle of radiotherapy is to completely ablate cancer tissue while sparing adjacent normal tissue. The same principle underpins modern radiotherapy techniques.

As in many other branches of medicine, in radiation oncology there are various vendors that produce and distribute treatment equipment. While this equipment often has different configurations and various price points, the radiotherapy techniques delivered by these machines are fundamentally the same. A radiation oncology 'treatment technique' is defined as a method for accomplishing a desired radiation therapy dose distribution. The term 'technology' is used to describe the delivery device for a particular radiotherapy technique[4].

Patient access to clinically appropriate and affordable radiotherapy treatment techniques is of paramount importance. Some examples of radiotherapy techniques include:

- Three-Dimensional Conformal Radiation Therapy (3DCRT)
- Intensity Modulated Radiation Therapy (IMRT)
- Image Guided Radiation Therapy (IGRT)
- Stereotactic Radiotherapy (SRT) and Radiosurgery (SRS)
- Brachytherapy (BT)

Patient access to clinically appropriate radiotherapy techniques should form the measurable quality benchmark for the health system. Report cards on the availability of key radiotherapy techniques in Australia are included under the section on Essential Imaging and Radiotherapy Techniques (on page 82).

The issues of new and evolving technologies are not new in Radiation Oncology and have been highlighted in the Baume Inquiry. Problems persist with the safe and timely introduction, reimbursement and dissemination of promising innovations in radiation oncology. The Commonwealth Department of Health and Ageing (DOHA) is a key agency which supports patient access to treatments through the Medicare Benefits Schedule and infrastructure improvement through the Radiation Oncology Health Program Grants (ROHPG). In the absence of DOHA support, the treatment is either not made available in Australia or is introduced on an ad hoc basis. In the latter case, the cost is passed to the patient or to the State/Territory Health Services. In radiation oncology, the effect of unavailability, delayed introduction or ad hoc introduction typically means that the service cannot be delivered to all those patients who require it for optimal cancer care. Existing delays in the introduction of modern radiotherapy techniques are around 10 years in comparison to North America. This gap is likely to continue to grow unless measures are taken.

Keeping pace with modern radiotherapy techniques makes sense because of the promise they hold for better survival, reduced side-effects and greater efficiencies. Naturally, radiation oncology techniques and technologies need to be prioritised and assessed. Technology assessment processes (including the Medical Services Advisory Committee (MSAC)) in Australia struggle to manage radiation oncology technologies for several reasons, which include[5]:

- Medical devices require different criteria for assessment than pharmaceuticals because they tend to progress with incremental innovations in performance and safety. For example, in radiation oncology substantial improvements in care can be based on the next version of computer software
- Lack of capital and infrastructure to support randomised clinical trials (RCT)
- Strict adherence to the requirements for RCT-derived evidence of superior efficacy can be problematic if applied to radiation oncology. The limitations of the RCT methodology when applied to radiation oncology are discussed in the Research and Academia section of this report (on page 118).

There is a growing concern among decision-makers about the rising costs of healthcare, including cancer care. Similarly, there is a desire to promote innovations that achieve value for cancer patient and the health system. Radiation oncology sector presents an opportunity for such innovations and improvement, but under certain conditions. The Lancet Oncology Commissions in 2011 summarised those as follows:

- Policies developed to provide value-based assessment of radiation oncology treatments must create an infrastructure for evidence generation and management.
- This infrastructure must have the ability to gather evidence in an ongoing manner throughout the life cycle of the technology and to adapt to inevitable incremental changes.
- Finally, the infrastructure must prove a path to payment coverage that ensures emerging technologies provide value and contribute to the advancement of the discipline.

Registries[6], as a mechanism of data capture and post-market surveillance of technologies, are a powerful tool to inform clinicians and planners. The use of meaningful endpoints and nimble research methods are essential to harness the potential advances in radiation oncology treatments.

Data collection and information standards have a key role in continually informing the directions of clinical care, health services research and support advancements in techniques and new technologies. Existing research[7] supports the value of collecting clinical and economic data on radiotherapy treatments.

Ongoing delays in the adoption of new techniques and technologies in Australia make it a key priority that Australia moves to value-based radiotherapy and the creation of infrastructure to support data collection on the impact of new treatments.

Harmonisation of Legislation

The impact of regulatory differences between jurisdictions may influence the availability of some clinical radiation oncology services or may alter practices such that some workforce initiatives viable in one jurisdiction cannot be easily translated to another jurisdiction. For example, the current implementation of the nationally adopted codes of practice and standards for radiation protection varies considerably between jurisdictions.

The differences in application and interpretation of radiation protection measures may require a greater or lesser investment in radiation shielding to comply with local regulatory requirements. There may also be lack of requirements specific to a particular practice which is exhaustively regulated in other Australian jurisdictions. These local differences mean that the clinical availability of some techniques may be relatively hindered in some jurisdictions or have associated greater compliance costs.

Another example is in industrial relations where some workforce initiatives developed in one jurisdiction may not be easily adopted in other jurisdictions. The harmonisation of these and other regulatory requirements affecting the provision of radiation oncology services should be initiated to improve consistency in access to, and the delivery of, radiation oncology services.

Minimum Radiation Oncology Data Set

A vital component of a quality radiation oncology sector is access to data to inform planning and policy. Multiple stakeholders commented in their submissions that inadequate data collection is still a barrier to effective planning within the cancer sector. The work of Cancer Australia on a National Minimum Data Set (NMDS) and national support for this initiative is therefore critical. An NMDS is contingent upon a national agreement to collect uniform data and to supply it as part of the national collection. Over time, the availability of these data will provide more accurate information on national trends, diagnoses, health service utilisation and, ultimately, improved health outcomes[8].

There needs to be a specific sub-set of this data relevant to radiation oncology, which is available for strategic planning. This subset needs to be readily accessible by those involved in radiation oncology planning and the users must be able to contribute to the data set and able to validate and correct the data as required. The radiation oncology sub-set of the NMDS may include the following data: case mix, cancer outcomes, toxicity outcomes, patterns of care, techniques used and intent of treatment (radical or palliative). To provide a common framework for the sharing of data and to maintain visibility of radiation oncology in cancer planning, the radiation oncology sub-set of the NMDS should not be a separate data set and should be administered by Cancer Australia.

The Availability of Radiotherapy to All Patients for whom it is Clinically Appropriate that can be Accessed in a Timely Manner

Importance of ensuring access

Radiation oncology's contribution to the fight against cancer is significant. The impact of radiotherapy in cancer survival has been estimated at 40%, compared to 49% of patients being cured by surgery and 11% of patients for systemic treatments[9]. Cancer is a leading cause of death in Australia[10]. The 2012 report on cancer incidence projections by the Australian Institute of Health and Welfare (AIHW)[11] highlights just how significant the age related increase in cancer incidence across Australia will become. The AIHW report projects that the number of cases of cancer diagnosed in Australia will rise over the next decade for both males and females and is expected to reach about 150,000 in 2020—an increase of almost 40% from 2007. Increases in the number of cases diagnosed are due primarily to the ageing and increasing population and are expected to be most evident in older populations. In this context, enabling patient access to a quality radiotherapy service across Australia that is integrated with the other cancer services becomes paramount to cancer management.

The current average radiotherapy utilisation rate for Australian cancer patients is estimated at 38.1%, while the agreed target level is 52.3%[12]. This means that:

- On average, 14.2% of Australian cancer patients miss out on a clinically appropriate radiotherapy treatment (which is understood to be a conservative estimation);
- This equates to at least around 18,000 cancer patients not receiving potentially beneficial radiotherapy treatment in 2012;
- In 2022, if the current under-utilisation rate is maintained, this would equate to around 24,000 cancer patients will miss out on radiotherapy[13].

The matter of access to services is dependent on multiple interrelated factors. These include patterns of referrals, level of implementation of MDTs and other factors. Nonetheless, research in the area of access to radiotherapy[14] as well as anecdotal evidence from across Australia strongly suggests that the single most important barrier to access is the proximity of patients to radiation oncology services[15]. This observation supports the case that patient access to radiation oncology severely limits the impact of other facility level initiatives aimed at increasing productivity to improve access.

Timely access

Waiting time for radiotherapy is an important quality indicator for oncology services[16]. Several different lines of evidence support the conclusion that a delay in initiating radiotherapy has an adverse effect on outcomes[17]. The risk of local cancer recurrence increases with increasing waiting times for radiotherapy. The increase in local recurrence rate translates into decreased survival in some clinical situations. Waiting times for radiotherapy treatments should be as short as reasonably achievable[18].

Maximum acceptable delays in radiotherapy

Category	Definition	Maximum Acceptable Waiting Time
Emergency Care	Medical emergency	24 hours
High Priority Care	Patients for whom delay in starting will have a significant adverse effect on outcome	14 calendar days
Planned Care	All others	28 calendar days

Data from 2008 in New South Wales shows that the percentage of patients who were treated within target times improved overall: with 57% of priority one patients, 72% of priority two patients and 82% of priority three patients treated within the maximum acceptable times recommended by the Royal Australian and New Zealand College of Radiologists[19]. These same data can be interpreted to say that 43% of priority one patients and 28% of priority two patients were not treated within the maximum acceptable times within New South Wales in 2008.

The National Health and Hospital Reform Commission concluded in 2009 that national access targets are needed in Australia to continuously measure and report on whether people are accessing the health services they need in a timely manner. Targets for access to radiotherapy were included on the priority list and the preliminary targets were aligned with those set by the RANZCR[20].

Financial impact on patients, families and carers

The financial impact of accessing cancer treatments on the patients, their families and carers can mean that the optimal treatment option is unaffordable. For remote and rural patients who may need to travel to a metropolitan centre to receive treatment and be away from home for many weeks, the financial impact can be significant and prohibitive. Their ability to access childcare, replace lost income or continue their business, access the emotional and physical support provided by family and carers, as well as fund travel and accommodation costs, can determine whether the optimal treatment option is chosen. This issue is discussed in greater detail in the Supporting Regional and Rural Access to Radiation Oncology Services section (on page 96), however the quality of service provided to a patient is strongly influenced by this issue.

In the 2002 Baume Inquiry report, a recommendation was made that the Commonwealth legislation should be revised to allow out-patient radiation oncology to qualify for private health insurance. Ten years on and patients receiving radiotherapy still do not qualify for private health insurance. Financial issues that inhibit patient access to radiation oncology services have a significant impact on the quality of care offered to patients.

A Patient-Centred, Evidence-Based and Multidisciplinary Approach to Care

Empowered Consumers

A cancer diagnosis often brings about fear, anxiety and sometimes depression for patients, carers and their families. Cancer itself is a threatening experience and the acquisition of more information by those affected is associated with higher levels of satisfaction, compliance and psychological adjustment[21],[22]. Patients undergoing radiotherapy have multiple fears, anxieties, stress and expectations[23],[24]. This anxiety and depression adds costs to other Government services such as psychiatry and psychology services, other support services and in General Practice. Accessing these services is a particular problem in the rural setting where many are not readily available.

Radiation oncologists and other staff (such as radiation therapists, medical physicists and nurses) are actively involved in providing information to patients, particularly in the early stages of the treatment process[25]. There are no standard guidelines for the timing of information provision, and individual departments vary in terms of the level of information that they provide and the setting in which the information is provided. Increasingly, cancer patients and the broader community seek to be active participants in health-care decision-making[26]. The development and availability of evidence based information for consumers and the community supports informed decision-making and enables individuals to act to improve their health outcomes.

Consumer representatives on the Tripartite Committee have recommended that the following principles should be in place with regards to informing consumers:

- All patients and their families should have up-to-date, evidence-based and relevant information regarding radiotherapy;
- The information needs to be accessible to all. Information should be available, via interpreter services to patients and their families where their primary language is not English;
- The option of radiotherapy should be offered when it is clinically appropriate;
- The advantages and disadvantages of radiotherapy and treatment alternatives should always be discussed, including the information on the potential short and long term side effects;
- Costs (including gap payments) associated with radiotherapy in private radiotherapy centres should be made clear because the financial strain can add to the pre-existing stress and anxiety. This information should include whether the fees are to be paid up front or whether only the gap between the Medicare rebate and the actual fees is to be paid.

Currently, specific patient information about radiation oncology is not consistent or comprehensive and in many cases seen as too technical. In Australia there is lack of centrally-located, clinically-appropriate, credible and easily accessible information for patients, carers and families on procedures and treatments in the area of radiation oncology. The benefits of an easily accessible radiation oncology patient information resource could include:

- A national source of reliable and credible information about radiation oncology
- Easier access to this information by cancer patients and practitioners living in rural or remote locations, where access to reliable information is limited, thereby providing equitable access nationally to all Australians wherever they live
- Increased transparency of clinical decisions improving the likelihood of the improved evidence based treatment techniques, technology and systems being used consistently across the nation
- Contributing to informed patient consent and practice risk management
- Providing access to this information to professionals involved in providing radiation oncology increasing the likelihood of consistent and appropriate advice being provided to patients, carers and their families
- Reducing consumer anxiety about radiation oncology treatments caused largely by lack of understanding or fear of the unknown or inappropriate information
- Decreasing patient uncertainty thereby possibly reducing costs to other Government services and support services such as psychology, counselling and psychiatric services
- Reducing costs to jurisdictions by eliminating the need for each jurisdiction to produce these resources on their own

Radiation oncology practice standards

The 2002 Baume Inquiry identified a number of national safety and quality issues relating to radiation oncology. Recommendation 26 was that 'a facility accreditation program should be developed as a matter of priority ... with input from 3 professions, it should be tested in 2004 with full accreditation starting in 2005 and made a condition of continued funding in 2006'. Recommendation 27 was that 'the accreditation program should initially cover national guidelines for minimum Quality Assurance (QA) processes and dosimetry program. New requirements should be introduced as they become practical'.

Radiation Oncology Practice Standards, a Tripartite Initiative, outline the components of a quality radiotherapy service at facility level. Facility management is considered to be of vital importance in the delivery of safe, quality care to radiation oncology patients. The standards encompass three domains:

- Facility Management
- Treatment Planning and Delivery
- Safety and Quality Management

It is the Tripartite's view that the Standards should be made mandatory and that this should be achieved through legislation. The legislation should mandate compliance and will refer to the Radiation Oncology Practice Standards but should not enumerate them, so as to allow regular reviews of the Standards in line with contemporary practice. If legislated, compliance with the Standards would become a function of normal business operations for each facility. The following two steps are important:

- Incentivising facilities to reach the required Standards and providing resources
- Ongoing facility participation should be mandated and incentivised through the Medicare Benefits Schedule

Evidence based multi-disciplinary oncology practice

Cancer patients can receive treatment from a number of medical professionals. This can create challenges in the delivery of consistent care and in the coordination of care between expert clinicians. Multidisciplinary management is designed to overcome this fragmentation and ensure that best practice is delivered enabling optimal patient outcomes to be achieved, contributing to improved survivorship outcomes[14]. There are additional benefits to multidisciplinary practice, including opportunities for patients to be identified as suitable for clinical trials and as forums for professional development, and quality improvement activities for the team[27].

Cancer Australia is promoting the medical multidisciplinary team (MDT) approach nationally[28] with state-based initiatives to monitor and encourage MDT practice already in existence. The work of the NSW Cancer Institute is one such example. MDT practice is a critical component of quality care and should be embedded and strongly encouraged in service planning and delivery.

The MDT would consist of radiation oncologists, surgeons, medical oncologists, and haematologists. It is acknowledged that a range of other clinical health professionals make important contributions to the treatment decision-making process, these professionals may include nurses, pharmacists, radiation therapists, medical physicists, nuclear medicine physicians and radiologists amongst others. This collaborative approach allows the MDT to make decisions about the most appropriate treatment and supportive care for a patient, while taking into account the individual patient's preferences and circumstances including their care and family arrangements[29].

Once the decision to utilise radiotherapy for treatment has been agreed, a radiotherapy specific MDT consisting of radiation oncologists, radiation therapists, and medical physicists, as well as other professionals as required from time to time, should discuss and review the technical details of the treatment planning and delivery.

Clinical peer-review audit

It is argued that 'high-quality' means minimising process variation and moving the average closer to the optimum value. In radiation oncology this should mean a consistent and up-to-date set of specifications for treatments and procedures[30].

Peer review is a quality tool that is used to enable practice-based improvements in clinical practice and patient care. 'Review by Peers'[31], a document prepared by the Australian Commission on Safety and Quality in Healthcare (ACSQHC), states that "review of professional practice by a peer is a valuable and important part of the maintenance and enhancement of a health practitioner's clinical and professional skills". The importance of participation in peer review activities by health practitioners has been identified by the Medical Board of Australia in the Continuing

Professional Development Registration Standard[32], highlighting that CPD (now mandatory as a condition of registration) must include practice-based reflective activities such as peer review.

The Faculty of Radiation Oncology, RANZCR, strongly supports the participation of radiation oncologists in peer review activities and has developed a Peer Review Audit Instrument[33] to help ensure an effective peer review process. The use of this tool by radiation oncologists is strongly encouraged before radiotherapy treatment has commenced and ideally after all planning has been completed to ensure its results are the most beneficial for radiation oncology practice. This way, patient care and treatment are optimised. The Peer Review Audit Instrument is also used for radiation oncologists returning to practice from an extended break in clinical practice[34]. The importance of peer review has been embraced in radiation oncology and mandatory participation in practice-based reflective activities such as peer review audit, clinical audit and attendance at multidisciplinary team meetings has been introduced[35].

Ongoing Evaluation with a Strong Emphasis on Quality Assurance, Patient Quality of Life and Survivorship

Evaluation

Evaluation refers to a periodic process of gathering data and analysing these in such a way that the resulting information is used to determine whether planned activities are being carried out effectively. An evaluation can also illustrate the extent to which the stated objectives and anticipated results are being achieved.

Evaluation in radiation oncology applies to all components of the service and can include:

- Assessment of treatments in terms of dose distribution
- Prospective and retrospective data collection, particularly for treatment outcome assessment
- Consideration of cost-effectiveness of treatments
- Review of workforce performance
- Assessment of service and facility performance
- Quality Assurance activities

Importance of quality assurance to safety and quality care

Radiation oncology is considered safe, largely because of the decades-long recognition of its risks and the evolution of quality assurance (QA) regimes to mitigate these risks. Medical physicists, radiation engineers, and other technical and quantitative-minded individuals, integral to radiotherapy practice, bring an objective and systematic approach to QA[36]. The term QA is defined by the International Standard Organization (ISO) as 'all those planned or systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality'[37]. QA activities are of vital importance in the delivery of safe, quality patient care in radiation oncology. A national approach to QA should be planned and facilitated to make radiotherapy more consistent and ensure safety for patients.

The process of delivering radiotherapy treatments is complex and involves understanding of the principles of medical physics, radiobiology, radiation safety, dosimetry, radiation treatment planning, simulation and interaction of radiation with other treatment modalities. Each step in the integrated process of radiation oncology needs quality control and quality assurance to prevent errors and to give high confidence that patients will receive the prescribed treatment correctly[38]. The World Health Organization (WHO) states that proper QA measures are imperative to reduce the likelihood of accidents and errors and increase the probability that the errors will be recognized and rectified if they do occur[39]. The incorporation of quality processes into radiation oncology practice allows institutions and individuals to systematically review their processes and adapt them going forward.

Providing safe, quality care is broader than just QA of the techniques and technologies used as part of radiotherapy. QA is part of the broader topic. As part the strategic plan the Radiation Oncology Practice Standards should be promoted and used to help shape the future so that they are an integral part of service planning and implementation. In this regard, the Standards should be used as a foundation and a framework

for service planning which would support safe and quality care. Enabling access to a quality service has to be the primary goal of planning any health service. There has been wide stakeholder input into the development of the Radiation Oncology Practice Standards which supports it being used as the foundation for service planning.

The WHO further recommends a number of general preventative measures aimed at reducing radiotherapy errors[40]:

- A thorough quality assurance program to reduce the risks of systematic equipment and procedural-related errors;
- A peer review audit program to improve decision making throughout the treatment process;
- Extensive use of procedural checklists;
- Independent verification through all stages of the process;
- Specific competency certification for all personnel;
- Routine use of in-vivo dosimetry.

The goal of a radiation oncology QA program is to deliver the best and safest radiotherapy treatment to each patient to achieve cure or palliation[38]. Radiation Oncology Practice Standards, a Tripartite Initiative, outline the components of a quality radiotherapy service at facility level and include a key section on safety and quality management. A number of guidelines on QA have also been developed in Australia, with the Radiation Oncology Practice Standards able to provide the overall framework for these activities.

In a recent study 75% of facilities reported that they were participating in a formal QA system. However, there were considerable variations in the policies followed and QA procedures performed[41]. In the absence of national accreditation in line with the Radiation Oncology Practice Standards, the variation in quality programs between facilities presents an ever-increasing risk. This risk increases in line with the following challenges in radiation oncology QA[36]:

- Increased time demands and workflow;
- Higher doses of radiation are delivered more precisely and accurately, meaning that with the increase in beam-on time there are higher risks associated with each error;
- Reliance on accurate imaging technology where various imaging factors which previous had low impact on accuracy now have a higher impact on accuracy, for example stereo-tactic radiosurgery;
- Reduced utility of some 'end of the line' QA tools as processes evolves to a point where the traditional 'end of the line' QA tools are insufficient and so either replaced or discarded;
- Shorter treatment schedules leading to reduced time to assess and manage any error;
- Tighter margins mean that the consequences of geographical misses or dosimetric inaccuracies become larger.

A national and consistent approach to radiation oncology quality assurance is needed in Australia, strengthened through an accreditation program based in the Radiation Oncology Practice Standards. This should include a national reporting framework to identify issues associated with quality, similar to the anonymous reporting mechanism used in the aviation industry, which should be beneficial to identify quality issues early and address these issues to reduce the number of patients affected. This incident reporting strategy is discussed in detail under Continuous Quality Improvement (on page 56).

Dosimetry

Dosimetry is used to check that the dose of radiation delivered to the patient is accurate and appropriate. It ensures the risks of accidental over- or under-doses are minimised, leading to the best possible results from treatment. The Baume Inquiry recommended that there be a national dosimetry program. This recommendation was amplified by two significant dosimetry incidents in Australia and the pilot of the Australian Clinical Dosimetry Service (ACDS) was established in 2011. This program is well supported by the radiation oncology community in Australia with almost all centres agreeing to participate in the pilot study[42].

Establishing an independent national dosimetry service places Australia at the forefront of risk mitigation and patient care, even among the most technically advanced countries in the world[43]. Only the UK, the US and some of the Scandinavian countries have developed programs which provide a level of clinical support similar to that which will be provided by the ACDS. The service will also help to maintain the quality of radiotherapy in Australia, and provide a national approach to radiation measurements, making radiotherapy more consistent across the country and safer for patients[43].

The ACDS provide an integrated national approach and extension of this dosimetry service beyond its three year pilot is an important step to enhancing the quality and safety of the Australian radiation oncology sector.

Quality of life and survivorship

The selection of technique and technology for the treatment of patients with radiotherapy strongly influences quality of life (QOL) and survivorship for patients. The increasingly positive survival statistics for individuals diagnosed with cancer indicating increasing lengths of survival mean that QOL many years after diagnosis is becoming increasingly important. QOL and survivorship are strongly dependent on other treatments provided in the multidisciplinary environment and are essentially whole of cancer issues – they cannot be relegated to the silos of radiation oncology, medical oncology, surgery or haematology. These issues need to be examined over time in the context of the multidisciplinary team. The radiation oncology team must have awareness of and sufficient resources to contribute to this process.

Survivorship is a term that represents how a person's life fares following a diagnosis. It is a concept which can be used in cancer to describe the physical, social, psychological, and spiritual/existential impact of cancer on patient's life and help understand these factors. Cancer survivorship can be viewed as a continual evolving process starting from the moment of cancer diagnosis which occurs over the course of the remainder of life and can be defined as the experience of "living with, through, or beyond cancer"[44].

With the implementation of newer radiotherapy techniques and improved delivery technologies, the inference or claimed improvement in QOL or survivorship needs to be assessed. As part of this process, data on the late side effects of radiotherapy need to be systematically collected and evaluated. All of this information can be used to inform health professionals in radiation oncology so that they are aware of changes in QOL and survivorship to better understand and support patients during radiotherapy[45].

The information gathered from assessing QOL and other survivorship measures is also important as part of the total quality management for cancer care by providing information that can be used to inform appropriate selection of treatment technique in the future.

The contribution of radiation oncology to quality of life and survivorship outcomes needs to be an essential component of the National Cancer Action Plan and is part of the total quality management of radiation oncology for the benefit of the Australian cancer patient.

Continuous Quality Improvement

A quality management system for radiation oncology

A part of implementing a quality system, such as ISO 9001 or the ACHS Quality Standards, is implementing a mechanism by which the users of the quality system can learn from experience and developed the system over time into one which provides services of an even higher quality. This is termed quality improvement. Examples of improved quality by following this process can be reducing errors in service delivery, implementing techniques and technologies that have higher precision and accuracy, increasing efficiency and access, amongst others.

Quality improvement capacity needs to be aligned with professional receptiveness, leadership, technical expertise and survey data. It is important to remember that the patient is the greatest beneficiary of an optimal quality program[46].

Without an explicit feedback mechanism in place, the evaluation of the outcomes of an existing system is not necessarily provided as feedback to the users. Part of any quality system is the ongoing review and audit cycle in which all the quality system documents and processes are regularly reviewed. In this regard the following should be undertaken:

- A regular review of the Radiation Oncology Strategic Plan which includes an evaluation of the implementation of previous strategic plans;
- A regular review of the Radiation Oncology Practice Standards which use information gained from implementing the standards to inform the review;
- The development of a system by which workers on the floor are able to identify issues affecting service quality and to bring these rapidly to the attention of management with issues being escalated quickly and remedied promptly.

It should be recognised that, from a strategic point of view, the radiation oncology strategy and standards are part of the quality system and should be part of the evaluation and review process. The Radiation Oncology Practice Standards and the Tripartite Strategic Plan need to be included as part of the review and audit cycle and are incorporated in the strategic plan itself. This self-referential process is common to the quality manuals and similar established under existing quality standards, such as ISO 9001, and a similar quality system should be adopted.

Incident monitoring

Stakeholder submissions to the Tripartite Plan raised the quality imperative of a national radiation oncology incident monitoring system. Currently, generic incident monitoring and reporting systems exist in all healthcare facilities. Unfortunately, these systems were not designed for recording radiotherapy incidents and near misses.

Understanding why errors in radiation oncology occur and enhancing systems for error detection and harm minimisation play a central role in the delivery of quality services. Factors that can contribute to errors in radiation oncology include: lack of training, competence or experience; fatigue and stress; poor design and documentation of procedures; hierarchical departmental structure; staffing and skills levels; changes in process and others[47]. While local reporting, investigation and learning following an incident are important, it is likely that other centres are experiencing similar issues. The transfer of knowledge between radiation oncology facilities is important to make radiation oncology sector safer across Australia. The absence of a national incident monitoring system in Australia constrains analysis of systemic process issues. This means that such issues can remain unidentified and therefore unaddressed, putting patients at risk.

The potential of incident reporting systems to detect, monitor, and reduce the occurrence of incidents should be recognised. For example, the Radiation Oncology Safety Information System (ROSIS) has been widely used in Europe. ROSIS aims to reduce the occurrence of incidents in radiation oncology by:

- Enabling the clinics to share reports on incidents with other clinics as well as with other stakeholders such as scientific and professional bodies
- Collecting and analysing information on the occurrence, detection, severity and correction of radiotherapy related incidents
- Disseminating these results and generally promoting awareness of incidents and a safety culture in radiation oncology[48].

Going forward, the radiation oncology sector needs to adopt a more systematic approach to reporting and understanding the causes of errors and harm. Clear criteria and definitions need to be agreed to categorize different types of errors and their causes, and to be able to facilitate analyses that lead to methods of prevention[36]. The establishment of a national radiation oncology incident monitoring system would be a significant step in establishing and enhancing safe delivery of radiation oncology in Australia.

Engendering Leadership and Fostering a Culture of Quality

Sustainability of a quality system

Even with a quality system in place, its adoption by the users is contingent on the quality system becoming part of the culture of the workplace. In radiation oncology, a nationally consistent approach to a quality culture, both from an informed expectation of the patients and the healthcare professionals, would encourage the adoption of a quality management system and adherence to the Radiation Oncology Practice Standards.

To ensure the ongoing sustainability of a quality system established under the Radiation Oncology Strategic Plan, the culture of quality should be fostered. Some organisations have identified several aspects which foster the required culture, which are:

- Identifying that all members of the radiation oncology community are in this together including jurisdictions, facilities, suppliers and patients;
- Understanding that there should be no subordinates or superiors allowed which inhibit free communication or democratic decision making;
- Valuing open and honest communication;
- Providing access to all information on all operations to everyone, within the limitations of privacy;
- Focusing on processes, which are constantly improved by evaluating outcomes and using evidence-based best practice;
- Recognising that both successes and failures are opportunities for learning.

These aspects need the investment of resources such as an information and communications system being able to be shared by all users. Establishing and promoting this culture of quality may be challenging given concerns for patient privacy and commercial interests between private and public practices. However, some elements may be implemented across Australia, while other elements supported and encouraged within a facility through incentivisation schemes or professional learning opportunities. This would include support for succession planning and networking for those individuals within a facility who are responsible for quality management. This leadership in quality management within radiation oncology should be developed and resourced throughout Australia to provide the means to sustain an on-going quality culture.

It has occurred in the past that centres would shut down services when change of management occurs. This can result in patients losing local access to treatment either part way through their treatment or for a period a time after diagnosis. These events should be managed in such a way for the continuity of service delivery to be met through appropriate service planning which may include transfer of patient referrals so that access to radiation oncology services are minimally disrupted. These events should be coordinated through the national strategic planning framework and will require collaboration of public and private providers possibly across jurisdictional boundaries.

Recommendations

A forward-looking strategy to deliver improved radiation oncology services

Importance of planning

1. Planning of radiation oncology services must be based upon achieving the agreed optimal target utilisation of radiotherapy for new cases of cancer (currently set at 52.3%).
2. The commitment needs to be made now so that the target optimal utilisation rate for radiotherapy can be met by 2022.
3. Radiation oncology service planning needs to occur:
    - 3.1. Regularly on a long-term basis and coordinated at a national level.
    - 3.2. With reference to other cancer therapies.
    - 3.3. Ensuring that patients have clinically appropriate and affordable therapies.

Keeping pace with radiotherapy techniques and technologies

4. Health technology assessment processes at all levels must be improved so innovations that provide value for both the cancer patient and the health system are effectively implemented.
5. There needs to be a sustainable financial model for the introduction of new radiotherapy techniques and technologies based on comparative effectiveness.
6. A radiation oncology registry of treatments and outcomes needs to be established to provide data capture and post-market surveillance.

Harmonisation of legislation

7. Regulatory legislation and processes should be harmonized across jurisdictions.

Minimum radiation oncology data set

8. A minimum radiation oncology dataset must be established, implemented and incorporated into a future national cancer data set.
9. All radiation oncology services must comply with the requirements of a radiation oncology national dataset and provide data.

The availability of radiotherapy to all patients for whom it is clinically appropriate which can be accessed in a timely manner

Timely access

10. Planners, decision-makers and service-providers must ensure that radiation oncology services have the capacity for patients to receive radiotherapy within clinically appropriate timeframes.
11. National targets for timely access to radiotherapy (as recommended by National Health and Hospital Reform Commission) should be set and services should be reporting against these targets.

Financial impact on patients, families and cares

12. The financial impact of accessing cancer treatment should be minimized to ensure that optimal treatment is available to all patients.
13. Legislative issues must be resolved to allow out-patient radiation oncology to qualify for private health insurance

A patient-centred, evidence-based and multidisciplinary approach to practice

Empowered consumers

14. Patients, carers and families need to be empowered such that:
    - 14.1. They are provided with current, relevant and evidence-based information regarding radiotherapy.
    - 14.2. Information is available in languages other than English, where appropriate.
    - 14.3. Any costs associated with treatments are clearly described prior to treatment.
    - 14.4. Current radiotherapy waiting times information is made publicly available.
15. There needs to be a central information resource on radiation oncology that is:
    - 15.1. Reliable and appropriate
    - 15.2. Readily accessible in all geographic locations

Radiation oncology practice standards

16. The Radiation Oncology Practice Standards must be mandatory.
    - 16.1. A mechanism for oversight of compliance with the Standards needs to be established and funded.
    - 16.2. The professions to regularly review and keep the Standards contemporary.

Evidence based multi-disciplinary oncology practice

17. Multidisciplinary Team management is the gold-standard of cancer care and must be supported by services, professionals and planners.

Clinical peer-review audit

18. Peer-review practices should be supported and increased to minimise process variation and ensure that treatments comply with best practice.

Ongoing evaluation of quality assurance, patient quality of life and survivorship

Quality assurance for safety and quality care

19. A national framework for quality assurance should be developed to make radiotherapy more consistent and to ensure patient safety.

Dosimetry

20. The Australian Clinical Dosimetry Service must be made permanent to ensure safe delivery of radiotherapy.

Quality of life and survivorship

21. Patient survivorship must be a focus of cancer management.

Continuous quality improvement

A quality management system for radiation oncology

22. There must be a national reporting framework to identify issues associated with quality.
23. A formal benchmarking exercise across jurisdictions and radiation oncology facilities must be undertaken, including activity targets, waiting times and clinical patterns of care variation:
    - 23.1. Service and planning benchmarks must be agreed nationally
    - 23.2. Variability between services must be measured and reported
    - 23.3. Individual plans must be developed for services to meet the benchmarks

Incident monitoring

24. A national incident monitoring system specific to radiation oncology must be implemented.

Engendering leadership and fostering a culture of quality

25. Quality management and leadership must be included in all professional training programs.

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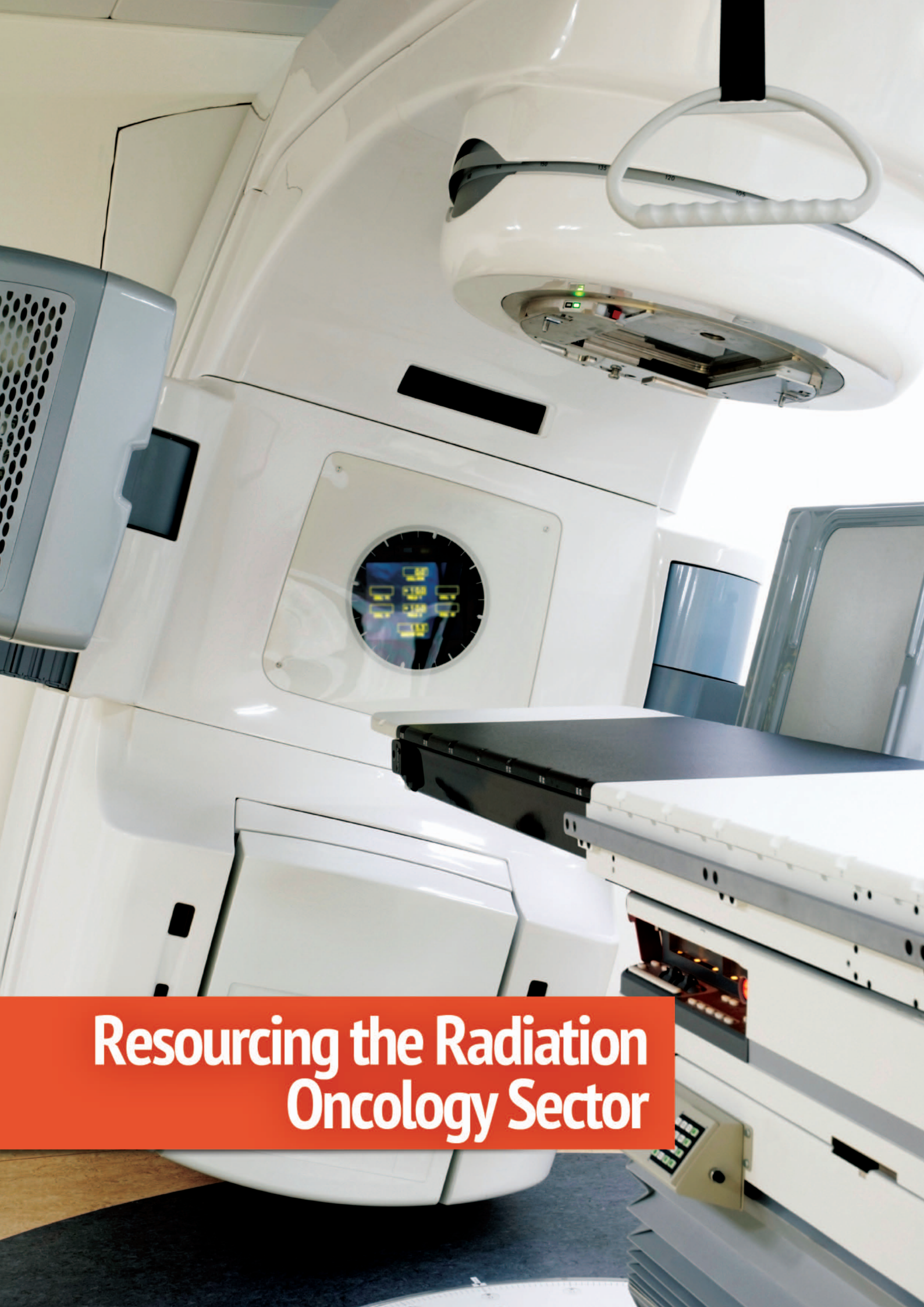


Resourcing the Radiation Oncology Sector

In this section

Key Issues

Delivery of a quality radiation oncology service for cancer treatment relies on the availability of specialised workforce and infrastructure. The situation across the Australian radiation oncology sector is such that:

- The current numbers and trends in the availability of workforce and linear accelerators (linacs) are not sufficient to meet the target optimal utilisation rate of 52.3% of new cancer patients either in 2012 or in 2022;
- There is a lack of effective coordination between bodies responsible for workforce, resources and infrastructure planning;
- A critical barrier for patients to access radiotherapy is their proximity to radiation oncology facilities;
- Appropriate imaging and specialised radiotherapy techniques (such as IMRT) are not cohesively incorporated into service plans and infrastructure planning;
- Ongoing resourcing for the national program of equipment replacement within agreed lifespans is essential to ensure that radiotherapy equipment is kept current.

Objective

The radiation oncology workforce and infrastructure are appropriate to meet current and future cancer incidence.

Defining Success

A prospectively planned and nationally coordinated radiation oncology service across Australia, which includes the following:

- Cancer incidence is the basis for planning;
- Workforce and infrastructure are planned together in a coordinated way;
- Workforce training is aligned with service demand projections and supported appropriately;
- A National Cancer Action Plan which includes radiation oncology is adopted;
- Jurisdictional radiation oncology action plans are developed, maintained and integrated with the National Cancer Action Plan;
- Closer consultative collaboration between governments, policy-makers, service providers, patients and the professions to ensure most effective use of resources;
- Innovative models of quality service provision are developed to improve efficiencies.

Calculating Demand for Radiation Oncology Services

Calculations of the demand for radiation oncology service that underpin this section of the Plan are based on the following model.

Number of new cancer cases	x	Radiotherapy utilisation rate	=	New cases requiring radiotherapy	+	Re-treatment cases and treatment of non-notifiable disease	=	**Total number of cases requiring radiotherapy**

The Australian Institute of Health and Welfare (AIHW)[1] projected cancer incidence data was used (all cancers excluding basal and squamous cell carcinomas of the skin). The target radiotherapy utilisation rate for new cancer cases was the clinically-appropriate benchmark of 52.3% for notifiable cancers[2]. For each year between 2012 and 2022, the utilisation rate was applied to the projected incidence of new cancer cases to obtain the number of new cases to receive radiotherapy. This result is increased by 25% to account for retreatments, and by 10 % to account for treatment of non-notifiable disease[3]. In this way the total number of cases requiring services is obtained.

Workforce

Introduction

Radiation oncology is a complex multidisciplinary service and requires interaction between a range of professionals. Workforce has historically been a rate-limiting step in radiation oncology. At facility level, workforce profile is considered in terms of risk management as it can be a causal factor in adverse patient care incidents. Specific emphasis is needed to match workforce strategies to service expansion plans to provide a quality service, ensure that investment in workforce is used effectively and to grow the facilities infrastructure sustainably.

The specialist workforce

Radiation oncology treatment is delivered by three core professional groups: Radiation Oncologists (RO), Radiation Therapists (RT) and Radiation Oncology Medical Physicists (ROMP). This essential team must be supported by a broader inter-professional team which include: engineers, IT support, data managers, oncology nurses, social workers, dietitians and other allied health professionals. Although detailed workforce analysis for the broader team supporting cancer care is outside the scope of this plan, these groups are essential to optimising outcomes for patients and the access to allied health staff is explored in the section on Rural and Regional Access (on page 96).

Radiation Oncologists

Radiation Oncologists (ROs) are the medical specialists responsible for the treatment of patients with cancer through the use of ionizing radiation. A Radiation Oncologist is a medical specialist who has specific postgraduate training in management of patients with cancer, in particular, involving the use of radiation therapy. They are responsible for assessing the patient by clinical evaluation, and organising imaging and other tests, in order to establish and implement a management plan for an individual. Patient management may include assessment, treatment, follow-up, and psychosocial and physical care coordination.

Radiation Therapists

Radiation Therapists (RTs) are responsible for working with patients throughout their treatment course, to localise the area to be treated, develop dosimetry and accurately deliver radiation therapy, as prescribed. In conjunction with the Radiation Oncologists they are responsible for the design, accurate calculation and delivery of a prescribed radiation dose over a course of treatment to the patient.

Radiation Oncology Medical Physicists

A Radiation Oncology Medical Physicists (ROMPs) are medical physicists who establish, implement and monitor processes which allow optimal treatment using radiation, taking account of the protection and safety of patients and others involved in the treatment process. In their role, a ROMP:

- Consults on optimisation of medical exposures;
- Performs or supervises radiotherapy calibration, dosimetry and quality assurance; and
- Gives advice on matters relating to radiation protection[4].

Estimating workforce requirements and projecting future need

The Tripartite Committee has commissioned the Allen Consulting Group to develop an analysis of the medical radiation workforce and projections covering the next ten years. This work covers three professional groups:

- Radiation Oncologists;
- Radiation Therapists; and
- Radiation Oncology Medical Physicists (ROMPs).

Previous studies have been conducted on radiotherapy workforce, in particular, the 2009 Health Consult for the Department of Health and Ageing. However, the Tripartite Committee did not find that previous work provided the answers to the key questions underpinning the Plan. Therefore, the Allen Consulting Group was commissioned to work on updated data and makes more variables available for analysis. Workforce and linac projections in this section of the Plan are based on the Allen Consulting Group work.

In order to estimate potential workforce shortfalls for each occupation into the future, demand for, and supply of, full-time equivalent (FTE) professionals has been estimated over the period 2012 to 2022. The base year is 2011 and projections start from 2012 and extend through to 2022. Projections of the medical radiation workforce rely on assumptions regarding supply and demand.

Factors that influence workforce demand

A number of factors influence the medical radiation workforce demand. These include:

- Incidence of cancer;
- Availability of linacs;
- Availability of clinical training positions;
- Actual and optimal radiotherapy utilisation rates;
- Relevant State/Territory and Commonwealth government policies.

Projections are further based on the number of linacs required to service patients, which are calculated based on the industry accepted average number of courses of treatment (414) each linac can accommodate per year.

Target utilisation for radiation oncology- closing the gap in patient access

The demand projections in the Plan factor in the increasing incidence of cancer and the utilisation rate. Target utilisation was set to 45.2% in 2017 and 52.3% in 2022. A utilisation rate of 52.3% is estimated to be the optimal rate, and 45.2% was taken as the mid-point between the target rate and the current under-utilisation rate of 38.1%[4-6].

Factors that influence workforce supply

Factors which influence the supply of this workforce include:

- The supply of newly qualified personnel;
- Participation rates;
- Flexible work arrangements;
- Work practices, including use of time for different purposes;
- Retirements from the existing workforce; and
- Relevant government policies.

Baseline workforce supply – business as usual

The projections calculate the supply of FTE professionals from which it is possible to derive headcount numbers. The baseline supply estimates the supply of professional FTEs into the future assuming that current entrant and attrition trends continue. The projections build on the base year's supply of professional FTEs, with inflows into the occupation due to trainees, immigration and re-entry added each year, and outflows due to retirement and other factors such as emigration and career change removed each year. The inflow due to trainees is the intake of trainees each year minus the average loss rate from the trainee program. The entry and attrition inputs have been determined based on historical data sources. They are held constant across future years, but the calculations are conducted year on year.

This gap between the current rate of radiotherapy under-utilisation (38.1%) and the target rate (52.3%) represents the magnitude of the unmet need for radiation oncology services in Australia. To close this gap, appropriate radiation oncology infrastructure and workforce are required. Assuming that appropriate facilities were to be put in place, the table below summarises the number of radiation oncology professionals required in 2012.

Current workforce and required workforce: 2012

Profession	*Available workforce 2012*	*Workforce required to meet target utilisation rate of 52.3% (FTE)*	*Shortfall*
Radiation Oncologists	259	415	156
Radiation Therapists	1447	2073	626
Radiation Oncology Medical Physicists	203	415	212

Issues impacting on the workforce

Stakeholder consultation identified a number of factors that impact on the radiation oncology workforce, these include:

- Uncertain funding mix and regulatory environments for both senior and trainee workforces;
- The ageing of the workforce;
- Increasing trend towards part-time work; and flexible work hours;
- Perceived issues of early retirement or exit of experienced professionals from the workforce;
- Perceived declining attraction of the professions;
- Increasing dependence on overseas recruitment;
- Increased training requirements necessitating more volunteer time from supervisors;
- Difficulty for existing accredited training facilities to balance the increasing demand for training positions and provision of clinical services;
- Reported difficulties for jurisdictional health departments to maintain staff salary increases and competition between jurisdictions and facilities for skilled workforce;
- Challenges in funding the difference between the actual salary for training positions and the Commonwealth funding received;
- Increasing demand and changes to the workforce mix due to the opening of regional cancer centres.

There are also a number of issues specific to the each individual profession in radiation oncology sector:

- Some jurisdictions have reported they have half the number of radiation oncologists they require now;
- Widely reported deficiencies in the number of training positions for ROMPs;
- The status of Commonwealth funding for ROMP and RT training positions is uncertain;
- There is a significant disparity in remuneration for ROMPs across the Australia, creating a system where graduates flock to states with higher remuneration;
- Radiation Therapists post National Professional Development Programme (NPDP) often exit the profession because positions are not available. Although some hope this will be remedied when the new regional radiation oncology treatment centres open, the problem may remain because some graduates may not wish to relocate for work.

Projecting the 2022 Workforce Requirements

Assuming the achievement of the target utilisation rate of 52.3% in 2022, significant workforce shortfalls would occur by 2022. These are summarised in the table below. Significant action coordinated nationally would be required to meet these shortfalls, including implications for the funding of additional linacs and clinical training positions.

*Estimated workforce and required workforce: 2022**

Profession	*Estimated workforce 2022 (current trends)*	*Workforce required to meet target utilisation rate of 52.3% (FTE)*	*Projected short*
Radiation oncologists	499	535	36
Radiation Therapists	2135	2673	538
Radiation Oncology Medical Physicists	327	535	208

Source: The Allen Consulting Group, 2012[7]

Appendix I provides these projections for each jurisdiction across Australia.

** These projections of radiation oncology workforce are an extrapolation of past trends, assuming that the same trend will continue into the future, and are intended to illustrate future changes that may reasonably be expected if the assumptions underpinning the model were to apply over the projection period. These projections are not forecasts and do not allow for future changes in cancer incidence, treatments, risk factors or other factors. No liability will be accepted by the Tripartite Committee or its member organisations for any damages arising from decision or actions based upon these projections.*

Radiation Oncologist Workforce

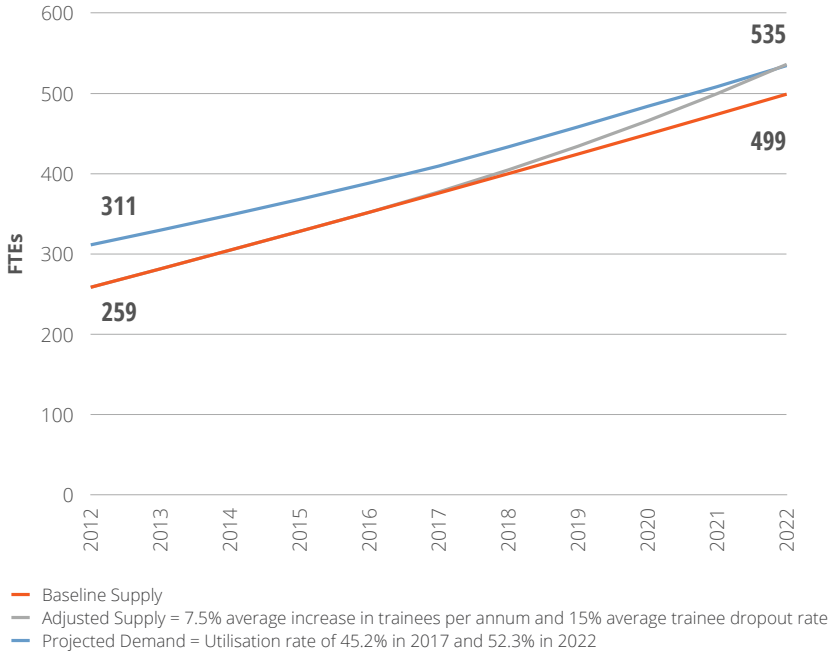
Baseline workforce supply – business as usual

Starting from a base supply of 235.8 FTE professionals in 2011, the Ra diation Oncologist baseline supply model, which assumes current entry and attrition trends will continue, projects a supply of 376 FTE professionals in 2017 and 499 FTE professionals in 2022. The precise difference between supply and demand depends, in large part, upon the utilisation rate that will be achieved in 2017 and 2022.

Target utilisation for radiation oncology- closing the gap in patient access

In 2017, with an utilisation rate of 45.2%, 410 FTEs would be required, resulting in a shortfall of 34 FTEs. If the target utilisation rate of 52.3% is to be achieved by 2022, the model projects that 535 FTEs would be required in 2022, resulting in a workforce shortfall of 36 FTEs (see Figure).

Radiation oncology workforce in 2022 target utilisation scenario



Source: The Allen Consulting Group, 2012[7]

What needs to be done

In order for supply to meet target utilisation in 2022, the intake of trainees over the years 2012 to 2017 needs to increase, on average, by around 7.5% each year (resulting in an inflow of 31 FTE trainees into the occupation in 2022, assuming the dropout rate from the trainee program remains at 15%). Historical data indicates that the intake of trainees has been increasing at a rate of only 2% per annum over the last 10 years.

Radiation Therapist Workforce

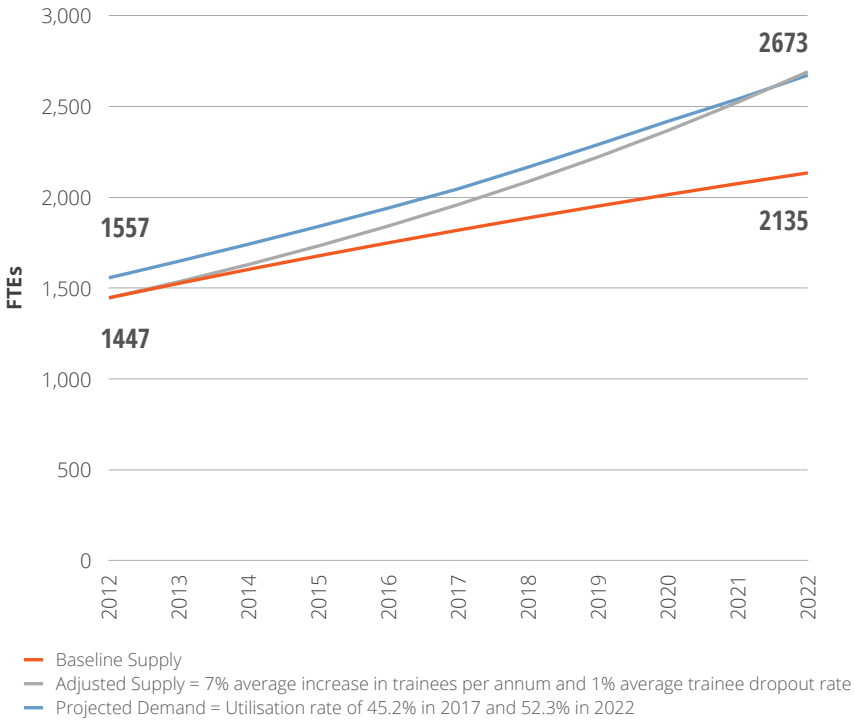
Baseline workforce supply – business as usual

Starting from a base supply of 1364.4 FTE professionals in 2011, the Radiation Therapist baseline model projects a supply of 1726 FTE professionals in 2017 and 1947 in 2022.

Target utilisation for radiation oncology- closing the gap in patient access

In 2017, with an utilisation rate of 45.2%, 2047 FTEs would be required, resulting in a shortfall of 228 FTEs. If the target utilisation rate of 52.3% is to be achieved by 2022, the model projects that 2673 FTEs would be required in 2022, resulting in a workforce shortfall of 538 FTEs (see Figure).

Radiation therapist workforce in 2022 target utilisation scenario



Source: The Allen Consulting Group, 2012[7]

What needs to be done

In order for supply to meet target utilisation in 2022, the intake of trainees over the years 2012 to 2021 needs to increase, on average, by around 7% each year (resulting in an inflow of 292 FTE trainees into the occupation in 2022, assuming the dropout rate from the clinical trainee program remains at 1%).

Radiation Oncology Medical Physicist Workforce

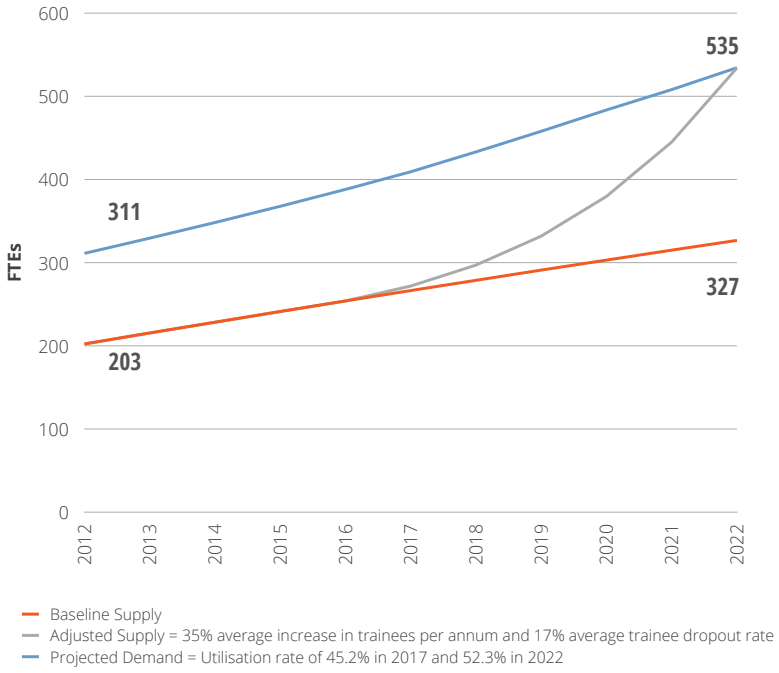
Baseline workforce supply – business as usual

Starting from a base supply of 189.2 FTE professionals in 2011, the ROMP baseline model projects a supply of 267 FTE professionals in 2017 and 327 in 2022.

Target utilisation for radiation oncology- closing the gap in patient access

In 2017, with an utilisation rate of 45.2%, 410 FTEs would be required, resulting in a shortfall of 143 FTEs. If the target utilisation rate of 52.3% is to be achieved by 2022, the model projects that 535 FTEs would be required in 2022, resulting in a workforce shortfall of 208 FTEs (see Figure).

Radiation oncology medical physicist workforce 2022 target utilisation scenario



Source: The Allen Consulting Group, 2012[7]

What needs to be done

In order for supply to meet target utilisation in 2022, the intake of trainees over the years 2012 to 2017 needs to increase, on average, by around 35% each year (resulting in an inflow of 94 FTE trainees into the occupation in 2022, assuming the dropout rate from the trainee program remains at 17%). Historical data indicates that the intake of trainees has been increasing at a rate of only 6% per annum over the last seven years.

Interpreting the results

The estimates are conservative and likely under represent the demand for the workforce.

The projections of radiation oncology workforce numbers are conservative estimates for a number of reasons:

- Linac throughput of 414 is used as a planning parameter, however, data from hospitals across Australia indicates that the actual throughput may be lower than that;
- Trends towards more complex and time-consuming treatments may negate efficiency gains in other areas;
- Generational changes that affect the Australian society generally are likely to also have an impact on the radiation oncology workforce. The most likely implication may be the increase in professionals working part time;
- The increasing number of regional cancer centres may result in a misdistribution of the workforce, with an over-supply in metropolitan and an under-supply in regional areas.
- Conversion of FTE projection into headcount (i.e. people) is likely to increase the numbers required.

The workforce projections are entirely contingent on the availability of the appropriate radiation oncology infrastructure.

In the absence of appropriate infrastructure, including facilities and equipment, the radiation oncology workforce will not be able to deliver radiotherapy services. This will result in unhealthy workforce dynamics and is likely to impact on the future ability of the sector to recruit top quality graduates into the professions.

The workforce projections cannot be viewed in isolation from each other.

The three radiation oncology professions are interdependent in the delivery of quality radiotherapy treatments. Significant shortage of any profession inhibits the provision of services by the others. This is over and above the link between the professions and the infrastructure availability.

Implications for the training programs

There are limits to the capacity of each training program to expand with the requisite urgency to achieve the target utilisation of 52.3%. Growth in training programs needs to be planned carefully to acknowledge the challenges the workforce is currently facing. Planning needs to recognise the need for sustainable growth in training programs and cannot be done independently of facility planning.

Impact on clinical supervisors and examiners

With training program expansion, the professions need to ensure that there are enough clinical supervisors to train trainees effectively, while effectively managing their clinical workload. The need to accommodate further increases in trainee numbers will challenge all three professions, because there are limited numbers of supervisors and examiners available.

Availability of educational resources

Many radiotherapy centres are already under considerable clinical training strain. Training and education are currently provided in addition to the normal duties of clinicians. There are limited education resources available that take advantage of improved technologies to reduce the burden on clinicians of providing didactic lectures.

Need for nationally coordinated training networks

Regional and rural training must be considered as an integral part of training. The allocation of training positions often depends on the individual facility's capacity to provide comprehensive training. A pilot project for supported training networks for radiation oncology trainees is underway with funding from the Commonwealth Department of Health and Ageing. A nationally coordinated training network approach will enable provision of adequate breadth of training for trainees and would include new and established centres.

Specific issues – Radiation Oncologists

There is a greater need for Fellowship positions (with related funding required), to provide a post graduate training pathway for radiation oncologists.

Fellowship positions in this context refer to positions filled by recently graduated specialist Radiation Oncologists following their Registrar (vocational) training, undertaken as a transition to specialist level employment. These positions are usually filled for one year, although are of no defined duration. The positions can include any mix of clinical and research-based work and can involve the integration of other post-graduate qualifications. Fellowship positions can be undertaken locally or internationally with many Fellows using the role as an opportunity to practice in a different centre to the one in which they completed their specialist training, thus broadening their training experience.

Fellowships are a highly desirable component of post-graduate training through which Radiation Oncologists develop important clinical and research skills that allow them to remain at the forefront of cancer management and research, thereby ensuring that Australian and New Zealand cancer patients receive the best possible care.

Specific issues – Radiation Therapists

For service and workforce planning reasons, the radiation oncology sector clearly has a vested interest in student numbers entering medical radiation science courses In Australia. Effective workforce planning must also involves consideration of the need for clinical service providers to accommodate clinical education and training for students, an essential component of entry level training. Service providers themselves however exert only some influence over student numbers. Governments, universities themselves and educational, vocational and economic market forces arguably have far greater influence on total numbers in the available workforce.

Balancing student numbers with the number of available clinical placements will be an increasingly important issue in workforce planning. Wide and coordinated consultation between governments, universities, clinical services and those responsible for workforce planning will be necessary. This is particularly so given the workforce projections to 2022 prepared as part of this Tripartite National Strategic Plan and anecdotal evidence that suggests clinical centres are already under significant student training stress.

An example of the problems that result from ineffective consultation is a unilateral decision by a university in recent years to cease its undergraduate radiation therapy course and only offer a post graduate entry level course. Anecdotally, the graduate output from this school now appears to be declining and the viability of the course threatened whilst at the same time state RT workforce needs are increasing. The radiation oncology sector can ill afford such examples to be repeated and the matching of students with clinical placements and workforce needs will be critical to success.

The other priority issues for RT training are:

- Further support and development of virtual learning environments base on the need to ease the burden on clinical services to provide for clinical placements and training;
- For education and training to focus on supporting advanced and extended scopes of practice as a means of establishing enhanced and robust career pathways in the profession and a more skilled and knowledgeable workforce[8];
- Academic courses to include more emphasis on quality management and research;
- Developing where applicable and appropriate assistant roles as is happening in other allied health professions and for which implementation frameworks are already in place in some jurisdictions[9] with a view to: providing the space for RTs to develop into more value added advanced practice roles; and to provide a feeder for the profession for assistants to go on to undertake further training;
- Development of strategies to attract more Indigenous and regional students into radiation therapy and tailor education and training to their needs;
- Re-design the RT staffing model to ensure educational roles in staffing profiles are better matched to clinical training needs for both learners and qualified staff (re-design of the staffing model is underway).

Specific issues – Radiation Oncology Medical Physicists

The major workforce issue for ROMP's is ensuring adequate postgraduate clinical and academic education and training. There is no specific undergraduate degree for ROMP's and a career in Medical Physics relies on the completion of both an undergraduate (in physics or engineering) and a postgraduate degree with a major in medical physics. The post-graduate Training Education and Assessment Program (TEAP) generally takes three to five years to complete.

There are several challenges inhibiting the increases in the number of ROMPs:

- Declining attractiveness of undergraduate science degrees majoring in physics[10];
- Lack of funding for ROMP registrar positions;
- Lack of senior ROMP positions to appropriately supervise registrars;

Hospitals are increasingly concerned about rejecting funding for registrar positions, despite not having the supervisory capacity in place. This funding is often tied to clinical outcomes, diminishing the focus on training and education.

Some centres find it difficult to recruit senior medical physicists, even with the recent initiatives for experienced certification and certification of overseas-trained medical physicists. Medical Physics is likely to remain on the Australian Department of Immigration's Skilled Occupation List.

As part of meeting the need for senior ROMPs to train ROMP registrars, the option of employing dedicated training preceptors has proven beneficial to improve the quality and governance of the TEAP. Where these preceptor positions provide support to a network of training sites, the ROMP registrars are able to access to a wide variety of training opportunities enabling the quality of the TEAP graduates to be more consistent. If the preceptor support were to include regional centres then additional resources are required to allow movement of preceptor and registrars between centres.

Infrastructure

Introduction

In comparison with other branches of medicine, radiation oncology is highly dependent on physical infrastructure and equipment. Most people in Australia who have radiotherapy are treated with megavoltage X-rays produced by a linear accelerators (linacs).

The Tripartite National Strategic Plan utilised linacs as a basic unit of resource availability and projected the numbers of linacs required to meet the increase in cancer incidence numbers.

The importance of imaging in the delivery of quality radiotherapy and a range of essential radiotherapy techniques has also been considered.

Linacs require a number of important accompanying resources, which are not specifically assessed in the Plan, including:

- Radiation-proof bunkers
- Expansion pathways
- IT infrastructure and information systems
- Access to imaging modalities and other cancer treatments

Linear Accelerator Fleet in 2012

As of December 2011, there were 168 linear accelerators installed in Radiation Oncology centres throughout Australia, 108 (74%) were in the public sector and 60 (36%) in the private sector. Table one shows the number of linear accelerators by state and territory.

Linear accelerators in Australia 2011

State/territory	*Public*	*Private*	*Total*	*Population Sep 2011 '000*[16]	*Population per linac '000*
ACT	4	0	4	367	91.8
NSW	41	13	54	7,318	135.5
NT	2	0	2	231	115.5
QLD	17	16	33	4,599	139.4
SA	5	8	13	1,660	127.7
TAS	5	0	5	511	102.2
VIC	28	16	44	5,641	128.2
WA	6	7	13	2,367	182.1
Australia	*108*	*60*	*168*	*22,696*	*135.1*

Currency of radiotherapy equipment is maintained though the Australian Government Department of Health and Ageing program – Radiation Oncology Health Program Grants, which reimburses the cost of expensive eligible radiation oncology equipment to facilities. A profile of the linear accelerators in Australia is provided in Appendix II and demonstrates that government support has resulted in a reduction in the average age of linear accelerators.

Baseline linac supply – business as usual

In 2011 there were 168 linacs nationally. At current utilisation and throughput levels, the gap between the availability of, and requirements for, linear accelerators would be 5 nationally in 2022.

Target utilisation for radiation oncology- matching linacs to workforce

The table below summarises the workforce and linac requirements for reaching target utilisation of radiotherapy. The number of linacs needed in the table below does not take into account machine retirements.

2011 numbers of workforce and linacs, compared to projected requirements to meet target utilisation rate.

	Actual numbers	*Estimated numbers required to meet target utilisation rate of 52.3%*	
Year	*2011*	*2017*	*2022*
Linacs	168	208	267
ROs (FTE)	235.8	410	535
RTs (FTE)	1364.4	2047	2673
ROMPs (FTE)	189.2	410	535

Source: The Allen Consulting Group, 2012[7]

Projecting required linac numbers

The number of linacs that will be available and the number that will be required over the years 2012 to 2022 was projected. Each year of projections of the number of linacs that will be available adds the average number of linacs installed per year over the last five years, and removes those that should be retired. The 2011 data on existing linacs was broken down into year of installation.

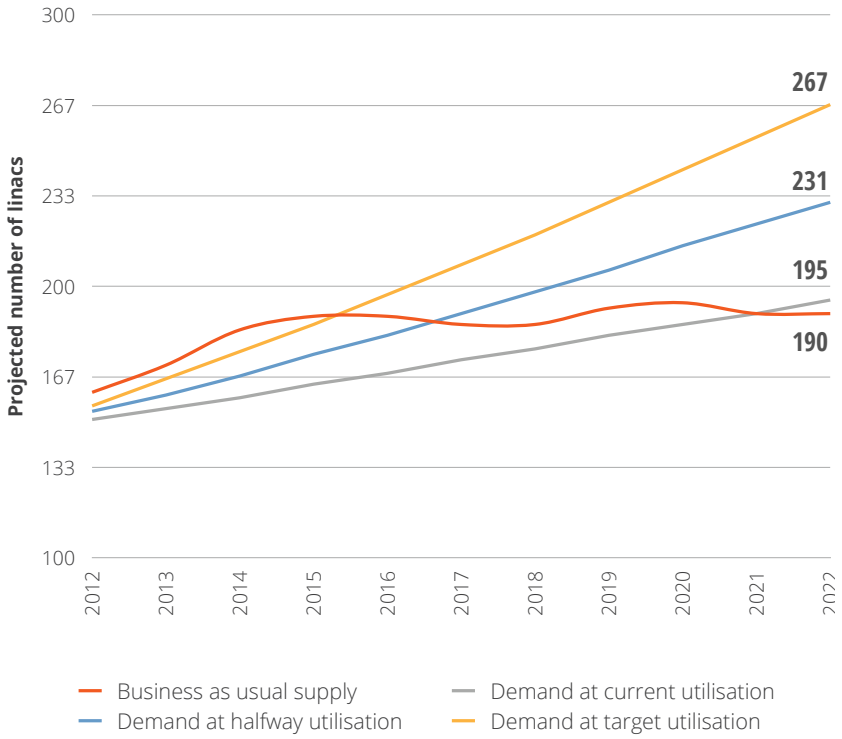
Projections are further based on the number of linacs required to service patients, which are calculated based on the industry accepted average number of courses of treatment (414) each linac can accommodate per year. It is acknowledged that linac throughput can vary based on the case mix of patients and service-related factors. The useful life of a linac was assumed to be 10 years.

Projected linac availability over the next 10 years, at the national level, was compared with 3 scenarios based on the utilisation:

- target – optimal rate of 52.3% by 2022
- halfway rate of 45.2% by 2022
- maintenance of current under-utilisation rate 38.1%.

The first year of projections (2012) removes all linacs in the current stock that was installed in 2002 or prior (15% of current stock), as it is assumed they will not be in service in the projected period. In the subsequent years, the linacs that were installed in the year that was 10 years prior are removed from the projections. The average number of linac installations per year, over the years 2007 to 2011 years, was calculated. Each year of projections adds this number to the previous year's stock.

Projected linear accelerator requirements 2012-2022



Source: The Allen Consulting Group, 2012[7]

Implications of Projections for Infrastructure Planning

Interpreting the results

The projections should be treated as baseline numbers rather than as the maximum linac numbers required.

The model developed by the Allen Consulting Group to predict the number of linacs required across Australia assumes that capacity needs equal demand. However, queuing theory (mathematical study of waiting times) proves that capacity needs to exceed mean demand to avoid the build-up of waiting times, including in radiotherapy[11]. Research into the required percentage of spare capacity needed to keep radiotherapy waiting times to treatment short found that about 10% spare capacity is required to ensure that 86% of patients are able to start radiotherapy within a week of completing the treatment planning process[12].

Meeting the target utilisation rate should therefore incorporate an additional 10% capacity in linear accelerator numbers to negate increases in the waiting times for treatment. This would mean that to meet the 52.3% target utilisation rate in 2022, at least 27 additional linacs would be needed extra to the projected number of 267 linacs to create this needed spare capacity.

It is possible that the lack of spare capacity allocation in previous calculations of linac requirements by service planners has resulted in unrealistic expectations regarding throughput and waiting times.

Linac requirements in each jurisdiction

Projected linac requirements for each State and Territory are not included in the Plan. There are two key reasons for this:

- Some jurisdictions have very low linac numbers and therefore the model is of limited use;
- While the national linac projections are robust, linac numbers at jurisdiction level should be based on local population characteristics and numbers.

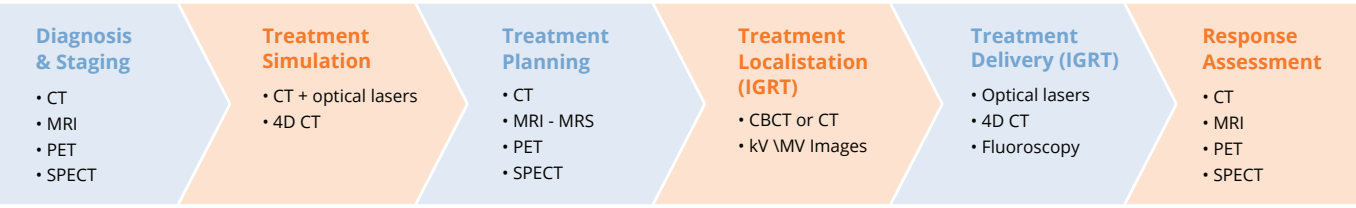
There are existing benchmarks for planning radiotherapy services on a population basis2. For every 1,000 cases of cancer in a population, 523 patients would need radiation as an optimal part of their management. Considering the average linac throughput (patients that can be treated in a year), for every 600 new cases of cancer, a linac is required.

Imaging in radiation oncology

The success of radiotherapy as a treatment modality is intimately related to the ability to accurately define, plan and deliver radiation treatment to the tumour whilst limiting dose to normal tissue. The confluence of technological advances in both imaging techniques and the way radiotherapy is being delivered has fostered even closer relationships between radiologists, radiation oncologists (RO), radiation therapists (RT), and radiation oncology medical physicists (ROMP). At the same time, the capital and human resource costs associated with these advances challenges the management of modern radiotherapy centres.

Advances in imaging technologies have supported improved treatment delivery and the development of new techniques in radiation oncology such as stereotactic body radiotherapy. Increased accuracy has led to improved tumour control rates and a reduction in treatment-related toxicities with resultant improved quality of life for cancer patients.

The imaging phases of the best practice radiotherapy process



The increasing use and complexity throughout the best practice radiotherapy process is demonstrated in the figure above.

Diagnosis and staging

There is now a large body of evidence showing that more accurate staging in cancer is associated with better patient selection onto treatment pathways.

The imaging used for diagnosing and staging the disease should have quantitative capabilities allowing for longitudinal studies to be performed. During treatment and for follow up on completion of treatment, the quantitative capability of the imaging system must be verifiable and maintained to allow accurate and precise evaluation of treatment outcomes in a quantitative manner. This requires the imaging systems to be adequately calibrated and maintained which requires consultation with Diagnostic Imaging Medical Physicists. The increasing reliance of complex imaging systems is increasing the interaction and collaboration between diagnostic imaging and radiation oncology modalities.

Treatment simulation and treatment planning

Computed tomography (CT) scans acquired in the radiotherapy treatment position before the start of radiotherapy remain the basic imaging modality for contouring tumour target volumes and defining dose-limiting normal body structures known as “organs at risk”. A CT scan is mandatory for accurate calculation of dose using a treatment planning computer. 4D CT can be utilised to capture the motion of the tumour volume and the surrounding organs at risk to allow for dose escalation and dose hypo fractionation. Tumour motion can also be managed or reduced, for example, by using respiratory gating technology to deliver the treatment only at a certain phase of the breathing cycle. This enables improved tumour control and reduction in the toxicity from treatment. Advances in the software, computing power and data storage capabilities of treatment planning systems have enabled multiple image sets to be overlayed or “fused” with the planning CT scan to further improve accuracy of delineation of tumour and normal tissue. There is reasonable evidence from lung, oesophageal and head and neck cancers that fusion of PET images to the planning CT can result in significant changes to the target volumes delineated.

Treatment delivery and localisation (IGRT)

The problem of motion of tumour volumes within organs as well as adjacent healthy organs, for example motion of the prostate due to bladder and rectal filling and of lung tumour movement within the breathing cycle, has been addressed by the implementation of image-guided radiotherapy (IGRT). Whereas previously only bony structures could be visualized on the treatment couch of the linear accelerator at the time of each radiotherapy fraction, the integration of computed tomography into linear accelerator technology (“cone-beam CT”) as well as the option to

introduce radio-opaque fiducial markers into tumours, such as the prostate, made possible the correction of the patient position based on this information at each treatment session. This same principle of IGRT is used in delivery of brachytherapy of gynaecological cancers where MRI is used; as well in high-dose rate brachytherapy of prostate cancer where implanted fiducial markers are used. This not only ensures that the tumour volume is being treated accurately each day but gives the potential to reduce 'error margins' in radiotherapy delivery thereby significantly reducing side effects of treatment.

A good understanding of the dosimetric impact of the increased imaging requires access to Diagnostic Imaging Medical Physics expertise. If daily cone beam CT imaging is used, then a significant proportion of the radiation dose could be delivered by the imaging system requiring the two sources of radiation dose to be combined for planning purposes. This challenge is yet to be faced in most centres, however it will become increasingly important that the diagnostic imaging modalities used during treatment are well understood.

Evolution of new techniques

Extremely precise delivery of high radiation doses to small volumes was already technically possible in the 1990s but this was limited to intracranial stereotactic radiotherapy ("radiosurgery"). The brain is ideal for this procedure, as tumour or organ motion is practically non-existent within the bony cranium.

However, with the ability to accurately image patients while lying in the treatment position on the linear accelerator, new ablative treatments have become available for treating extracranial sites, particularly in the lung, liver and spine. Although these procedures have only recently become available the emerging literature suggests that they are more efficacious and well tolerated compared to previous 'non-stereotactic' treatments. These new evolving techniques depend on a combination of immobilisation devices integral to the linear accelerators and on-board, in treatment room, real-time imaging that allow for online correction of minute displacements of the target from the idealised treatment position. This technology has started to become available in the modern radiotherapy department with sophisticated equipment that requires additional investment in capital and human resources. The actual delivery of such complex treatment that requires additional quality assurance steps, and time, also impacts on the throughput of patients within a radiotherapy department. These new techniques of treatment allow an additional spectrum of patients to be referred for radiotherapy; including those who are considered inoperable and otherwise would be considered "untreatable". These non-invasive techniques enhance the armamentarium of the radiation oncologist and offer additional hope to such patients.

Response assessment

After receiving radiotherapy, particularly for radical (curative) radiotherapy it is important to be able to decide if a patient is in remission or if there is still evidence of active disease that may require further treatment. Many patients will have residual abnormalities on standard imaging (CT or MRI) following treatment that has previously been difficult to define as residual active tumour, necrotic (dead) tumour/tissue or post-radiotherapy fibrosis and oedema. There is no doubt that before the evolution of improved imaging techniques like functional MRI and PET /CT there were a large number of patients that underwent unnecessary treatments based on anatomical information alone.

There is now good evidence in head and neck cancer and in lung cancer that the use of post-treatment PET scanning to assess treatment response is not only an accurate predictor of outcome but has significantly reduced the rate of unnecessary salvage surgery offered to patients that have an anatomical abnormality which is composed of dead/dying tumour. Likewise in brain tumours, functional MRI and PET imaging may reduce the rate of unnecessary salvage surgery offered to patients, who appear to have disease progression on routine imaging, by more accurately delineating those with treatment related changes from those with true progression. This approach is being extended to other sites including lung cancer, gastrointestinal tumours and melanoma.

These new approaches to the use of functional and targeted imaging will allow the evaluation of changing treatment regimens, including in clinical trials, to determine the most appropriate clinical programmes are offered to patients. Integration of such technologies into routine clinical practice remains a challenge as a result of difficulties providing access and limited expertise.

Essential Radiotherapy Techniques – Intensity Modulated Radiation Therapy (IMRT)

What is Intensity Modulated Radiation Therapy (IMRT)

Intensity modulated radiation therapy is a radiotherapy technique that allows radiation to be more closely shaped to fit the tumour and spare nearby critical normal tissue.

Use of IMRT

The decision to use IMRT would depend on the clinical circumstances and the intent of the treatment. Not all patients will require IMRT; however there are circumstances where IMRT is increasingly the standard of care. When the radiation doses required to control the cancer are close to normal tissue radiation tolerance levels IMRT is indicated.

Consideration should be given to the impact on the quality of life, technical implementation and anatomical complexity.

The sparing of normal tissue achieved by IMRT results in fewer treatment-related toxicities and side effects. In addition, comparable or higher doses to the tumour with IMRT would result in equivalent or better tumour control and disease free intervals.

IMRT is also indicated where previous radiotherapy has been given to nearby tissues and conventional techniques of radiotherapy would result in unacceptable toxicities.

IMRT-capable equipment distribution across Australia[14]

C-arm linac: IMRT

IMRT is traditionally delivered by a C-arm Linac, with a number of static modulated beam positions around the tumour volume. According to the Faculty of Radiation Oncology facilities census, 85% of all linear accelerators in Australia are IMRT-capable and 97% of Australian radiotherapy centres have at least one IMRT –capable linac.

C-arm linac: Volumetric Modulated Arc Therapy (VMAT)

VMAT is a newer type of IMRT technique that uses the same hardware but delivers the radiotherapy using a rotational or arc geometry rather than static beams. Of the current linear accelerator pool 25% of machines are VMAT-capable. Arc techniques enable an improvement in the beam delivery time and may result in overall reduction in the treatment time.

Helical IMRT

Helical IMRT combines a 'CT-like' physical configuration with a radiotherapy delivery system (linac). One Helical IMRT linac is currently operating in Australia.

IMRT services across Australia in 2010 [14]

Although IMRT-capable equipment is available in 49 centres (97%) nationally, in many centres the IMRT service is not offered. In 2010 Australian Capital Territory and Northern Territory did not offer any IMRT services. They both have since introduced the service, but the data on IMRT utilisation is not available. In South Australia IMRT is only available through a private service provider.

Although the majority of Australian centres have IMRT capability, 14 centres (29%) of those with IMRT capability do not deliver any IMRT treatments.

Of the 35 centres (71%) that deliver IMRT treatments in 2010:

- 12% treated 10 of fewer patients with IMRT
- 20% treated between 11 and 50 patients with IMRT
- 25% treated between 51 and 150 patients with IMRT
- 14% treated more than 151 patients with IMRT

Overall, out of the total new radiotherapy treatments delivered nationally, IMRT treatment courses comprised only 6.5%.

Total National IMRT courses delivered (2010)

State	Percentage by state
ACT	0%[14]
NSW	44%
QLD	23%
SA	1%
TAS	3%
VIC	29%
WA[14]	0.1%
NT	0%

Trends and issues arising

IMRT should be available in all centres that offer radiation therapy including rural, metropolitan, and in both public and private facilities. All patients who have radiation therapy should have access to IMRT where clinically appropriate.

Given that the equipment base to deliver IMRT in Australia already exists and that the sector is becoming more experienced in the use of this technique, it is estimated that between 30% and 50% of all radiation therapy patients will be treated with IMRT going forward. The fact that the IMRT potential of existing technology is not being used to benefit patients should be a significant concern to patients and service providers.

There are a number of barriers to IMRT uptake at present, these include:

- Professional – lack of capacity to undertake the training and learning required as most radiotherapy teams are devoted to meeting the existing patient load;
- Professional – lack of capacity to undertake the necessary Quality Assurance which is essential for this technique;
- Resourcing – lack of an appropriate Medicare rebate which would resource and encourage timely implementation.

IMRT treatment planning and delivery requires significantly longer preparation time and physics QA and therefore is more resource-intensive. As such, the cost of delivering IMRT treatment is higher than 3D conformal therapy. In the absence of appropriate public funding, patient access to IMRT is limited by the capacity of the radiotherapy departments to absorb the financial cost.

Delivering IMRT requires precise imaging to guide clinical decision-making. Image Guided Radiation Therapy (IGRT) is an essential component of delivering IMRT. The rapid evolution of IGRT technologies offers a high level of reassurance that IMRT cases can be done with high quality[15].

Essential Radiotherapy Techniques – Stereotactic Radiotherapy

What is a stereotactic treatment?

A highly specialised and complex delivery of external beam radiation therapy called stereotactic radiation uses focused radiation beams targeting a well-defined tumour, relying on detailed imaging, computerized three-dimensional treatment planning and precise treatment set-up to deliver a much higher radiation dose than standard radiotherapy with extreme accuracy.

There are two types of stereotactic radiation

- Stereotactic radiosurgery (SRS) refers to a single or several stereotactic radiation treatments of the brain or spine. Dedicated equipment is required, which could be either a CyberKnife or Linac that has been specially modified with small sized collimators. Specific planning systems are required for this treatment delivery in all such cases.
- Stereotactic body radiation therapy (SBRT) refers to one or several stereotactic radiation treatments with the body, excluding the brain or spine.

Conditions treated with stereotactic radiation

Stereotactic radiosurgery (SRS) is used to treat conditions involving the brain or spine including:

- Primary brain tumours
- Brain metastases
- Benign tumours arising from the membranes covering the brain (meningiomas)
- Benign tumours of the inner ear (acoustic neuromas)
- Abnormal blood vessels in the brain (arteriovenous malformations)

Stereotactic body radiation therapy (SBRT) is used to treat small tumours in the chest, abdomen or pelvis that cannot be removed surgically or treated with conventional radiation therapy, including:

- Small lung cancers
- Lung metastases
- Liver metastases

These lists cover commonly treated conditions but cannot include every possibility.

Stereotactic services across Australia[14]

Stereotactic radiotherapy is offered in 11 centres (21%) nationally. 82% of stereotactic equipment is located in the public sector, while the remaining 18% is located at privately owned facilities. Australian Capital Territory, Northern Territory and Tasmania do not offer any stereotactic services.

Stereotactic equipment distribution

State	*Percentage of total machines*
ACT	0%
NSW	45%
QLD	18%
SA	9%
TAS	0%
VIC	18%
WA	9%
NT	0%

Trends and issues arising

Demand for stereotactic services is difficult to measure because in the absence of stereotactic radiotherapy treatment patients receive alternative treatments such as surgery for acoustic neuromas and whole brain radiotherapy for solitary brain metastasis. For this reason an increase in stereotactic service provision is important for patient choice and appropriate clinical decision-making. The likelihood of SRS usage will increase from increased patient and referrer demand as the more consistent utilisation of SRS in other countries will resonate with cancer managers and patients here. This will be compounded as oligometastases are increasingly more aggressively managed overseas.

Continued evolution of stereotactic techniques broadens applicability of stereotactic treatments to extra-cranial sites. This activity is referred to as stereotactic body radiation therapy (SBRT) and this is a fast-developing area, particularly in Europe and North America. SBRT has potential for reduced morbidity, an example being SBRT to liver metastasis as an alternative to surgery. SBRT also holds a promise for durable local control and even cure for patients with solitary (or oligo) metastatic disease.

The capability of linear accelerators to deliver stereotactic radiotherapy is increasing and it is expected that this technique will be applied more widely in the next decade. Highly specialised techniques, such as SRS and SBRT must be provided by centres which have specialist multidisciplinary clinical teams with expertise in the delivery of the stereotactic technique.

The current single fraction Medicare rebate grossly under-reimburses the cost of providing stereotactic radiosurgery, when considered in terms of cost in capital outlays and time taken for planning and treatment. The rebate is based on a single fraction (i.e. one big dose of radiation delivered in one treatment). All stereotactic radiotherapy regardless of its mode of delivery should carry a Medicare rebate that is appropriate for the

complexity of planning and delivery. Fractionated delivery of stereotactic radiotherapy (i.e. delivered over multiple treatments) is expected to increase. Research into the radiobiology of cancer supports increased fractionation to allow normal tissue cells time to repair and recover between treatments.

Essential Radiotherapy Techniques – Brachytherapy

What is brachytherapy?

Brachytherapy is a highly specialised and resource intensive radiotherapy technique. Brachytherapy involves the placement of radioactive sources in, or just next to, a cancer. Unlike external beam radiotherapy, brachytherapy may be invasive. During brachytherapy, the radioactive sources may be left in place permanently or only temporarily, depending upon the radioactive isotope employed. Brachytherapy may be used alone or in conjunction with external radiation treatments.

Two types of brachytherapy

- High-dose-rate (HDR) brachytherapy involves the remote placement of the powerful radiation source into the tumour for several minutes through a catheter. It is usually given in multiple doses once or twice daily or once or twice weekly.
- Low-dose-rate (LDR) brachytherapy involves the longer placement of the temporary (several days) or permanent radiation source into the tumour area.

Conditions treated with brachytherapy

- Prostate cancer
- Gynaecological cancers
- Breast cancers
- Cancers of the eye

This list covers commonly treated conditions but cannot include every possibility.

Brachytherapy services across Australia[14]

Less than half of all radiation oncology centres in Australia offer some form of brachytherapy service (45%). Northern Territory is the only Australian State or Territory that does not currently have any brachytherapy services.

High-dose-rate brachytherapy (HDR BT) is offered in 22 centres (42 %) nationally and in all jurisdictions excluding Northern Territory. 70% of HDR BT equipment is located in the public sector, while the remaining 30% is located at privately owned facilities.

HDR BT equipment distribution

State	*Percentage of total machines*
ACT	5%
NSW	32%
QLD	19%
SA	14%
TAS	3%
VIC	19%
WA	8%
NT	0%

Low-dose-rate brachytherapy (LDR BT) is offered in only 14 centres nationally (27%). In 2010 Australian Capital Territory, Northern Territory and Tasmania did not offer any LDR BT services. This has since changed for ACT and Tasmania. In Queensland, LDR BT services are not available in the public hospital system.

LDR BT service volume

State	*Percentage of total LDR BT courses delivered*
ACT	0%
NSW	24%
QLD	15%
SA	23%
TAS	0%
VIC	32%
WA	6%
NT	0%

Trends and issues arising

Brachytherapy services are changing and developing along with other oncological and radiotherapy services. The screening and vaccination programs across Australia should ultimately result in reduced referrals for gynaecological brachytherapy overall. This, however, is anticipated to be offset to some extent by the increasing complexity of the gynaecological cases requiring brachytherapy, as these cases are often late stage disease.

Significant growth is expected to continue in the demand for prostate cancer brachytherapy. Current evidence-based reports suggest brachytherapy has a favourable cost-effectiveness compared with other active treatments for prostate cancer. Prostate cancer is the most common internal cancer, and increasing rapidly in incidence with population growth and aging. These factors are likely to lead to a demand for brachytherapy services. The potential introduction of prostate cancer screening services is likely to increase the demand for early brachytherapy (low-dose-rate) in particular.

Essential Radiotherapy Techniques – Superficial and Orthovoltage

What are superficial and orthovoltage treatments?

Superficial (SXT) and Orthovoltage (DXT) radiotherapy utilise low energy ionizing radiation to treat cancer and other conditions that occur either on or close to the skin surface. SXT utilises x-ray energies of between 50 and 200 kV, having a treatment range of up to 5mm, and DXT utilises 200 to 500 kV x-rays penetrating to a useful depth of 4 – 6cm.

The shallow penetrating power of both SXT and DXT means that they are often superior to megavoltage external beam radiation for the treatment of superficial lesions. Orthovoltage and superficial treatment machines are becoming less common, with much of the treatment that was previously delivered with them now being delivered using linear accelerators.

Conditions treated with superficial and orthovoltage radiotherapy

Superficial and orthovoltage radiotherapy are used for the treatment of skin lesions such as melanoma, squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) as well as non-malignant skin conditions such as keloids. Relatively high absorption of these low energy x-rays in bone also means that orthovoltage treatment is well suited to the palliative treatment of painful bony metastases in shallow regions such as the ribs and sternum.

These above mentioned conditions are those commonly treated with these techniques but do not constitute an exhaustive list.

Superficial and orthovoltage services across Australia[14]

Superficial and orthovoltage radiotherapy are offered in 28 centres (55%) nationally. 86% of the relevant equipment is located in the public sector, while the remaining 14% is located at privately owned facilities. Northern Territory is the only jurisdiction which does not offer Superficial and orthovoltage radiotherapy.

SXT and DXT equipment distribution

State	*Percentage of total machines*
ACT	4%
NSW	46%
QLD	14%
SA	7%
TAS	4%
VIC	21%
WA	4%
NT	0%

Trends and issues arising

Superficial and orthovoltage radiotherapy will remain a useful technique for treating skin cancer and a number of other conditions. It is likely that the caseload for these treatments will increase due to the ageing population and the consequent rise in the incidence of cancer. However, this trend may be offset by:

- Impact of the prevention campaigns (such as 'sun-smart' strategies);
- Better management prior to the condition turning into a malignancy;
- More effective management of early skin cancer;
- Use of alternative methods of treatment (such as Moh's surgery and laser surgery or ablation).

Equipment availability

- It is anticipated that superficial treatments will move solely to the domain of radiotherapy departments as anecdotal evidence suggests this equipment is being phased out in the private dermatology practices.
- Some radiotherapy departments and centres will choose not to install superficial and orthovoltage machine units. This is because most of the applications can also be delivered by appropriately configured linear accelerators.

There still are some specific clinical situations where the unique characteristics and physical properties of superficial radiotherapy remain compelling, one example being treatments around the eye, such as skin cancers on the eye.

Recommendations

Cancer incidence is the basis for planning

26. The nationally coordinated radiation oncology planning must consider:
    - 26.1. Projected cancer incidence;
    - 26.2. Target optimal utilisation rate;
    - 26.3. Regional and rural service access;
    - 26.4. Projected changes in demographics.

Workforce and infrastructure are planned together in a coordinated way

27. Establish a system for facilities to regularly report on their activities to inform coordinated planning.
28. Implementation of new technology must consider workforce implications.
29. Overcapitalized radiotherapy services, such as brachytherapy and radiosurgery, should be rationalised.
30. New facilities should be planned with the capacity to allow expansion and service continuity.
31. All facilities must have adequate information and communication technology infrastructure and expertise.
32. Workforce planning should consider the need for multidisciplinary care and adequate supply of allied health and support services.
33. Australia needs 267 linacs by 2022 to achieve the optimal utilisation rate of 52.3% (approximately an extra 100, in addition to the replacement of current fleet).
34. Governments must have a plan for the number of new linacs that will come into use over the next ten years.
    - 34.1. Coordinated across the public and private sectors;
    - 34.2. Aligned with workforce training and development;
    - 34.3. Developed in close consultation with the professions and consumers;
    - 34.4. Taking into account the lead time of 2-5 years for starting an operational service.
35. Services should be planned to operate with 10% additional capacity such that surges in demand can be met without increasing the waiting times for treatment.
36. Development of sustainable fellowship programs for Radiation Oncologists must be a key priority to ensure the development of important clinical and research skills.
37. Develop workforce strategies offering enhanced career pathways for Radiation Therapists (RT):
    - 37.1. Support advanced practice and role evolution for RTs;
    - 37.2. Explore assistant roles in radiotherapy.
38. The Radiation Oncology Medical Physicists (ROMP) workforce crisis requires an urgent and multi-faceted response:
    - 38.1. Australia must have a nationally self-sufficient ROMP workforce by 2022;
    - 38.2. support promotion of a physics career to school students and undergraduates;
    - 38.3. increase and streamline funding for TEAP positions, and embed into the radiation oncology workforce profile;
    - 38.4. strengthen recruitment strategies to attract and retain the ROMP workforce;
    - 38.5. urgently develop innovative models of service provision that do not compromise quality;
    - 38.6. a national workforce summit must be held by June 2013 to get consensus on the implementation of workforce solutions.
39. Develop plans to support professionals returning to full-time and part-time work.

Workforce training is aligned with service demand projections and supported appropriately

40. Governments to match the funding contracts for training positions in both public and private accredited facilities to the length of the training programs.
41. Accreditation and training processes that allow for:
    - 41.1. Increased trainee numbers in the three key professional areas i.e. Radiation Oncology, Radiation Therapy and Radiation Oncology Medical Physicists;
    - 41.2. Embedded funding for clinical supervisors, preceptors and training network coordinators to adequately support the training programs; and
    - 41.3. Continued professional education and development for those in the workforce;
    - 41.4. Support of training in rural and regional areas.
42. To establish innovative models of training such as:
    - 42.1. Virtual and simulated learning programs;
    - 42.2. Nationally coordinated training networks to enable optimal utilisation of resources.

A National Cancer Action Plan which includes radiation oncology is adopted

43. There needs to be a National Cancer Action Plan developed, implemented and maintained for Australia:
    - 43.1. In consultation with the professions and consumers;
    - 43.2. Encompassing radiation oncology as a core element of quality cancer care.

Jurisdictional radiation oncology action plans are developed, maintained and integrated with the National Cancer Action Plan

44. Jurisdictions must develop, regularly review, evaluate and update 5-year action plans for radiation oncology and these must be coordinated nationally.
45. Financing options for establishing and resourcing services should be explored and must ensure access to radiation oncology services is safeguarded;
46. To ensure that infrastructure is used efficiently:
    - 46.1. Business process review must be undertaken regularly;
    - 46.2. Business process improvement must be part of standard practice;

Closer consultative collaboration between governments, policy-makers, service providers, patients and the professions to ensure most effective use of resources

47. Establish and strengthen radiation oncology networks where smaller centres are linked to major centres.
48. The existing national ROHPG capital replacement program must be maintained and regularly updated to reflect changes in radiation oncology practice.

Innovative models of quality service provision are developed to improve efficiencies

49. There should be ongoing horizon scanning for new radiotherapy techniques and technologies, to inform facilities planning;
50. Essential role of imaging in radiation oncology must be acknowledged:
    - 50.1. Regulatory constraints such as licensing must be remedied;
    - 50.2. Training and expertise of professionals must be enhanced;
    - 50.3. Funding for planning and treatment of patients must support evidence-based practice;
    - 50.4. The role of the Diagnostic Imaging Medical Physicists needs to be recognised and supported.
51. The use of essential radiotherapy techniques must align with best practice:
    - 51.1. At least 30% of radiotherapy patients should receive IMRT treatments;
    - 51.2. Benchmarks for other essential radiotherapy techniques should be developed and services should publicly report against these.

Appendix I – Workforce Projections by Jurisdiction

Radiation oncologist workforce

	2012			2017			2022		
	supply	demand	shortfall	supply	demand	shortfall	supply	demand	shortfall
NSW	85.4	98.1	12.7	124.3	139.7	15.4	165.2	182.3	17.2
VIC	79.0	79.7	0.7	114.9	99.3	-15.6	152.7	129.6	-23.1
QLD	51.0	58.4	7.4	74.2	80.8	6.6	98.6	105.4	6.8
SA	17.0	25.6	8.6	24.7	33.8	9.0	32.8	44.1	11.2
WA	9.4	35.6	26.2	13.7	37.7	23.9	18.2	49.2	30.9
TAS	6.6	8.1	1.5	9.6	10.9	1.4	12.7	14.3	1.5
NT	1.5	0.3	-1.2	2.2	2.1	-0.1	3.0	2.8	-0.2
ACT	7.7	6.6	-1.1	11.2	5.3	-5.9	14.8	6.9	-7.9
AUS	*258.6*	*311.4*	*52.8*	*375.8*	*409.5*	*33.6*	*499.0*	*534.6*	*35.5*

Radiation Therapist workforce

	2012			2017			2022		
	supply	demand	shortfall	supply	demand	shortfall	supply	demand	shortfall
NSW	476.3	490.5	14.2	599.1	698.3	99.2	702.9	911.7	208.8
VIC	380.6	398.3	17.7	478.6	496.4	17.7	561.6	648.0	86.4
QLD	317.6	292.1	-25.5	399.4	403.8	4.4	468.6	527.2	58.5
SA	99.8	128.1	28.3	125.5	168.8	43.3	147.2	220.3	73.1
WA	74.7	178.1	103.5	93.9	188.3	94.4	110.2	245.8	135.6
TAS	50.6	40.3	-10.3	63.6	54.7	-9.0	74.6	71.4	-3.3
NT	8.5	1.6	-6.9	10.7	10.7	0.0	12.5	13.9	1.4
ACT	38.8	33.0	-5.8	48.8	26.4	-22.4	57.3	34.5	-22.8
AUS	*1446.8*	*1556.9*	*110.1*	*1819.6*	*2047.3*	*227.7*	*2134.9*	*2672.8*	*537.9*

Radiation Oncology Medical Physicist workforce

	2012			2017			2022		
	supply	demand	shortfall	supply	demand	shortfall	supply	demand	shortfall
NSW	95.4	98.1	2.7	125.6	139.7	14.1	154.0	182.3	28.3
VIC	42.9	79.7	36.7	56.5	99.3	42.8	69.3	129.6	60.3
QLD	25.7	58.4	32.7	33.8	80.8	46.9	41.5	105.4	63.9
SA	17.7	25.6	8.0	23.3	33.8	10.5	28.5	44.1	15.5
WA	8.0	35.6	27.6	10.6	37.7	27.1	13.0	49.2	36.2
TAS	5.4	8.1	2.7	7.0	10.9	3.9	8.6	14.3	5.6
NT	3.2	0.3	-2.9	4.2	2.1	-2.1	5.2	2.8	-2.4
ACT	4.3	6.6	2.3	5.6	5.3	-0.4	6.9	6.9	0.0
AUS	*202.5*	*311.4*	*108.9*	*266.7*	*409.5*	*142.8*	*327.0*	*534.6*	*207.5*

The supply is based on existing workforce with current entrant and attrition trends. The demand is based on radiotherapy utilisation rate of 39.3% in 2012, 45.2% in 2017 and 52.3% in 2022.

Source: The Allen Consulting Group, 2012[7]

Note regarding the WA data: *An adjustment was made to reflect the 2012 actual data from Western Australia in the above table to account for the one non-responded WA facility in the original data collection process. The Australian total does not reflect the adjusted WA figures to maintain consistency of the data set.*

Cautionary note about small numbers: *The workforce numbers in some jurisdictions can be very small. Due to a large degree of year-to-year statistical fluctuation in these small numbers, great care should be taken when assessing apparent differences involving small numbers and measures based on small numbers.*

Appendix II – Linacs Age and Features

Linear accelerators across Australia in 2000 and 2010: age and features

	2000[13]	*2010*[14]
Characteristics	*Percentage*	
By Year of Installation		
>10 years	14.0%	9.0%
>5 to 10 years	39.0%	28.3%
0 to 5 years	40.0%	60.7%
In the survey years	7.0%	2.1%
X-ray Energy		
Dual		88.3%
Single		11.7%
MLC (Multileaf collimation)		
Yes	74.2%	97.2%
No	25.8%	2.1%
No response		0.7%
EPI (Electronic Portal Imaging)		
Yes	79.6%	92.4%
No	20.4%	5.5%
No response		2.1%
R&V (Record and Verify)		
Yes	91.4%	94.5%
No	8.6%	2.8%
No response		2.8%
IMRT Capable (Intensity Modulated Radiation Therapy)		
Yes		84.8%
No		15.2%
Cone Beam CT		
Yes		39.3%
No		58.6%
No response		2.1%
Tertiary Imaging/online correction		
Yes		63.4%
No		29.0%
No response		7.6%
VMAT Capable (Volumetric Modulation Arc Therapy)		
Yes		24.1%
No		73.8%
No response		2.1%

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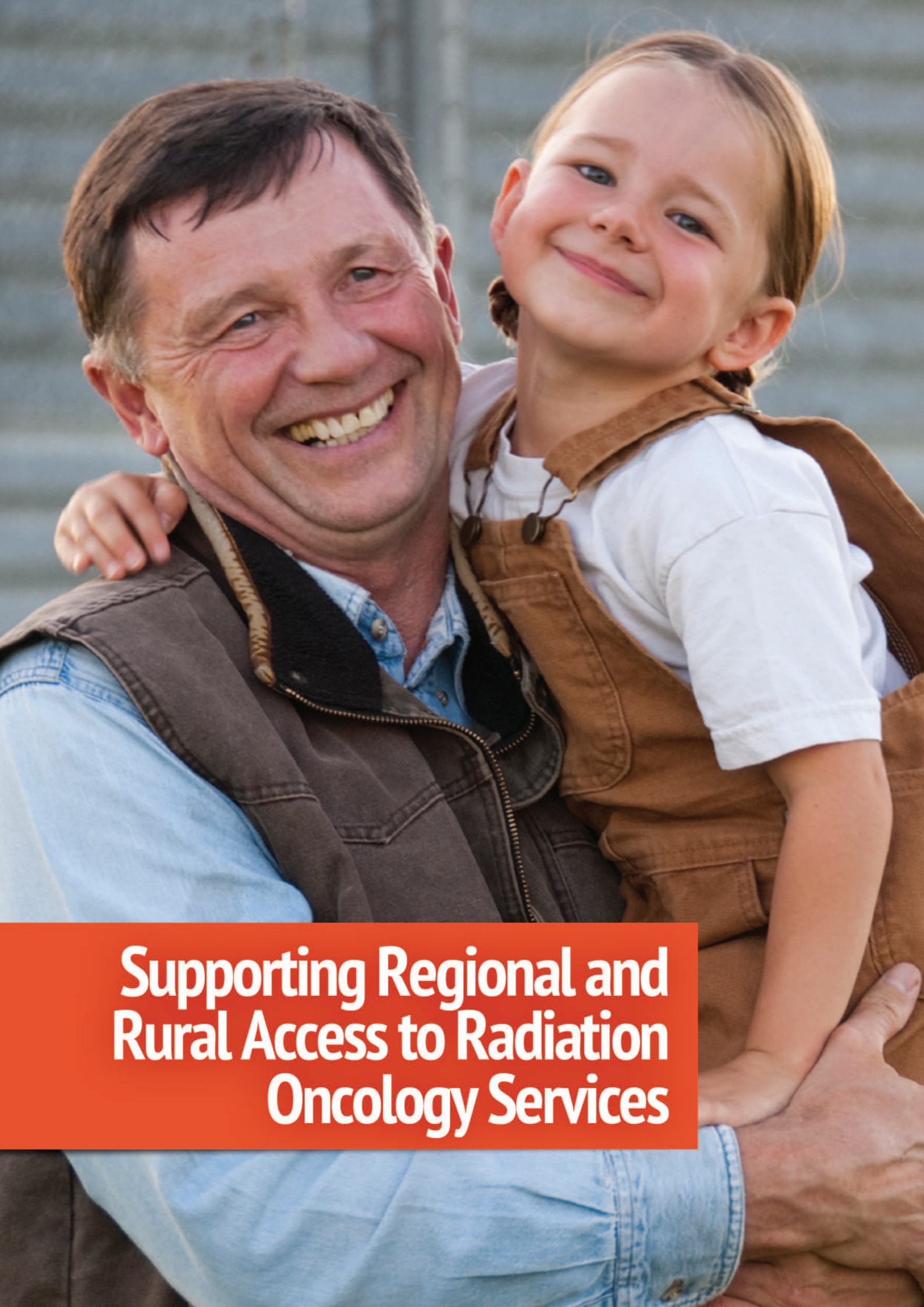

Supporting Regional and Rural Access to Radiation Oncology Services

In this section

Key Issues

There are multiple barriers for rural and regional cancer patients to access services:

- The availability of quality and timely cancer care;
  - Financial burden of cancer and its treatment has a disproportionate impact on patients based on their geographical location;
  - Travel to receive treatments and the associated social burden;
  - Opportunities in communications technology still waiting to be harnessed to improve care and patient convenience;
- Rural and regional radiotherapy centres face challenges with recruitment and retention of workforce;
- Lack of effective coordination in service planning and workforce development for rural service provision.

Objective

Rural and regional patients have timely and affordable access to radiation oncology services.

Defining Success

A nationally coordinated and focused approach to improving rural and regional patients' access to radiation oncology services, including:

- Comprehensive, quality cancer care is available to patients, which includes a national patient travel and accommodation scheme;
- Models of care are locally tailored and appropriate to rural and regional areas;
- Strategies in place that recognise and ameliorate the financial and social impact of cancer on patients and carers in rural and regional areas;
- Innovative approaches to patient care are implemented, evaluated and supported.

Introduction

Providing equitable access to healthcare services for Australians living in rural and regional communities is a national priority. When compared to metropolitan populations, rural and regional patients have a number of specific challenges because they:

- Are more likely to present with late stage diagnosis;
- Have lower survival rates;
- Have greater difficulty accessing treatments of equal quality;
- May face a greater financial burden from cancer diagnosis and treatment[1].

Research indicates that people with cancer in regional areas are 35% more likely to die within 5 years of diagnosis than patients in the city[2]. Death rate for patients with rectal cancer rises by 6% for every extra 100km a patient lives away from radiation therapy facilities[3]. There are numerous studies[4-8] of health outcomes for cancer patients being compromised due to access to and/or distance from a treatment facility and access to the most clinically effective treatments.

Concerns highlighted in stakeholder submissions during the consultation process have been categorised into three main areas: patient access, facility workforce, and service planning, as illustrated in the following figure.

Rural and regional issues raised during the consultations

Patient Access	*Facility Workforce*	*Service Planning*
Financial Impact	Recruitment	Tailored models of care
Travel & Accomodation schemes	Retention	Linked to a comprehensive cancer and specialised service
Innovation		Allied health services

Patient Access to Quality Services

Regional and rural patient access to cancer care services, including radiation oncology services, are adversely impacted by a number of key factors such as distance from facilities, financial burden caused by the cancer and the added emotional distress if there is a need to stay away from family and friends whilst undergoing treatment[9].

Financial impact of cancer on patients

Cancer treatments, including radiotherapy, may impose financial pressures on patients, carers and their families. Examples of additional expenses include:

- The cost of travel and accommodation when treatment is sought from a facility away from home. Reimbursement of travel and accommodation can be process oriented and time consuming, and not reflecting the full costs;
- The cost of accessing alternative treatment providers, i.e. private or public facilities. In the former case, it may be gap payments and upfront expenses for the treatment; in the latter it may the cost of travelling and staying away from home;
- The loss of income for patients, carers and their families; for example if travelling for treatment requires taking leave from work or bearing the loss of income for small business owners;
- Extra expenses such as child care fees while parents travel to metropolitan centres and stay away from home for the duration of treatment.

In many cases, radiotherapy treatments follows a significant number of medical investigations and services, at the time when the patient has already reached or is about to reach the Extended Medicare Safety Net thresholds. In some instances, patients may be required to pay significant out of pocket costs as gaps or may have to pay upfront for treatment. It was noted during consultation that there is not sufficient information about costs associated with treatment, alternatives and reimbursements, particularly for patients in rural and regional area where treatment options can be limited.

Of significant concern to all stakeholders is that financial pressures regularly influence the choices that patients from rural and regional areas make with regards to their treatments. Without doubt, these pressures contribute to the poorer health outcomes experienced by cancer patients in rural and regional areas.

Patient travel and accommodation schemes

The State and Territory governments offer travel and accommodation assistance to patients living in regional and rural areas of Australia to access specialist services. These patient travel and accommodation assistance schemes (PTAS) are essential to patients and carers as they reduce some of the financial barriers for accessing appropriate clinical care.

Submissions from professionals, peak groups and experts working in rural and regional health services consistently commented on the fundamental importance of PTAS funding. The current schemes across Australia were criticised for their complexity and their insufficiency. The issues highlighted during consultation were supported by existing research[9,10] and include:

- Significant differences in the eligibility criteria and reimbursements between jurisdictions;
- The reimbursements not reflecting the commercial cost of travel and accommodation;
- The complexity of procedures to access PTAS and delay in processing PTAS applications;
- Cross border jurisdictional issues complicating patient access to travel and accommodation assistance;
- Shortages of supported accommodation facilities linked to the radiation oncology centres.

Appendix III provides a snapshot of the PTAS arrangements as of 1 April 2012 across the Australian jurisdictions illustrating the differences in eligibility and rate of reimbursements and the gaps between the rate of reimbursement and the actual cost of travel and accommodation.

In 2007 the Senate Standing Committee on Community Affairs made sixteen recommendations on the PTAS in their report 'Highway to health: better access for rural, regional and remote patients'[10], which highlighted many of the issues raised above. The Commonwealth Government's response to the Senate report supported many of the recommendations[11] yet the matter was largely deemed to be the responsibility of State and Territory governments. Since the publication of the Senate report, PTAS across jurisdictions have been reviewed, however, as the consultation for the Tripartite Plan has highlighted, significant shortcomings remain.

Although a detailed examination of PTAS is outside the scope of this Plan, the findings of the Senate report remain current and a further streamlining of the schemes is required to improve patient access to essential radiation oncology services.

Use of innovations to aid service provision

Innovative approaches to provide consultation, treatment and follow-up for patients should be incorporated into regional and rural patient service models. Telemedicine, enabled by the National Broadband Network, provides significant opportunities to improve professional support to regional radiation oncology services, outreach services and patient follow up[12]. Telemedicine is vital to extending the benefits of multidisciplinary care to regional patients and reducing the associated cost of care. Although this is already established in Australia, the level of use of remote/telemedicine in radiation oncology is well behind other countries such as Canada and other medical disciplines in Australia.

There are existing initiatives in radiation oncology capitalising on the potential of telehealth, for example:

1. The North Coast Cancer Institute in NSW runs nurse-led phone follow-ups, doctor-led phone follow-up clinics, and video-conferenced clinics with patients.
2. Radiation Oncology Queensland are enabling nurses to follow-up patients about skin conditions two weeks after treatment using tablet computers, so patients do not have to travel to facilities once their treatment is completed.

Lessons learnt[13] from successful telehealth projects in other health disciplines suggest that telemedicine has the potential to:

- Improve access to specialist health services;
- Reduce patient travel;
- Encourage local case management;
- Improve staff training and support;
- Improve recruitment and retention of staff.

Cancer care is increasingly multi-modal and multidisciplinary team (MDT) care is the gold standard of treatment. It is not always possible for regional and rural health services to support every discipline that makes up an MDT. In this context, telehealth can also alleviate some of the pressures that specialist shortages in rural areas create. The use of videoconferencing or web-conferencing technology can enable access to tumour-specific MDTs[14]. Patient access to these telehealth innovations are further supported by the Medicare Benefits Schedule item numbers, making it a feasible and practical direction for regional health planning.

Facility Workforce

Challenges around recruitment, retention, and professional isolation for the health workforce in rural and regional Australia are well documented[15]. Submissions to the Tripartite Plan from radiation oncology professionals, jurisdictions and peak groups have all highlighted a significant concern around workforce sustainability in regional cancer centres. Submissions stressed that regional radiation oncology centres are currently experiencing difficulties with recruitment and retention of specialist staff in the absence of a planned national approach for regional radiation oncology workforce. The issue is expected to become more acute over the coming decade as new regional cancer centres become operational.

Recruitment

Radiation oncology should learn from the experience of other acute medical services which have a longer history with service provision in rural and regional areas. There have been a number of studies undertaken to identify barriers to ensuring sustainable workforce in rural and regional areas. Research indicates a connection between a number of factors and rural practice, which affect recruitment and can be summarised as follows[16-26]:

- Rural and regional origin;
- Partners of rural origin and other family considerations;
- Professional background and career plans at the time of admission to medical school;
- Long term earning potential;
- Professional development opportunities;
- Availability of quality primary and secondary education; and
- Rural undergraduate and post graduate training experience.

At present, radiation oncology workforce training is necessarily concentrated in metropolitan centres. This may have an impact on the availability of workforce to staff regional cancer centres[27]. It is therefore pivotal that training is extended to rural and regional locations. However, this must be done in a sustainable and clinically appropriate way, so as not to compromise patient care and to ensure appropriate level of training and supervision.

Workforce planning for rural cancer centres must ensure comprehensive care inclusive of expert radiation oncology nurses, all allied health groups and psycho-oncology professionals, in addition to access to multidisciplinary medical teams.

Retention

Retention of skilled workforce in regional and rural areas similarly requires a proactive approach and planning. There are personal, professional and service-related considerations that play a part. Consultation findings suggest that these considerations in radiation oncology include:

- Level of workload;
- Quality of service and the availability of modern techniques and technologies;
- Incentivised payment structure for staff;
- Access to and ability to participate in clinical trials and research;
- Professional development opportunities (such as conference attendance); and
- Career progression opportunities.

Building a sustainable regional workforce in radiation oncology requires a calculated approach, which takes into account service expansion, current capacity to train new workforce and incorporates strategies to make regional facilities attractive to work in.

Service Planning

Tailored models of care

The cancer care service models for regional and rural Australia should be tailored to suit the needs of local communities. The cultural and geographical variations in regional Australia must be accounted for when modelling healthcare provision. The importance of planning in the radiation oncology sector is enunciated in the section on Providing a Quality Radiation Oncology Service (on page 40).

To further strengthen the effectiveness of planning in rural and regional areas, cooperative involvement of key stakeholders is required. Such stakeholders include providers of radiation oncology services, regional health authorities, other service providers, patients and communities. A specific example for radiation oncology is the need for transparent infrastructure planning and the taking into account of existing private sector radiation oncology infrastructure. Consideration of costs of developing regional public facilities as opposed to providing publicly-funded access to an existing private facility is an important financial variable in this question. In this context, the advantages of public-private partnerships should be explored.

Links to a comprehensive cancers service

The lessons learned from the previous Radiation Oncology Capital Works Programs (RORIC Symposium)[13] highlight the need for planning a comprehensive service when establishing regional cancer centres. This planning ought to focus on the health outcomes and patient experiences including the provision for integrated multidisciplinary care.

The importance of MDT care for cancer patients is explored in detail in the section on Providing a Quality Radiation Oncology Service (on page 40). Currently, some of the barriers to referral for radiotherapy treatment include: experience and training of the individual referring practitioner, training and their level of understanding of radiotherapy[28]. Participation in MDTs improves referring physician's knowledge of radiation oncology and increases referrals for clinically appropriate radiotherapy treatments. Enabling MDT care in the specific circumstances of each regional and rural facility is a priority for quality patient care.

Networking and cooperation are critical in health care broadly, but more so in rural and regional centres. One radiation oncology expert from a regional cancer centre responded to a question 'how can rural and regional access to radiation oncology be improved?' as follows: better networks for transferring patients, better linkages to health services, better linkages to allied health, better ancillary supports, and better information technology systems to support care.

Access to allied health services

Allied health services are part of holistic cancer care and must be included in planning of any comprehensive cancer care system. Historically, the role of allied health staff, including but not limited to psychologists, social workers, physiotherapists, occupational therapists, speech pathologists, exercise physiologists and dietitians, and of nurses in radiation oncology has not been emphasised. In the absence of allied health services, cancer patients' management can be fragmented, and they can experience treatment-related problems such as social and emotional consequences[29]. To illustrate this point, an individual diagnosed with head and neck cancer will fail to achieve excellent outcomes if their nutritional status is so compromised after treatment that they are not able to regain adequate functional capacity to return to work.

Current funding models for radiation oncology, which support patient access to radiotherapy treatments, are insufficient to fund allied health support. As a result, in rural and regional areas allied health support is often only available privately and at a financial cost to the patient and their carers and family. Stakeholder submissions to the Plan noted that access to allied health services is improving in the cities, particularly in the larger cancer centres, but is difficult for rural and regional patients.

Recommendations

Comprehensive, quality cancer care is available to patients, which includes a national patient travel and accommodation scheme

52. Adequately funded and equitable national patient transport and accommodation assistance schemes must be in place.
    52.1. Financial support should demonstrate a relationship between the subsidy and reasonable transport and accommodation expenses.
    52.2. The transport and accommodation support schemes should be simplified and disparities between jurisdictions should be addressed.
53. A comparative study of costs of providing treatment and out of pocket expenses across various private and public facilities should be developed
    53.1. to benchmark the costs related to radiotherapy and reimbursements or rebates;
    53.2. to provide governments with the necessary data to ensure equity.

Models of care are locally tailored and appropriate to rural and regional areas

54. Design models of care appropriate to the regional area and its population needs, including linkage to major radiation oncology centres;
55. Adopt a national planning approach (facilities, workforce and services) with input from regional and rural stakeholders;
56. Regional facility development should focus on patient care outcomes and experiences;
57. Establish access to specialist services through the Cancer Care Network and links between regional and comprehensive metropolitan cancer care services
58. Accommodate needs for future expansion and uptake of technology in regional facility planning and development

Planned workforce strategies are developed to support the expansion of radiation oncology services to regional and rural areas.

59. Strategies are developed to recruit trainees and radiotherapy professionals of regional and rural origin
60. Increased training opportunities in rural and regional centres; increased funding support for prioritisation of rural training placements
61. Incentives and bonuses to attract and retain rural and regional staff
62. Staffing models that support professional development, professional collaboration and research activities
63. Increased flexibility of decision-making and funding responsibilities in regional centres for specific strategies for staff retention
64. Individual regional facilities should develop areas of expertise, including research, and specific competencies in techniques and technologies to increase competitive attractiveness of rural work.

Strategies in place that recognise and ameliorate the financial and social impact of cancer on patients and carers in rural and regional areas

65. Actions to be taken such that financial consideration by rural and regional patients and carers do not influence decisions regarding treatments:
    65.1. Where it does not exist already, there should be expansion of arrangements for publicly funded patient access to private regional radiotherapy treatment and review of the eligibility criteria for the same.
    65.2. Modified billing mechanisms in private facilities where payments and reimbursements are streamlined so that patients are only required to pay the gap payments, while the facility can maintain its operating cash flow.
    65.3. Costs of developing regional public facilities as opposed to providing publicly-funded access to an existing local private facility need to be considered.
    65.4. Reimbursement of out of pocket expenses incurred should be an option for those who are forced to pay more because of their place of residence.

Innovative approaches to patient care are implemented, evaluated and supported

66. A planned adoption of telehealth into radiation oncology services for consultation, care planning and follow up of patients
    66.1. Such adoption should focus on cancer care outcomes and patient experiences.
    66.2. Clinicians should be consulted to identify clinical needs and the best supporting technology.

Appendix III: Comparison of Patient Travel Assistance Schemes across Australia

Patient Travel and Accommodation Assistance Schemes					*Commercial accommodation*[29]	
State/ Territory	*Name of scheme*	*Minimum travel distance to be eligible*	*Travel – fuel subsidy/ km*	*Accommodation assistance per night per person*	*City*	*Rate per night*
NSW	IPTAAS[31]	Minimum 100 km each way or cumulative distance of 200 km per week	19 cents	$43 for single and $60 for double	Sydney	$80-$100
QLD	PTAS[32]	50 km one way	15 cents	$30 per night-commercial, $10 per person for private	Brisbane	$70-$100
VIC	VPTAS[33]	> 100 kilometres one way or on average 500 kilometres / week for a minimum of five consecutive weeks	17 cents	$35 plus GST per night per person	Melbourne	$70-$100
SA	PTAS[34]	100 km each way	16 cents per km for private car, contribution of $30 / trip for public transport, air travel-pre approved	$30 per night +GST for commercial accommodation, escort has to pay for first night, then eligible for rest of the days	Adelaide	$90-$100
WA	PTAS[35]	70-100 km	16 cents	$20 per night for private accommodation ($40 if travelling with an escort) and $60 per night for patient or $75 per night for patient travelling with an escort for commercial accommodation	Perth	$80-$100
TAS	PTAS[36]	50 km one way	19 cents per km, cheapest economy fair for travel	$46 per person – commercial accommodation	Hobart	$70-$99
NT	PTAS[37]	200 km	15 cents /km, $40 per return trip for ground travel if interstate	$10 per night for private accommodation and $35 per night for patient /escort per night –commercial accommodation	Darwin	$75-$100
ACT	IPTAS[38]	Interstate travel for treatment	Rebate to the amount specified for each city and mode of travel please see list below	$36.90 per night each patient and/or escort (commercial). $11.28 per night each patient and/or escort (private accommodation).		

Notes

PTAS are a contribution scheme, not a fully supported program. For example, SA has contribution of $30 per trip as that is the cost of travel for patients not eligible for PTAS, those living close to treatment facilities, NSW also has a co-contribution arrangement for non-pensioners and non-healthcare card holders.

Average duration of treatment for breast cancer is six weeks and for prostate cancer is 6-8 weeks.

If patients choose to have treatment and stay in commercial facility in Sydney, close to RPAH for 6 weeks, the average cost to patient and escorts would be $1500 after subsidy, when the cost of meals and other associated costs of living away is factored in, the out of pocket expenses would be even higher unless there is an assisted accommodation within the area at a subsidy rate.

For a person in low income earning category, raising funds for treatment and accommodation would be harder unless there are agencies other than commercial lenders to offer assistance or a government scheme of financial assistance in advance which the patient can pay back over a period of time.

Patients have to access treatment in the nearest facility- the waiting period may be longer in the nearest facility. Nearest facility is not always in a capital city, it could be a regional centre.

The rates above are the cheap hotel accommodation within 15 km of city centre, with disabled access.

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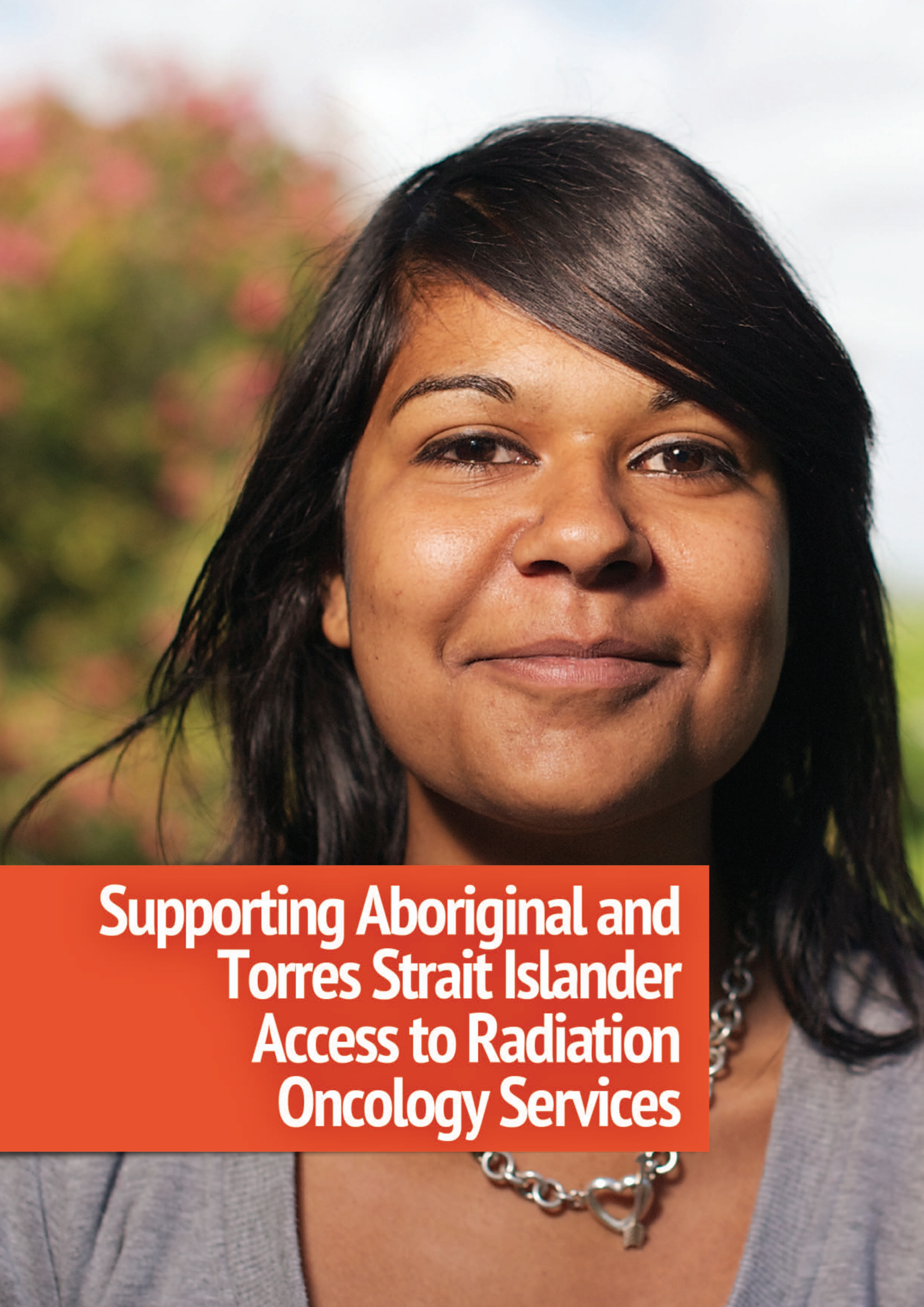

Supporting Aboriginal and Torres Strait Islander Access to Radiation Oncology Services

In this section

Key Issues

Indigenous Australians have unique needs with respect to radiation oncology for the following reasons:

- Different patterns of cancer incidence compared to non-Indigenous Australians;
- Later diagnosis and lower survival;
- Continued disadvantage in accessing treatments;
- Cultural considerations;
- Limited data and research on Indigenous cancer care, particularly in metropolitan settings.

Objective

Aboriginal and Torres Strait Islander patients have access to radiotherapy services offered in a culturally appropriate and respectful way.

Defining Success

A focus on improving Indigenous patients' outcomes in cancer control and radiotherapy specifically, including:

- Better data collection on Indigenous access to oncological services;
- Assessment of specific barriers to service access;
- Evidence-based strategies to improve access to treatments;
- Improved engagement between the hospital system, local communities and community-controlled Aboriginal and Torres Strait Islander health services.

Introduction

The Australian health care system is failing to adequately prevent, diagnose and treat cancer among Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) Australians, a situation which is being confirmed by a growing body of research evidence[1-2]. Cancer survival is lower for Indigenous Australians than other people. It is the second leading cause of death among Indigenous people, accounting for a greater number of deaths each year than diabetes and kidney disease[3-6].

The burden of cancer for Indigenous Australians has only recently begun to be fully appreciated. Compared with other Australians, Indigenous people have a similar or lower incidence of all cancers combined[1,6,8], but a higher incidence of rapidly fatal cancers (e.g. lung, liver) and a lower incidence of cancers with better survival (e.g. melanoma, breast)[1,2,8]. In addition, many cancers that are amenable to prevention through reduction in exposure to risk factors or that are detectable early through screening programs are more common among Indigenous people[1,2].

Advanced cancer at diagnosis[1,4,6], reduced access to/uptake of treatment[5], higher rates of co-morbidities amongst Indigenous patients[6], and language barriers[5] are some of the factors that may lead to poorer cancer outcomes. However, these factors only partly explain the disparity. Indigenous people with cancer have poorer survival compared to non-Indigenous people even after taking into account stage at diagnosis, cancer treatment and presence of co-morbidities[5]. Further complicating the picture is that many Indigenous cancer patients are not identified as such in the state/territory cancer registries that are the key sources of data on cancer patterns[1,2,7], this means that the burden of cancer among Indigenous Australians continues to be underestimated.

The need to improve cancer-related health services for Indigenous Australians is apparent however the available evidence is currently inadequate to effectively direct efforts. Limited access to cancer care services, including radiotherapy services, continues to have a detrimental impact on cancer outcomes of Aboriginal and Torres Strait Islander patients.

Radiation oncology plays an important role in the treatment of those cancers that are most common among Aboriginal people. Access to radiation oncology services for Indigenous patients warrants additional research and a greater emphasis.

Demographics

Over half of the estimated resident Indigenous population reside in either[9] New South Wales (29%) or Queensland (28%); 15% in Western Australia and 13% in the Northern Territory. Over a third of the population was located in Major Cities (32%); 21% lived in Inner Regional areas; 22% in Outer Regional areas; 10% in Remote areas and 16% in Very Remote areas.

Socioeconomic factors

Indigenous Australians have a lower life expectancy, higher unemployment rate (16.5%) and a significantly lower weekly income compared to non-Indigenous Australians[10]. According to the National Aboriginal and Torres Strait Islander Social Survey 2008, 'Indigenous peoples aged 18 years and over were almost four times more likely than non-Indigenous people to live in households that were unable to raise $2,000 within a week in an emergency (47% compared to 13%)[10].

Cancer Impact on the Indigenous Population

A recent study found that cancer was responsible for 18% of total deaths among Indigenous Australians[11]. Although cancer death rates were similar for Indigenous and non-Indigenous Australians aged less than 35 years or 65 years and over, Indigenous Australians in the middle age groups had higher mortality rates than non Indigenous Australians[11]. The study concluded that a difference in treatment between the two groups was mainly responsible for lower survival rate among Indigenous Australians.

The Rural Doctors Association in their submission to the Tripartite Committee stated that Indigenous Australians with cancer are twice more likely to die within five years of diagnosis than non-Indigenous Australians and urgent action is required to improve Indigenous access to multidisciplinary cancer care[12].

Indigenous people are more likely to be diagnosed with cancers that have a lower survival rate than non-Indigenous people. A recent publication, reported that compared to other Australians, Indigenous Australians had much higher incidence of lung and other smoking-related cancers, cervix, uterus and liver cancer, but much lower incidence of breast, prostate, testis, colorectal and brain cancer, melanoma of skin, lymphoma and leukaemia. Incidence was higher in remote areas for some cancers (including several smoking-related cancers) but lower for others. The incidence rate ratios (IRRs) for smoking-related cancers were higher in younger than older people (Xiahua, Z and Condon, J. Est. cancer incidence in Indigenous Australians, 2011).

Cancer survival is lower for Indigenous than other Australians; two local studies indicated that fewer Indigenous patients received recommended treatment[5,6,23].

A study from Queensland concluded that the lower survival rate for Indigenous patients is within the first two years after diagnosis and that the outlook for those who survive the first two years had a similar outlook to non-Indigenous people. This study has shown no disparity among people in relation to socio economic or remoteness factors[14].

Some research indicates that clinical under-staging and non-staging of cancer in Indigenous patients could be linked to socioeconomic factors or lack of access to care as well as to possible physician bias[15].

Lower participation rate in cancer screening programs among Indigenous Australians is a factor that leads to late diagnosis of cancer. For many patients, this is exacerbated by the limited access to care or patient preferences regarding treatments (especially in rural areas).

Data collection, and in particular consistent use of an Indigenous identifier, has improved in recent years but remains variable across the health jurisdictions. Nationally, the data is not adequate to enable analysis of the overall trends in cancer among the Indigenous population and their access to radiotherapy.

Importance of Radiation Oncology

Radiotherapy is a cost effective efficient treatment mode for cancer and a valuable option in palliative care, to relieve pain and discomfort. The most commonly occurring cancers in Indigenous population (cancer of lip/mouth/pharynx, lung, oesophagus, pancreas, cervix and uterus[22]) respond positively to radiotherapy treatment.

Radiotherapy treatments can also be used effectively for symptom control, such as pain management. Considering the amount of late-stage disease in many Indigenous patients, radiotherapy can make a valuable contribution in the palliative setting[17]. It is understood, that issues around the late diagnosis need to be addressed separately, as cancer treatments have the best curative effect in early stages of cancer.

Indigenous Access to and Utilisation of Radiotherapy

Access Issues

There are inherent systemic problems and historical bias in the health care system concerning access to services for Indigenous peoples[18 - 20]. Research shows that there are disparities between the cancer treatments received by Indigenous and non-Indigenous Australians.

For example, a study on survival of Indigenous and non-Indigenous Queenslanders after a diagnosis of lung cancer[18] has found that 46% of Indigenous patients received active treatment with chemotherapy, radiotherapy or surgery compared with 72% of non-Indigenous patients. The percentage of Indigenous patients who received radiotherapy was 31% compared to 42.8% for non-Indigenous patients. The study concluded that the differences in treatment between the two groups were mainly responsible for the difference in survival rates.

Stakeholder consultation during the development of this Plan highlighted concerns around the disadvantage experienced by Aboriginal and Torres Strait Islander patients in accessing radiotherapy services in a timely fashion.

The financial burden of cancer and the expenses associated with travel to receive treatments are a barrier to Indigenous patients living in rural and remote areas of Australia. These issues are explored in Supporting Regional and Rural Access to Radiation Oncology Services (on page 96).

Published research and information on Aboriginal and Torres Strait Islander cancer patients from metropolitan areas appears to be very limited.

Cultural Considerations

There is limited availability of culturally appropriate educational resources for Aboriginal and Torres Strait Islander communities and patients with regards to cancer. As a result, awareness of cancer, including causes, prevention and treatment options, is limited.

Some research papers note that in certain communities patients believe that cancer is payback for offending a family member[16] or as punishment for wrongdoings[17] and a person who believes so would not seek treatment for cancer. Most Indigenous patients would prefer to be cared for by their community members.

In some communities, language has acted as a barrier to services as well. There are cultural and language variations across Indigenous communities in different geographical regions, and therefore cultural considerations must be tailored to suit local circumstances.

Compared to other areas in healthcare, oncology does not have a strong presence of workers with Aboriginal and Torres Strait Islander background who can bridge the language and cultural gaps. More emphasis needs to be placed on Aboriginal Liaison Officers within cancer-care facilities, including radiation oncology, to help culturally-appropriate service provision.

In the Northern Territory, initiatives in improving the understanding and uptake of radiotherapy treatment options and complementary support services have been given a boost with the establishment of the first radiation oncology facility in the Territory. These initiatives include: the development and integration of cancer knowledge into Aboriginal Health Worker (AHW) qualifications; the creation of placement opportunities for AHWs at the Cancer Care Centre; the production (and intended translation) of a DVD resource to explain and demystify radiation treatments; and continued promotion and evaluation of prevention messages[21].

Recommendations

Lack of and reduced access to radiation oncology is an important factor affecting the cancer outcomes for Indigenous patients. While acknowledging the fact that there is a need for a comprehensive approach, the recommendations below relate specifically to radiotherapy access. The recommendations below are based on the relevant research[11,12,14 - 18,20,22], and responses received during the stakeholder consultation process.

Better data collection on Indigenous access to oncological services

67. Development and implementation of a national radiation oncology dataset should include data collection on Indigenous patients.

Assessment of specific barriers to service access

68. Further research to identify the reasons for the lower survival rates of Indigenous peoples diagnosed with cancer.
69. Additional research to identify issues and barriers for Indigenous patients living in metropolitan areas.

Evidence-based strategies to improve access to treatments

70. Indigenous patients must have access to radiotherapy as close to their community as possible.
71. Accommodation facilities for Indigenous patients and their families must be appropriate and available.
72. Education and information strategies about cancer including causes, prevention and treatment options must be developed for Indigenous patients.

Improved engagement between the hospital system and community-controlled Aboriginal and Torres Strait Islander health services

73. Planning for radiation oncology services must take into account specific access issues for Aboriginal and Torres Strait Islander patients.
74. Planning must be undertaken with reference to and in close consultation with the local Aboriginal community-controlled health services.
75. Specific strategies, including Aboriginal Liaison Officers at cancer centres, must be developed.
76. Initiatives to support Indigenous people to join the radiation oncology professions must be considered and encouraged.

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Research and Academia as Foundations of Future Practice

In this section

Key Issues

Research in radiation oncology provides direct clinical benefit to patients (measurable outcomes, used in diagnosis and treatment).

- Radiation oncology research in Australia lacks capacity and resources,
  - This limits capability for developing and implementing advances in patient care, and for workforce training and development;
  - There is disparity of research funding for radiation oncology compared to its clinical benefit to patients;
  - The impact of this may be greater in regional and rural facilities
- Research in radiation oncology is different to pharmacological based research in that:
  - randomised clinical trials are more difficult;
  - lack of clinical data collection to evaluate technologies;
  - novel methodologies are required to evaluate new technologies;
- There is further potential for collaboration between the various research groups, institutions, professions and individuals involved in cancer research.

Objective

World class research is part of the core business of radiation oncology services.

Defining Success

Australia is an international leader in radiation oncology research that improves patient outcomes:

- Local research that results in evidence based and timely implementation of new treatment techniques and technologies;
- Increased funding allocation to radiation oncology research that is commensurate with its contribution to cancer control;
- Dedicated radiation oncology research equipment and staff time are included into national service planning;
- Access to clinical radiation oncology equipment time for (translational and implementation) research is factored into facility service planning;
- Integration of radiation oncology treatments into comprehensive electronic medical records (EMR);
- Research is recognised as part of core business for all radiotherapy facilities;
- Multidisciplinary research teams are established, incorporating discovery, translational and implementation research.

Introduction

Medicine is reliant on extensive research and trials to adopt and integrate relevant findings into clinical practice in order to progress, develop and improve patient care outcomes. Cancer is the second most significant cause of mortality and morbidity in Australia[1]. Improvements in cancer treatment are dependent on effective research in identifying the causes and biology of cancer, developing new drugs and techniques for treating cancer and developing methods to evaluate and quantify the individual's response to treatment so that personalised medicine is enabled for the patient.

This section focuses on research and academia in the area of radiation oncology: clinical trials, discovery, translational research (see below), adoption of new technology into clinical practice (i.e. implementation research), and the constraints to research and development in Australia. Stakeholder consultation amongst members of the three professions sought comment on whether the institutions they were associated with participated in research or actively supported research, what the constraints were to conducting research and how research can be improved in Australia. The majority of the responses were concerned with the lack of collaboration and what respondents felt was inadequate support for research. The results of the stakeholder surveys and written submissions received are incorporated into the analysis below.

Current Status of Research in Australia

Research can be classified as discovery, translational and implementation. The majority of participants in the consultation process were of the opinion that Australia is not leading the way internationally in radiation oncology research. While many hospitals with radiotherapy facilities have some level of participation in research and/or clinical trials, most respondents deemed it inadequate. In addition, out of a total of 64 respondents, only 43.7% said that their workplace made time for people to do research during work hours with 32.8% of respondents using time after work hours to do research.

Radiation oncology clinical trial research is largely implementation based research and in Australia is mostly conducted under the umbrella of the Trans-Tasman Radiation Oncology Group (TROG). TROG is Australia and New Zealand's specialist clinical research group for cancers that can be treated with radiotherapy. TROG is a cooperative multi-disciplinary organisation dedicated to the control of a wide range of cancers through quality multi-centre research. To date, TROG has activated over 60 cancer research trials in Australia and New Zealand. Approximately 10 to 15 trials are open at any time, giving many patients the opportunity to access innovative therapeutic approaches. From the feedback obtained during the membership consultation process, of the 62 members who responded to the question of whether their workplace supports clinical trials, 35.5% answered occasionally, 30.6% answered regularly and 29.1% answered most of the time.

Descriptions of clinical trial phases have been developed for pharmaceutical studies. Their application to radiation oncology and other non-drug medical specialties is not straightforward as the implications of the unique dynamics faced by these specialties, particularly imaging[2], have not been widely recognized or articulated.

Phase of Trial[3,4]	*Medical Description*	*Application in Radiation Oncology*
1	Initial studies	Proof of concept
2	Short term side effects	Implemented (pilot studies, not altering treatment)
3	Effectiveness and risk benefit analysis	Evaluation of clinical implementation and risk benefit analysis
4	Post market surveillance	Post implementation studies

The above table shows the phases of medical clinical trials and the product components that are tested in each phase. The application of the trial phases to radiotherapy can be seen in the right column.

Funding for Research

The majority of cancer research funding in Australia is provided by:

- The Australian Cancer Research Foundation (ACRF)
- The Australian Research Council (ARC)
- The National Health and Medical Research Council (NHMRC)
- State branches of Cancer Councils
- Cancer Australia (Commonwealth Government funding)
- The Victorian Cancer Agency
- Cancer Institute NSW
- Queensland Institute of Medical Research
- State and Territory Health Departments
- International agencies
- Donations (private and institutional)
- And other specific cancer support groups

Funding of radiotherapy research represents a disproportionately small percentage of total cancer research funding. For example, between 2000 – 2001 and 2011 – 2012 the NHMRC directed 18.5% ($232.8 Million) of total cancer research funding ($1269 Million) towards cancer treatment research. It is estimated that only 15.1% ($35 million)[5] of that sum was allocated to radiotherapy related treatment research. Similarly, in 2011, 30%[6] of the NSW Cancer Council research grants funding was disbursed to cancer treatment research. Approximately 6% of that total was for radiotherapy treatment research. These allocations can be contrasted to the recommended radiotherapy utilization rate of 52.3%[7] of cancer cases, and that radiotherapy is involved in 40%[8] of cancer cures. As a result, donations, which are irregular and unsustainable, form a significant proportion of research funding for some radiation oncology facilities. Increased investment in radiotherapy treatment research will enable greater and faster improvements in treatments that are applicable to large numbers of cancer patients.

Discovery Research

In cancer, discovery research, also known as basic research, is the exploration of underlying biological, chemical and physical processes related to cancer induction, growth and treatment responses. This research is undertaken to generate new knowledge with the aim that it may enable the development of new diagnostic and therapeutic techniques. The results of this research sometimes cannot be directly applied to cancer treatment; further translational research is generally required for clinical application.

This research is important, for example to:

1. Improve clinical decision making, e.g. discovery research should be supported to allow studies on associated physiology, genetics or pathology that could add to the clinical picture in the future;
2. Discover and develop technical materials and equipment, allowing improved understanding and characterisation of complex radiation delivery being considered for clinical use;
3. Improve understanding of cellular biology and genetics and their influence on diagnosis and treatment in radiation oncology, leading to the possibility of individualised treatment and incorporation of radiobiology into treatment management;
4. Generate knowledge to be used in the development of targeted therapies for treatment of systemic disease.

Translational Research

To improve human health, scientific discoveries must be translated into practical applications. Such discoveries typically begin at "the bench" with discovery research in which scientists study disease at a molecular or cellular level and then progress to the clinical level, or the patient's "bedside"[9]. Translational research supports collection of evidence which indicates patient outcomes, shortens the time needed to prove value of treatment before it can be adopted and made available to patients. Typically this involves laboratory or Phase 1 and 2 clinical trials. Successful translational research also provides the basis for making treatments available to patients through Medicare. This applies to radiation oncology as well.

Rapid advances in radiation oncology mean the development of new treatment techniques and technologies to deliver them. The section on Keeping Pace with Radiotherapy Techniques and Technologies (on page 47) explores challenges in evaluating and adopting innovations at the national level. However, survey responses indicate that the adoption of radiation oncology techniques and technologies into patient care in Australia occurs at a limited pace, partly limited by research related factors. These include:

1. Limited access to research expertise in the clinical environment especially in regional and rural facilities;
2. Inadequate access to diagnostic and radiotherapy equipment for research (including clinical trials) purposes;
3. Insufficient staff resources;
4. Lack of availability of translational research funding allocated to radiation oncology;
5. Insufficient interdisciplinary and inter-institutional collaboration.

Despite the challenges of incorporating translational research into the clinical environment, some examples of recent successes in translational research include:

1. The incorporation of ideas from other areas of sciences, for example combining patient images from different imaging modalities including CT/PET/MRI;
2. Development of an MRI Linear Accelerator[10,11];
3. Biologically optimised treatment planning[12-16];
4. Cone beam CT incorporated into the linear accelerator for image guided and adaptive radiotherapy[17, 18];
5. Adaptive radiotherapy utilizing tumour tracking and response[19,20];
6. Use of tin foil modified electrons to treat superficial cancers[21];

According to the Cancer Institute NSW, "the translation of research discoveries into public benefit has become a focus for many research funding agencies and is particularly relevant for the Cancer Institute with a core aim of impacting upon population health"[22]. This view on translational research is shared by Cancer Australia[23], commenting "that the main goal is the uptake of best practice cancer care through the translational research into evidence based information and improvements in cancer control, this includes new models of care that are effective and relevant to the Australian health system and -clinical practice guidance for health professionals and relevant information for patients and the community". Increased translational research in Australia will allow the assessment and incorporation of the results of discovery research into clinical practice in a more timely and efficient manner than currently occurs.

Implementation Research

Implementation research is the evaluation of new or clinically utilised diagnostic or treatment techniques in the clinical environment. Due to the time delay required to assess some endpoints (such as cancer specific survival), many radiotherapy techniques and technologies are assessed using shorter term endpoints (such as associated toxicity and dosimetry).

Once sufficient evidence is gathered in translational research, the modality or technique can be implemented on a large scale for the benefit of patients. This research is typically conducted through the equivalent of phase 3 and 4 clinical trials. In Australia, these clinical trials are principally conducted through TROG. This research is designed so that the results of translational research become routine and deliver efficient, effective and sustainable patient outcomes.

This research should include areas such as:

1. Early and late treatment toxicities;
2. Quality of life;
3. Survivorship;
4. Evaluation of processes and efficiency;
5. Patient selection for specific treatments.

Successful implementation research may result in infrastructure investment associated with new technology, if it has not already occurred at the translational research stage. In addition, the technique may then attract reimbursement from public funding; one example of this occurring was the radiotherapy treatment verification using electronic portal imaging (EPID).

In the future, the electronic medical record and the minimum radiation oncology data set, linked to the radiotherapy record will allow the equivalent of phase 4 trials to be undertaken. Phase 4 trials are post market surveillance studies. This has the power to improve the personalisation of treatment. Future data collection would allow discovery based research to flow out of these data. For example, genome wide association studies may be able to be performed which could lead to discovery of biomarkers directly relevant to clinical practice. The aim would be to enhance implementation research by linking to future discovery research.

Constraints to Research and Trials

Inadequate funding or lack of dedicated funding and support are the major constraints to radiation oncology research. Although many of the professionals noted during consultation that they participate in research projects in some form, there is a concern that the clinical workload is significant and that available time to do research is minimal. The hospitals are prioritising everyday patient care over research, which is understandable, however in most institutions research is not tangibly recognised as part of core business. The time and resources allocated to research are inadequate and often lack essential administrative or data support.

One of the reasons for the disproportionately low allocation of cancer research funding to radiation oncology may be the challenge in translating a research design that is appropriate for radiation oncology into a form similar to that used in pharmaceutical trials, as this is often the basis for funding applications.

Delays in ethics and governance approvals for multi-site clinical trials lead to delays in recruitment and low engagement. Lack of participation by patients from population sub-groups with poorer outcomes, such as people from regional and rural areas and people from Aboriginal and Torres Strait Islander origin, as well as insufficient resources to support clinical trials at the site level are other challenges restricting research activities.

At the professional level, there are limited opportunities for employment in designated research positions. This is exacerbated by the highly variable and often limited allocation of protected time for research at facility level across all specialties in radiation oncology. Many professionals strongly interested in conducting research feel that they would need to go overseas if they want a prominent career in research. The situation presents an even greater challenge in regional and rural facilities where maintaining appropriate staffing levels can be difficult. Additional full time equivalent (FTE) positions or effective management of existing workforce to ensure that protected research time is recognised and made available would be a solution to this challenge.

Limited access to radiation oncology equipment can constrain research initiatives. Flexible hours (i.e. outside of patient treatment times) and protected time on the equipment or dedicated research equipment (such as linacs, planned on a national level) need to be planned. With any purchase of radiation oncology equipment, the utilization of that equipment should be planned such that provisions for patient treatment, research access, as well as maintenance and quality assurance are included within operating hours. These factors should also be considered in service planning and reporting.

A constraint to implementational and some translational research is that there are commercial-in-confidence considerations for manufacturers of radiotherapy equipment. There is a perceived risk that competitors may use research results to support similarly designed products without the associated research investment.

A strong focus is needed on leadership and fostering collaboration between disciplines and organisations and international collaboration. At present, the academic, research and clinical components continue to function as disconnected silos. Often, radiotherapy research in Australia is conducted in isolation and as a result it takes longer for research projects to generate meaningful data sets, reducing the academic impact of the work. International collaboration with sector partners would make research activities increasingly financially viable and give better client participation with access to larger populations.

Academia and Education

Initial education for all radiation oncology professions is provided in universities and is supplemented with a mandatory clinical training program delivered either within the degree program, or following graduation. Specialised education and training as well as continuing professional development (CPD), is governed, administered, and in part provided by the professional associations often in collaboration with universities and facilities. Academia refers to both the universities and the professional associations.

Training for all radiation oncology professions has a clinical component aligned with current clinical practice. There is also a requirement for a research component for most programs. There is a link between providing education in research in an academic environment and practicing it in a clinical environment. Supporting this link is particularly important for those professionals whose exposure to research in their education and training is limited.

It is equally important for contemporary clinical practice to be continuously incorporated into education and training programs for the radiation oncology professions as this ensures that trainees have the necessary knowledge to work effectively. The links between the academic and clinical environments are important as they enable the education of quality trainees, the enhancement of research capability, and the implementation of techniques and technologies for the benefit of patients.

Future Directions

The technological advancements and understanding of the molecular basis of cancer will influence the approaches to cancer prevention, early detection, diagnosis, tumour classification, treatment and monitoring of disease. New radiotherapy techniques and technologies will continue to improve the accuracy and effectiveness of cancer treatments, while minimising treatment-related side effects and improving patient quality of life. Increased understanding of cancer biology/radiobiology and the development and application of new targeted technologies will enhance patient outcomes, quality of life and survivorship. Translational research will be increasingly important in the incorporation of sophisticated technologies into standard clinical care and delivering cost-effective and equitable cancer care across Australia. Implementation research is necessary to compare effectiveness of various treatment modalities using wider population database to determine the impact of new techniques and technologies on patient outcomes.

There is a strong trend internationally for the installation of proton and heavy ion treatment facilities[24-27]. Australia is likely to adopt this technology, primarily for research purposes in coming years, and is currently developing world leading capabilities in micro-beam research at the National Synchrotron Centre in Victoria. This will in turn have implications for the availability of a suitably trained workforce and the identification of investment in infrastructure. Similar to the Synchrotron, the planning of this type of facility would require a national approach and its introduction would enhance Australia's ability to conduct research at the forefront of radiation science. Such facilities would provide opportunities to attract international research leaders to Australia and to retain more of the best and brightest research scientists.

Future research also needs to address variations in cancer outcomes for different cancers and population groups. The newer technologies with their increasing integration with patient management systems will be increasingly developed to facilitate data capture and sharing. This will also require consolidated approaches to manufacturers to ensure that appropriate data fields can be built into the record and verify systems to meet Australian data requirements. Such data collection will strengthen the quality, consistency and availability of national data on cancer treatment and research and will assist policy decisions and service planning and delivery of equitable radiotherapy for all cancer patients.

The workforce will need to be flexible and knowledgeable to adopt the outcomes of research not yet identified as having direct application to radiation oncology. For example, the implementation of nanotechnology in the medical environment may introduce new diagnostic and treatment techniques. Research opportunities and corresponding management support should be available to the workforce, irrespective of the geographic location of their workplace.

Similarly, patients should have access to participation in implementation research opportunities (e.g. through clinical trials) so that this choice is available, irrespective of the treatment facility location. It is recognised that patient participation in clinical trials is associated with the development of refined treatment regimens resulting in improved patient outcomes[28].

Increased investment in research will increase access to treatments, improve the quality of the overall service, improve treatment outcomes for patients and holds the promise to increase the throughput and productivity of radiation oncology practice. A stronger investment in radiation oncology research should also enhance the transfer of knowledge from the academic to the clinical environment, allowing the timely adoption of new treatment techniques. In part, the results of investment would be measurable by the number of scientific papers published and patents issued.

Recommendations

Local research that results in evidence based and timely implementation of new treatment techniques and technologies

77. Specific support for radiation oncology research is required:

    77.1. Clinical and health systems research in radiation oncology that produces timely evidence of safety, efficacy and cost effectiveness of new techniques and technologies must be specifically funded through a dedicated funding stream.

    77.2. Expansion of research support in radiation oncology that advance our understanding of biological mechanisms translating into clinical practice through specific measures such as translational training fellowships, to maximise benefits for patients.

78. Patient awareness of clinical research needs to be increased:

    78.1. Health care consumers must be educated in the availability and importance of clinical research, leading to increased participation in clinical research.

Increased funding allocation to radiation oncology research that is commensurate with its contribution to cancer control

79. It is recommended that radiation oncology research funding is increased so that:

    79.1. Research processes are developed from current levels and are sustainable with adequate dedicated funding

    79.2. Additional translational research capacity enables faster identification and adoption of new techniques and technologies that improve efficiency

80. Workforce and equipment planning and implementation at site, jurisdiction and national levels must include the requirements to support research as an integral component of care delivery.

81. A small grants program must be introduced to develop projects to a level of national competitiveness.

Dedicated radiation oncology research equipment and staff time are included into national service planning

82. Infrastructure planning at jurisdiction, state and national level needs to accommodate research requirements.

Access to clinical radiation oncology equipment time for (translational and implementation) research is factored into facility service planning

83. Facility planning needs to accommodate research requirements including discovery, translational and implementation research.

Integration of radiation oncology treatments into comprehensive electronic medical records (EMR)

84. All treatment facilities must have the capability to collect comprehensive data sets including treatment details that can be shared through national collaborative research programs.

85. Strategies for data support and sharing between facilities must be in place.

Research is recognised as part of core business for all radiotherapy facilities

86. The importance of research positions needs to be recognised:

    86.1. research career path must be developed

    86.2. radiation oncology services should support research activities within their facilities

86.3. Programs should be developed (if not yet in place) that combine professional with academic (doctoral or masters) qualifications.

86.4. Mentorship programs must be introduced to link experienced researchers with early career professionals.

87. The ethics and governance approval process needs to be streamlined to enable efficient collaboration.

88. Professions must build ethics and governance literacy amongst their members.

89. It is essential that healthcare consumers are involved in the development of trials and represented on decision-making bodies.

Multidisciplinary research teams established, incorporating discovery, translational and implementation research

90. Active cooperation and collaboration between various departments, jurisdictions, disciplines and manufacturers must be actively encouraged.

91. Clinical professionals must have protected time to conduct research.

92. International collaboration in research and participation in international research projects must be encouraged and supported.

93. Collaborative links between treatment facilities and universities need to be developed or increased (where already in place):

93.1. Co-operation between universities and treatment facilities has to extend beyond teaching hospitals.

93.2. Reciprocal support arrangements need to be established between universities and treatment facilities, whereby facilities provide clinical placements and universities provide research support to facilities.

93.3. Support for the establishment of conjoint academic and clinical positions in all three professional groups.

93.4. Research training and the creation of roles for practitioner-scientists must be fostered across the radiation oncology professions.

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Current Research and Trials/Grants

More information available from:

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3. http://www.cancerwa.asn.au/research/successfulresearchfunding/
4. http://www.trog.com.au/Default.aspx?tabid=70
5. http://www.canceraustralia.gov.au/research-and-funding
6. http://www.cancercouncil.com.au/wp-content/uploads/2011/12/CAN626-Cancer-Council-Donor-Servicing-16pp-DL-Brochure-v7.pdf

Methodology

Background

The Tripartite Committee, Chaired by A/Prof Chris Milross, approved the project to develop the Tripartite National Strategic Plan for Radiation Oncology (Australia) 2012-2022 on 1 April 2011.

The Royal Australian and New Zealand College of Radiologists (RANZCR) received funding from the Australian Government Department of Health and Ageing, on behalf of the Tripartite Committee, to undertake the development of the Plan between July 2011 and June 2012.

The project was managed by RANZCR, on behalf of the Tripartite Committee, under the direction of Ms Natalia Vukolova, Director of the Faculty of Radiation Oncology, RANZCR.

Notices advising the radiation oncology professions of the project to develop the Plan were circulated via member publications by the three organisations of the Tripartite Committee in 2011. In line with the funding agreement with the Department of Health and Ageing, updates on the status of the project were provided to the officers of the Commonwealth when requested.

Data Sources

Cancer Incidence Projections

All projections of cancer incidence and derivative projections for radiation oncology workforce and infrastructure were based on the Australian Institute of Health and Welfare (AIHW) 2012 report 'Cancer incidence projections, Australia 2011 to 2020'. The report excludes basal and squamous cell carcinomas of the skin. In the absence of detailed and consolidated state and territory data for the projected period, jurisdiction level data was obtained by apportioning the national data by the distribution of incidence by state/territory reported in AIHW's 'Cancer in Australia 2010: an overview' report.

Target Radiotherapy Utilisation Rate

The optimal radiotherapy utilisation rate was based on the study conducted by Delaney GP, Jacob S, Featherstone C and Barton MB 'Radiotherapy in cancer care: estimating optimal utilisation from a review of evidence-based clinical guidelines', 2003. The overall optimal radiotherapy utilisation rate used was 52.3% of new cancer cases. The figure is a nationally accepted benchmark and has been used by the Commonwealth Department of Health and Ageing (DoHA) and NSW Department of health for planning purposes[1-3].

Projections of Workforce and Infrastructure for Radiation Oncology

The Allen Consulting Group was commissioned to develop analysis and projections of the radiation oncology workforce and linear accelerator requirements between 2012-2022. The model covers three professional groups:

- Radiation Oncologists;
- Radiation Therapists; and
- Radiation Oncology Medical Physicists (ROMPs).

A full report on this work is available at www.radiationoncology.com.au

Facilities and Equipment Data

Data on radiation oncology facilities, equipment and radiotherapy techniques across Australia was obtained from the 2011 Faculty of Radiation Oncology (RANZCR) Facilities Survey. The survey included all Australian radiotherapy facilities that were operational as of December 2010, and achieved a 98% response rate. Data collected reflected the treatment activity during 2010 calendar year.

These data were augmented with the available Medicare activity data to confirm the numbers of linear accelerators (linacs) as of December 2011, and used those data as the basis for the linac projections. In several instances, where there was a difference in the number of linacs at a facility between the Medicare activity data and the Faculty Facilities Survey data, the Medicare activity data were used.

Stakeholder Consultation

A comprehensive stakeholder analysis was developed and approved by the Tripartite Committee at its meeting in September 2011; all stakeholders were grouped into the following areas:

- Professionals (radiation oncologists, radiation therapists and radiation oncology medical physicists across Australia)
- Private providers of services
- Commonwealth Government agencies and groups
- State Governments
- Peak Groups
- Foundations
- Consumer groups
- Quality-specific
- Workforce-specific
- Technology-specific
- Rural and regional -specific
- Aboriginal and Torres Strait Islander-specific
- Research and academic groups

Submissions were invited between October and November 2011 requesting comment on issues impacting on the provision of quality radiation oncology as well as on the possible strategies to address these issues. Correspondence requesting submissions and the suggested questions for consideration by stakeholders were tailored to each stakeholder group, based on their area of professional knowledge.

Additional Information

To augment the findings from the consultation process, a limited review of literature was undertaken. The project team further utilised the following methods to develop the plan:

- Correspondence and interviews directly with members of the professions, government representatives, peak groups and consumers;
- A series of face-to-face consultation meetings with key experts;
- A web-conference with the experts nominated by the Tripartite Committee to review the assumptions underpinning the workforce projections by the Allen Consulting Group (March 2011);
- A two-day writing workshop with an extended set of experts nominated by the Tripartite Committee to review the draft Plan (April 2012);
- Progressive review and amendments of the draft Plan by experts in specific areas;
- A two-day writing workshop for members of the Tripartite Committee and a limited set of experts to finalise the Plan (June 2012).

A list of documents, websites and reports reviewed but not specifically referenced within the Plan is included in the bibliography for each section of the Plan.

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Acronyms and Glossary

Acronyms

AACR	*Australasian Association of Cancer Registries*
AHW	*Aboriginal Health Worker*
ACDS	*Australian Clinical Dosimetry Service*
ACHS	*Australia Council of Healthcare Standards*
ACSQHC	*Australian Commission on Safety and Quality in Health Care*
ACPSEM	*Australasian College of Physical Scientists and Engineers in Medicine*
AIHW	*Australian Institute of Health and Welfare*
AIR	*Australian Institute of Radiography*
ARPANSA	*Australian Radiation Protection and Nuclear Safety Agency*
BT	*Brachytherapy*
CBCT	*Cone beam computed tomography*
CPD	*Continuing Professional Development*
CT	*Computed tomography*
CTV	*Clinical target volume*
2D/3D/4D	*2 dimensional, 3 dimensional, 4 dimensional*
DoHA	*Department of Health and Ageing*
EMR	*Electronic medical record*
FRO	*Faculty of Radiation Oncology, the Royal Australian and New Zealand College of Radiologists*
FTE	*Full Time Equivalent*
GTV	*Gross tumour volume*
IAEA	*International Atomic Energy Agency*
IGRT	*Image guided radiation therapy*
IMRT	*Intensity modulated radiation therapy*
ISO	*International Organisation for Standardisation*
Linac	*Linear accelerator*
MDT	*Multi-disciplinary team*
MLC	*Multileaf collimator*
MRI	*Magnetic Resonance Imaging*
MRS	*Magnetic Resonance Spectroscopy*
MSAC	*Medical Services Advisory Committee*
NCCI	*National Cancer Control Initiative*
NHMRC	*National Health and Medical Research Council*
NMDS	*National Minimum Data Set*
NPDP	*National Professional Development Programme*
OH&S	*Occupational health and safety*
OAR	*Organ(s) at risk*
PET	*Positron Emission Tomography*
PTAS	*Patient Travel and Accommodation Scheme*
PTV	*Planning target volume*
QA	*Quality assurance*
QALY	*Quality adjusted life year*
QOL	*Quality of Life*
RANZCR	*Royal Australian and New Zealand College of Radiologists*
RCR	*Royal College of Radiologists*
RCT	*Randomised clinical trial*
RO	*Radiation oncologist*
ROHPG	*Radiation Oncology Health Program Grants*
ROJIG	*Radiation Oncology Jurisdictional Implementation Group*
ROMP	*Radiation oncology medical physicist*
RORIC	*Radiation Oncology Reform Implementation Committee*
ROSIS	*Radiation Oncology Safety Information System*
RT	*Radiation therapist*
SBRT	*Stereotactic body radiation therapy*
SPECT	*Single-photon emission computed tomography*
SRS	*Stereotactic radiosurgery*
SRT	*Stereotactic radiotherapy*
3DCRT	*Three-dimensional conformal radiation therapy*
TEAP	*Training Education and Assessment Program*
TROG	*Trans Tasman Radiation Oncology Group*
WHO	*World Health Organisation*

Glossary

Brachytherapy	Brachytherapy is a highly specialised and resource intensive radiotherapy technique. Brachytherapy involves the placement of radioactive sources in, or just next to, a cancer. Unlike external beam radiotherapy, brachytherapy may be invasive. During brachytherapy, the radioactive sources may be left in place permanently or only temporarily, depending upon the radioactive isotope employed. Brachytherapy may be used alone or in conjunction with external radiation treatments.
Cancer	A diverse group of several hundred diseases. All cancers are characterised by changes to some of the body's cells which become abnormal and begin to multiply out of control. These abnormal cells can form an invasive (i.e. malignant) tumour.
Dosimetry	Dosimetry is used to check that the dose of radiation delivered to the patient is accurate and appropriate.
External Beam Radiotherapy	The most common form of radiotherapy, which directs the radiation at the tumour from outside the body. With external beam radiotherapy, the dose is usually delivered by a linear accelerator, which can produce radiation beams from different angles by rotating the accelerator "arm" (the gantry).
Intensity Modulated Radiation Therapy (IMRT)	Intensity modulated radiation therapy is a radiotherapy technique that allows radiation to be more closely shaped to fit the tumour and spare nearby critical normal tissue.
kV imaging	Kilovoltage x-rays used to take films closer to diagnostic quality and for fluoroscopy
Linear Accelerator (Linac)	The device most commonly used for external beam radiation treatments for patients with cancer.The Linac is used to treat all parts/organs of the body. It delivers high-energy x-rays to the region of the patient's tumor. These x-ray treatments are designed in such a way that they deliver radiation to cancer cells while sparing the surrounding normal tissue.The Linac is used to treat all body sites, using conventional techniques, Intensity-Modulated Radiation Therapy (IMRT), Image Guided Radiation Therapy (IGRT), Stereotactic Radiosurgery (SRS) and Stereotactic Body Radio Therapy (SBRT).
Margin (clinical)	Clinical target volume encompasses the gross tumour or the high risk target volume with a margin to encompass potential microscopic tumour spread.
MV images	Megavoltage images (images taken on the Linac)
Orthovoltage treatment	See 'superficial and orthovoltage treatment'
Palliative treatment	Treatment for symptom control, not with a curative intent
Radical treatment	Treatment with a curative intent
Radiotherapy	A treatment for cancer and a number of non-malignant conditions, which uses highly precise doses of radiation to kill abnormal cells while minimising doses to the surrounding healthy tissue. Radiotherapy has a major positive impact on local cancer control and is a highly effective therapy for control of cancer symptoms such as pain.
Radiotherapy utilisation	A percentage of new cancer patients who access radiotherapy treatments.Utilisation is a measure of access to quality radiation oncology services. This Plan uses 2 figures for utilisation: target (optimal) radiotherapy utilisation rate – how many new cancer patients would benefit from radiotherapy; and current (underutilisation).

Radiation Oncologist (RO)	A radiation oncologist is a medical specialist who has specific postgraduate training in management of patients with cancer, in particular involving the use of radiation therapy (also called radiotherapy) as one aspect of their cancer treatment. They also have expertise in the treatment of non-malignant conditions with radiation therapy.Radiation oncologists work closely with other medical specialists, especially surgeons, medical oncologists and palliative care physicians, as part of a multidisciplinary team caring for patients with cancer.
Oncology Medical Physicist (ROMP)	A Medical Physicist is a clinician with substantial tertiary qualifications in physics who applies their knowledge of the principles of physics to the care of patients. Radiation oncology medical physics is the application and development of the principles and techniques of physics for the therapeutic use of ionising radiation.
Radiation Therapist (RT)	The Radiation Therapist is an allied health professional who works in the field of radiation oncology. Radiation therapists plan and administer radiation treatments to cancer patients.
Radiation Oncology Practice Standards	In 2008, the Tripartite Committee developed the Radiation Oncology Practice Standards with funding and support from the Department of Health and Ageing. The document presents 16 standards developed for Radiation Oncology Practices, to assist facilities to achieve best practice by providing a framework of requirements.
Stereotactic treatment	A highly specialised and complex delivery of external beam radiation therapy called stereotactic radiation uses focused radiation beams targeting a well-defined tumour, relying on detailed imaging, computerized three-dimensional treatment planning and precise treatment set-up to deliver a much higher radiation dose than standard radiotherapy with extreme accuracy.
Superficial and orthovoltage treatment	Superficial (SXT) and Orthovoltage (DXT) radiotherapy utilise low energy ionizing radiation to treat cancer and other conditions that occur either on or close to the skin surface. SXT utilises x rayenergies of between 50 and 200 kV, having a treatment range of up to 5mm, and DXT utilises 200 to 500 kV x-rays penetrating to a useful depth of 4 – 6cm.
Target (clinical)	Area where the radiation beams are aimed; usually a tumour, malformation, or other abnormality of the body.
Three Dimensional (3D) Imaging	Three-dimensional (3D) Imaging in radiotherapy treatment is localization of the target by comparing a cone-beam computed tomography (CBCT) dataset with the planning computed tomography (CT) dataset from planning.
Treatment Planning	The process in which a team consisting of radiation oncologists, radiation therapist and medical physicists plan the appropriate external beam radiotherapy or internal brachytherapy treatment technique for a patient with cancer.

Supporting Documents

- Allen Consulting Report on Radiation Oncology Resources 2012
  http://www.radiationoncology.com.au/supporting-docs/ranzcr-allenconsulting.pdf
- Tripartite Radiation Oncology Practice Standards
  http://www.radiationoncology.com.au/supporting-docs/ranzcr-standards.pdf
- Tripartite Radiation Oncology Practice Standards Supplementary Guide
  http://www.radiationoncology.com.au/supporting-docs/ranzcr-standardsguide.pdf