
A Review and Costing Study into Radiotherapy Services

Final Report

*Independent Hospital
Pricing Authority*

*A Review and Costing
Study in Relation to
Radiotherapy Services*

September 2013



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1 *Executive summary*

The Independent Hospital Pricing Authority (IHPA) engaged PwC and its sub-contractor SyRis Consulting to undertake a review and costing study of Australian radiotherapy services.

The study was commissioned to determine the reliability of radiotherapy cost data due to its role in the development of associated price weights in both admitted and non-admitted settings.

The purpose of this review is to assist IHPA and the jurisdictions obtain a better understanding of the cost data that had been submitted to IHPA and to bring to light the costing methodologies employed in services specifically for the pricing of radiotherapy services in 2014/15.

After an initial period of analysis, an approach was developed which recognised the challenges of limited data availability, partial jurisdictional participation and the need to complete this study promptly for IHPA's consideration for FY14 pricing. The approach to this study included:

- An invitation to all jurisdictions for participation
- National Hospital Cost Data Collection (NHCDC) data for Round 16 for patients that have consumed costs from any of the three Australian Hospital Patient Costing Standards (AHPCS) centres / areas¹:
 - Radiation Medicine - which generally hold staffing expenditures
 - Radiation Oncology - which generally hold expenditures relating to treatment
 - Radiotherapy Suites – which represent expenses within the radiotherapy department
- The Department of Health (Victoria) provided:
 - Patient level cost data for all episodes that reside in the Departments Victorian Cost Data Collection (VCDC) database for 2011/12 for the Victorian program “R” Radiotherapy
 - Patient level demographic data from the Victorian Radiotherapy Minimum Data Set (VRMDS)
- Jurisdictional and industry consultation for a sample of participating sites, with questions that centred specifically upon the costing methodology for radiotherapy services.

To ensure that the scope was met, a number of activities were completed including:

- Consultation with jurisdictions to gain access to existing radiotherapy reports and cost data
- A literature review related to the costing and funding of radiotherapy services
- The establishment of a cost data set for those hospitals that provide radiotherapy services and submit data to the NHCDC.

Some of the reasons for this limited data availability included:

- No costed activity within some jurisdictions, as this is still a work in progress
- Non submission of costed activity to IHPA, as some of the activity was deemed as Non-ABF and hence not forwarded by the jurisdiction to IHPA.

Given these data limitations, some of the data provided by the Department of Health (Victoria) which included cost data for all episodes that reside in the Departments Victorian Cost Data Collection

¹This provides the cohort for the IHPA analysis and includes the total consolidated cost

(VCDC) database for 2011-12 for the Victorian program “R” Radiotherapy for ABF and Non-ABF activity was also examined to inform some of the recommendations in this review.

Data was also received from the Peter MacCallum Cancer Institute (Peter MacCallum) to enable analysis of the costed record from the source costing system, to the jurisdiction and finally to IHPA.

Based on a data review of both admitted patients and non-admitted patients, the following recommendations are made to the Radiotherapy Steering Committee and IHPA specifically for consideration for the pricing of radiotherapy services for 2014/15:

1. A specific National Weighted Activity Unit (NWAU) loading for admitted inpatient Radiotherapy would present as a more equitable distribution of funds between Radiotherapy providers and other sites.

This is derived as the analysis indicates that radiotherapy services within the cohort examined present an inlier adjunct cost of approximately 40% of the total consolidated episode costs.

However, further analysis would be advised prior to any loading to ensure the appropriate loading is derived.

2. In order to identify Dosimetry events within radiotherapy and to enable the targeting of NWAU and funding to these events, consideration should be given to the 10.12 Radiation Oncology (Treatment) Clinic Definition being revised to split Planning (Dosimetry and Simulation) from Treatment.
3. Promote further costing development of radiotherapy services through the newly formed NHCDC Advisory Committee and through a pointed bottom up costing of specific radiotherapy services.

2 Introduction

PwC and its sub-contractor SyRis Consulting were engaged by the Independent Hospital Pricing Authority (IHPA) to undertake a review and costing study of Australian radiotherapy services.

2.1 Project Scope

The study was commissioned to determine the reliability of radiotherapy cost data given its role in the development of associated price weights in both admitted and non-admitted settings.

The purpose of this review is to assist IHPA and the jurisdictions to obtain a better understanding of the cost data that had been submitted to IHPA and to bring to light the costing methodologies employed in services specifically for pricing radiotherapy services in 2014/15.

The data submitted to IHPA is principally the National Hospital Cost Data Collection (NHCDC) and the study compares this with other available data, such as that which exists on hospital clinical costing systems and held by the jurisdictions.

2.2 Approach

The planned approach to this engagement was presented to the Radiotherapy Steering Committee in the project's inception meeting. This included:

- An invitation to all jurisdictions to participate in this review including their relevant hospitals providing radiotherapy services
- A data analysis framework that included a cost data review of inpatient and outpatient data from :
 - NHCDC Round 15 (2010/11) and Round 16 (2011/12) data
 - Cost data from the Department of Health (Victoria)²
 - Cost data directly from hospital clinical costing systems (where possible)
- Jurisdictional and industry consultation
- Radiotherapy cost data survey.

After an initial period of analysis it was recognised that with limited data availability, partial jurisdiction participation and the need to complete this study promptly for IHPA's consideration in FY14 pricing, the approach needed to be modified. Subsequently the approach to this study included:

- An invitation to all jurisdictions for participation
- An extract of NHCDC data for Round 16 for patients that have consumed costs from either of the three AHPCS centres / areas³:
 - Radiation Medicine - which generally hold staffing expenditures
 - Radiation Oncology - which generally hold expenditures relating to treatment
 - Radiotherapy Suites – which represent expenditures of the radiotherapy department
- The Department of Health (Victoria) provided:

² The Department of Health, Victoria has an established radiotherapy cost and service data collection, which was considered by a number of participants to be a reliable source of cost data, given the absence of any other national or other jurisdictional data.

³ This provides the cohort for the IHPA analysis and includes the total consolidated cost

Introduction

- Patient level cost data for all episodes that reside in the Departments Victorian Cost Data Collection (VCDC) database for 2011/12 for the Victorian program “R” Radiotherapy.
- Patient level demographic data from the Victorian Radiotherapy Minimum Data Set (VRMDS)
- Data was also received from Peter MacCallum to enable analysis of the costed record from the source costing system, to the jurisdiction and finally to IHPA
- Jurisdictional and industry consultation for a sample of participating sites, with questions that centred specifically upon the costing methodology for radiotherapy services.

To ensure that the scope was met, a number of activities were completed including:

- Consultation with jurisdictions to gain access to existing radiotherapy reports and cost data
- A literature review related to the costing and funding of radiotherapy services
- The establishment of a cost data set for those hospitals that provide radiotherapy services
- A cost data analysis to demonstrate and identify differences in costs and some of those underlying causes.

3 *Radiotherapy service*

According to the Australian Cancer Database it was estimated there were 120,710 new cases of cancer diagnosed in Australia during 2012. Prostate malignancies are the most common followed by Bowel, Breast, Melanoma of the skin, and Lung cancers.

Accessibility and affordability of radiotherapy services are key issues for many cancer advocacy groups, and remain a challenge for governments as cancer incidence increases with a growing and ageing population.

Radiotherapy involves the delivery of ionising radiation to the direct site of the tumour and is not associated with as many treatment side effects compared to chemotherapy. Radiotherapy is effective in the treatment of solid tumours, has a wide application and was used most commonly for seven of the top ten cancer diagnoses in 2012⁴.

In treating cancers, radiotherapy is employed in a number of different modalities, from active treatment to palliative management. It can be used as sole modality either for palliation or cure, and is used frequently in combination with chemotherapy and with surgery or both in the curative setting, to enhance cure rates. For example chemotherapy is used as an adjunct to radiotherapy or as a precursor to shrink the size of a tumour prior to more definitive surgery.

Radiotherapy can be administered in both admitted (inpatient) and non-admitted (outpatient) settings through radiotherapy centres located throughout Australia. However, it is estimated that over 90% of radiotherapy services are delivered within the non-admitted setting.

The wide application of radiotherapy in current oncology practice means appropriate funding mechanisms need to be implemented to ensure the sustainability of such services. An examination of the radiotherapy cost data will help to determine how robust the data is when used to create the National Efficient Price (NEP) and whether there is any need for further model refinements and adjustments.

The radiotherapy process generally involves a three steps:

- 1 Treatment prescription: this part of the process is initiated through consultation for the patient with a radiation oncologist, and potentially a multi-disciplinary discussion. The radiation oncologist decides the appropriate radio-therapeutic management and writes the required prescription for site, dose and fractionation and preferred technique.
- 2 Treatment planning: the patient attends the Radiotherapy Department for imaging of the site, and other preparation, for example the preparation of immobilising head or body casts in the mould room. The imaging is transferred to the planning computer, where the optimal field arrangements are determined, the dosimetry calculated, and the need for shielding of normal structures incorporated. The approved plan is then transferred to the treatment equipment. Other disciplines may be consulted, for example, Dental Oncology for head and neck cancer patients.
- 3 Treatment delivery:
 - a External beam therapy. The most common forms of external beam therapy is megavoltage therapy delivered by linear accelerators, and orthovoltage from lower energy X-ray machines. The patient attends the treatment suite on a number of occasions varying between 1 and 40 visits depending on the prescription. On each occasion the planned set-up is reproduced and verified with visual examination and/or imaging before the treatment is delivered. The patient may see medical, nursing and other allied health staff during a course of treatment. External beam therapy is the usual means of delivering radiation therapy.

⁴ [Australian Institute of Health and Welfare](#) Cancer Statistics; accessed 1/8/13

- b Brachytherapy. This involves the insertion of radioactive isotopes into the tumour in the patient, either temporarily and permanently, and requires extra specialist expertise to be included in the treatment team such as radiation oncologists, radiation therapists and radiation oncology medical physicists. Its use is virtually confined to treating prostate and gynaecological cancer, although other sites such as lung, bile duct, head and neck and breast, where the tumour is accessible, may be so treated.

Radiotherapy is a critical and cost-effective treatment modality for cancer patients, estimated to provide benefit to around half of all those diagnosed with cancer. Improving access to and capacity in radiotherapy services has been a key feature of state and Commonwealth government cancer services investments over recent years, most notably through the 2010 \$560M Health and Hospitals Regional Cancer Funding round.

The majority of radiotherapy is provided as a non-admitted service, with funding historically provided through the Commonwealth Medicare Benefits Schedule (CMBS) and jurisdictional contributions. This 'combined' funding is an unusual but long recognised feature of radiotherapy in Australia, and has been clearly articulated in national reports, and acknowledged in historical agreements.

4 Literature Review

The following section builds on previous work completed by SyRis Consulting titled ‘Review of Radiotherapy Non-Admitted Patient Funding’ (2012) for the Victorian Department of Health. This work included a comprehensive assessment of radiotherapy in Australia and a thorough review of international radiotherapy costing models.

Radiotherapy costing was first described in the British Journal of Radiology in 1983 and was based on treatment using a linear accelerator⁵. Since this time technology has evolved and has created great complexity in terms of apportioning and accurately predicting the costs associated with providing radiotherapy treatment. There has been an increase in the spending on radiotherapy services as well as an increase in the number of patients accessing treatment services. One Canadian study observed that the demand for radiotherapy services is increasing faster than the rising incidence of cancer in the community⁶.

4.1 International Literature Review

What is apparent from the SyRis Consulting reviews and the international literature is that costing radiotherapy treatment is complex due to a number of factors which occur during the four stages of treatment – clinical assessment, preparation, treatment and follow-up.

4.1.1 Cost drivers and cost allocation

The study by Dunscombe et al (cited by SyRis Consulting) observed “that only about 40% of the costs of a patient’s encounter are incurred in the treatment phase.” These early studies produced ‘average cost’ outputs but the more recent studies have moved towards an activity-based costing model developed at the Leuven Radiotherapy Department in Belgium⁷. Researchers from the Leuven Radiotherapy Department have contributed significantly to the understanding of the inputs into radiotherapy treatments. They have identified in their study published in 2000⁸ the inputs that are critical to radiotherapy services:

- buildings and facilities
- equipment
- staffing
- materials (consumables including anaesthetics)
- overheads
- travel (usually incurred by patients).

Of these inputs they proposed that equipment and staffing accounted for the majority of costs in delivering services and they noted the costs were not uniform across patients at different centres.

The primary driver of cost distribution was the number of patients treated by each radiotherapy machine.

⁵ Greene, D; *The Cost of Radiotherapy Treatments on a Linear Accelerator*; British Journal of Radiotherapy; Volume 56; pp. 189-191

⁶ Mou B, Cooke AL, Suderman K; *Radiation oncology in a Canadian province: measures of workload and treatment complexity*; Clinical Oncology; Volume 23; pp. 4-9

⁷ Lievens Y, van den Bogaert W, Kesteloot K; *Activity-based costing: a practical model for cost calculation in radiotherapy*; International Journal of Radiat Oncol Biol Phys. 2003 Oct 1; Volume 57 (2); pp. 522-535

⁸ Kesteloot K, Lievens Y, van der Schueren E; *Improved management of radiotherapy departments through accurate cost data*; Radiotherapy & Oncology; Volume 55 pp. 251-262

Researchers have also indicated that this activity can decrease given the need for new equipment to be purchased and the hiring of staff required to operate the equipment as the number of patient's increases. This highlights that within the bands of capacity of each piece of equipment the increase in cost allotment per patient is small, because of the high fixed cost of equipment. However, when the capacity threshold is reached and a new piece of equipment is required the costs increase sharply.

Other challenges present themselves for centres located in rural and regional areas of Australia where patient numbers may not be as high compared to the larger metropolitan services. Effective service planning is therefore required in order to extract the maximum value from the equipment and the staff required in these centres.

In 2010, NSW Health published their strategic plan to 2016 for radiotherapy services. The treatment course parameters used to build the service model are based upon the Radiation Oncology Reform Implementation Group's Planning forum. The parameters were:

- A 25% re-treatment rate
- 19 attendances per course
- 4.1 attendances per hour
- 8 operating hours per day
- 240 working days per annum

Based on these parameters it was determined that each linear accelerator could provide 414 total courses per year. The 414 courses are assumed to be comprised of 331 new treatment courses and 83 re-treatments. It was acknowledged that radiotherapy service providers will have differing parameters to these such as operating on weekends or extended hours during the week⁹.

The development of new technologies has presented an additional challenge for cost allocation and a number of studies outline the cost-effectiveness of these technologies^{10 11 12 13}. These new technologies have highlighted the limitations of the historical 'average costs' assigned to patients and created the more realistic and accurate 'activity-based' costing of radiotherapy services.

The Australian researchers Delaney et al developed the basic treatment equivalent (BTE) model for measuring linear accelerator throughput in 1997¹⁴ and further refined it in 2005¹⁵ and they concluded "the BTE model is a better measure of linear accelerator throughput. It incorporates weightings for treatment and patient factors that significantly influenced fraction duration."

4.1.2 Costing and Reimbursement models

Central to an effective reimbursement model is the need to attribute all the inputs to a single episode of care by tracking and linking the elements to each patient. Most important to this linkage is the apportionment of staff time, which can be difficult particularly when patients are receiving radiotherapy and chemotherapy simultaneously as part of their treatment regimen. Allied health staff

⁹ NSW Health, *Radiotherapy Services in NSW Strategic Plan to 2016*, 2010

¹⁰ Hummel S, Stevenson M, Simpson E, Staffurth J; *A model of the Cost-effectiveness of Intensity-modulated Radiotherapy in Comparison with Three-dimensional Conformal Radiotherapy for the Treatment of Localised Prostate Cancer*; Clinical Oncology; Volume 24; pp. 159-167

¹¹ Krug B, Van Zanten A, Pirson A, Crott R, Vander Borgh T; *Activity-based costing evaluation of a [¹⁸F]-fludeoxyglucose positron emission tomography study*; Health Policy; Volume 92; pp. 234-243

¹² Yong J, Beca j, O'Sullivan B, Huang S, McGowan T, Warde P, Hoch J; *Cost-effectiveness of Intensity-modulated Radiotherapy in Oropharyngeal Cancer*; Clinical Oncology; Volume 24; pp. 532-538

¹³ van Loon J, Grutters J, Macbeth F; *Evaluation of novel radiotherapy technologies: what evidence is needed to assess their clinical and cost effectiveness, and how should we get it?*; Lancet Journal of Oncology; Volume 13; pp. 169-177

¹⁴ Delaney G, GebSKI V, Lunn A, Rus, M, Manderson C, Langlands A; *Basic Treatment Equivalent (BTE): a new measure of linear accelerator workload*; Clinical Oncology; Volume 9; pp. 234-239

¹⁵ Delaney GP, Shafiq RJ, Jalaludin BB, Barton MB; *The development of a new basic treatment equivalent model to assess linear accelerator throughput*; Clinical Oncology; Volume 17; pp. 311-318

in particular consult with patients from a variety of departments and the associated costs are split between a number of departments and across a number of patients.

Kesteloot et al¹⁶ studied the time staff spend with patients during the different stages of radiotherapy treatment and the different cancers and determined costing classifications for reporting purposes. These classifications have been incorporated into the activity-based costing models in the United States, United Kingdom, Canada and Belgium. Australia's literature has been dominated by the work undertaken in the Victorian jurisdiction in the development of the Weighted Activity Unit (WAU) funding model.

In 2000, the US government via the Centre for Medicare and Medicaid Services (CMS) introduced a fixed bundled payment for hospitals that provide outpatient products and services called the hospital outpatient prospective payment system (HOPPS). The CMS bundled clinically similar outpatient services that used comparable levels of resources into discrete payment groups known as ambulatory payment classification (APC) groups. Historical claims data determined the relative weights to each of the APC groups and cost data and variations in wages were incorporated into the payment mechanism using the inpatient hospital wage index.

In the United Kingdom's Health Related Groups (HRGs), the planning HRGs are listed in 9 bands which are based on increasing complexity, with a tenth band for the classification of 'other radiotherapy planning'. The planning HRG is intended to cover all attendees required for completion of the planning process – it is not intended that individual attendances for parts of this process will be recorded separately.

The planning HRG does not include the consultation at which the patient consents to radiotherapy, nor does it cover any outpatient attendance for medical review required by any change in the status of the patient.

For treatment, there are eight bands of HRGs that are intended to capture increasing complexity, and a ninth band for 'other radiotherapy treatment.' For each fraction of treatment delivered, one HRG will be assigned.

The Canadian reimbursement model, by contrast, is determined at a provincial level rather than uniform national level. In Ontario, the model is structured to provide a base payment for the treatment of a minimum number of new cases per year which is decided by Cancer Care Ontario, and additional funds are allocated based upon:

- number of new cases above the base number of cases
- disease site
- intent (either curative treatment or palliative management)
- Technique being employed (IMRT, brachytherapy or TBI).

The current Australian experience is mixed, with the depth of costing rigour varied. A number of jurisdictions have indicated that they are not costing any non-admitted services and hence by default there is no methodology available to review.

The Victorian jurisdiction appears to be the most mature (it should be noted that this model had its inception approximately four years ago), with a costing methodology which builds intermediate products according to the three step radiotherapy process (planning, simulation and treatment) and within each stage of that process. The WAU is then developed using the costing data to fund radiotherapy services.

Table 1 below, summarises what is included in the reported costing data information from different jurisdictions by treatment regime.

¹⁶ Kesteloot K, Lievens Y, van der Schueren E; *Improved management of radiotherapy departments through accurate cost data*; Radiotherapy and Oncology; Volume 55; pp. 251-262

Table 1. Cost Data Overview by Treatment Type

Treatment type	Victoria*	Australia**	USA	UK	Canada	Belgium
Consultations	✓	x	✓	✓	✓	✓
Megavoltage	✓	x	✓	✓	✓	✓
Kilovoltage	✓	x	✓	✓	✓	✓
Brachytherapy	✓	x	✓	✓	✓	✓
Simulation	✓	x	✓	✓	✓	✓
Dosimetry	✓	x	✓	✓	✓	✓
Mould Room	✓	x	✓	✓	✓	✓

*Some Victoria ** excluding Victoria

In the US, its billing culture enables the type of service provided per patient to be itemised and the relevant cost attached given the requirements of its funding model.

In the Victorian case, data has been presented for three major health services at intermediate product level to demonstrate the types of services attached to each patient episode.

4.2 SyRis Consulting's report for the Department of Health (Victoria)

SyRis Consulting previously conducted a review of costing of radiotherapy services in Victoria that identified the cost drivers and elements of radiotherapy treatment and recommended those which need to be included in appropriate funding models.

The review was conducted in four stages. Stage 1 of the review examined the sources of revenue and expenditure in the provision of radiotherapy services in Victoria. The departments who participated in this study were:

- Austin Health (Heidelberg Repatriation Hospital, Ballarat Austin Radiation Oncology Centre)
- Barwon Health (The Geelong Hospital)
- Alfred Health (The Alfred, Latrobe Regional Hospital)
- Peter MacCallum Cancer Centre (East Melbourne, Monash Medical Centre Moorabbin, Bendigo Radiotherapy Centre).

These sites are the major radiotherapy providers within the Victorian jurisdiction and provide a broad snapshot of activity between metropolitan and regional centres. According to the findings of this first stage, the revenue sources included:

- Net Department of Health funding (including WAU)
- Training and development
- CMBS funding
- Weighted Inlier Equivalent Separation (WIES) funding
- Section 100 Pharmaceutical benefits Schedule (PBS) revenue
- Radiology billing
- Sundry revenue.

The significant majority of funding originated from either the state or federal health departments and it was clear where the funding had originated. Expenses, on the other hand, come from a variety of sources and they were accounted for in the General Ledger differently between the study sites. The identified expenses were:

- staffing (medical, nursing, allied health)
- capital costs for equipment and other infrastructure
- treatment costs (including consumables)
- paediatric anaesthesia

- dental costs
- patient transport patient accommodation
- patient education
- staff education and teaching
- staff transport and accommodation for outreach clinics
- pharmacy
- diagnostic and therapeutic imaging.

In an attempt to correctly apportion the staffing costs the report outlined the staff resource allocation matrixes for the medical, radiation therapy and physics staff providing radiotherapy services. Each matrix breaks down the time they spend completing each of the tasks during the radiotherapy process.

Stage 2 of the project built upon the previous stage and aimed to review the alignment of the elements of the current radiotherapy funding model against the key resource drivers identified during stage 1.

In order to undertake the comparison, the major cost drivers were grouped into the 3 major steps of radiotherapy:

- Planning (including simulation and dosimetry)
- Treatment
- Outpatient Consultations.

Stage 4 reviewed the existing patient costing processes employed at the participating radiotherapy sites. This involved assessing the capacity of the Victorian health services to provide ongoing radiotherapy patient level cost data to the Department and to provide advice on the methodologies to allocate costs to patient activities and link activities to consistently defined cost episodes.

It was noted at this stage that the data captured within existing costing systems are not adequate to enable sites to provide annual cost weight information that can be used by the Department of Health to rebase the WAU cost weights or develop future funding models.

The report concludes that “by utilising a stronger radiotherapy episode definition (based on the service event) and through the use of consistent Relative Value Units across the sites, the cost weight information will become more usable and reliable. In turn this will enable the ongoing review of the detailed cost data and it will facilitate the development of new, more clinically meaningful and relevant, funding models.”

4.3 Costing Standards

4.3.1 Australian Hospital Patient Costing Standards (AHPCS)

A review of both the earlier Reference manuals of the NHCDC and Version 2.0 of the AHPCS was undertaken and there is no specific standard or guideline for the costing of radiotherapy services for the purposes of the NHCDC.

Upon consultation with participating (non Victorian) jurisdictional and industry representatives, there appeared to be consensus that more work needed to be done to both obtain access to the required feeder data which exists in radiotherapy departments (and machines). This would enable costing of these services and to assist the costing community in providing greater clarity on how to cost these services if there was to be further alignment to national radiotherapy prices and funding models.

4.3.2 Clinical Costing Standards Association of Australia Guidelines for Radiotherapy

The work undertaken by SyRis Consulting was used by the Victorian costing workforce and the representatives from the Department of Health (Victoria) to develop a radiotherapy costing and reporting guideline through the (now defunct) Clinical Costing Association of Australia (CCSAA)¹⁷.

The guideline prescribes that cost data should be reported using a hierarchy beginning with the service activities, which aggregate to a service event episode that can be identified by the Course ID with a course of care or prescription.

The course of care involves:

- a prescription by a Radiation Oncologist outlining the anatomical region/site(s) to be treated, fractionation, and the total dose to be delivered
- all phases of radiotherapy delivered for the management of a single disease entity relating to a decision to treat
- either one, or multiple, treatment plans.

Radiotherapy service events are considered to be discrete events that form the focus of the activity around the patient's care. Typically, activities within the service event occur on the same day (in the non-admitted setting). The service event typically includes:

- Planning (including simulation and dosimetry)
- Treatment
- Outpatient Consultations.

The cost activities outlined in the guidelines are derived from the cost drivers identified through the work by SyRis Consulting.

The majority of cost drivers relate to the direct staffing inputs in either developing a treatment plan or the actual delivery of treatment for a patient. The guidelines contain a table outlining the main cost activities and each of these activities is assigned a Relative Value Unit (RVU). The salary and wages RVU should correlate with the actual time staff spend performing a particular activity, and these may be different for different sites.

For the treatment areas, it is expected that the appointment duration will be used as the volume of time for the treatment, and an RVU used to reflect the staff present for the duration of the appointment, depending on the complexity of the treatment. For example, an RVU of 2 could be used if two radiation therapists are usually involved in a particular treatment regime and 1 if only one staff member is usually involved.

The application of these volumes and RVUs are to be site specific so variation in the RVU chosen and the final costed product should be expected given differences in cost centre structures which reflect service provision at each site.

The initial consultation findings with Victorian costing staff indicated that where possible the guideline was being utilised.

Further the costing teams were seeking to build intermediate products with unit costs that describe the service provided (for example the type of treatment such as a MVT or a medical consultation) on an episodic basis. For reporting purposes these would then be grouped to a radiotherapy ID to understand the full cost of care.

¹⁷ Clinical Costing Standards Association of Australia (CCSAA); *Clinical Costing Guideline*; No 5, DRAFT. 2013

5 ***Radiotherapy within the National Efficient Price (NEP) Funding Model***

The NEP funding model produces an estimate of the efficient cost to deliver a service, given the patient’s clinical and demographic characteristics.

The parameters of the NEP funding model comprise a *base price*, termed the “National Efficient Price”, and *price weights*, which are applied to each unit of activity. The total efficient cost to deliver services, based on a local health network’s mix of services actually delivered, is then determined as:

Efficient value of services delivered = [Sum of (price weights applied to each unit of activity)] x NEP

5.1 Using costs for pricing of radiotherapy services

The price weights in the NEP funding model are based primarily on analysis of the costs reported by jurisdictions through the NHCDC. Whilst radiotherapy costs have been identified across a range of final products, the bulk of services are provided in non-admitted settings.

5.1.1 Pricing radiotherapy services in acute admitted care

Within the acute admitted care type, “R64Z – Radiotherapy” is a key DRG identified for radiotherapy services. However, radiotherapy services may also be provided to patients that are allocated to other DRGs as it forms part of the care received during a stay, such as the E71 family of DRGs (Respiratory Neoplasm’s).

For these other DRGs, the costs for radiotherapy services will be reflected within the price weights – to the extent that the radiotherapy costs are allocated to the patients that use those services, in the costing process.

Examples:

- R64Z Radiotherapy: the efficient cost of \$2,408.62 reflects the cost of patients allocated to the radiotherapy DRG
- E71B Respiratory Neoplasm: the efficient cost of \$6,661.16 reflects the cost of patients, and will reflect all costs associated with the treatment of those patients, including the average cost of radiotherapy services for those who may have accessed these services and those that have not. It also includes all other ancillary costs incurred by this patient cohort including nursing, operating room, pathology, supplies, etc.

These examples highlight that the radiotherapy component would be reflected within the price weight and for all patients within the DRG, irrespective of their consumption of these radiotherapy resources. It is this spread of resource use and associated cost that has, in part, given rise to consideration of the appropriateness of current funding arrangements.

5.1.2 Pricing Radiotherapy Services in Non-admitted Outpatient Care

The price weights for outpatient care are largely determined by the type of outpatient clinic, using the classification called “Tier 2”. There are two Radiotherapy Tier 2 clinic classifications, which are:

- 10.12 – Radiation Oncology (treatment) with a price weight of 0.0630. This clinic is defined as “Simulation, planning and/or treatment of patients using x-rays, radioactive substances, and other forms of radiant energy to lyse or destroy tumour cells”¹⁸
- 20.43 – Radiation Oncology (consultation) with a price weight of 0.0760. This is defined as “Consultation and maintenance of patients who have been treated using x-rays, radioactive substances, and other forms of radiant energy to lyse or destroy tumour cells”¹⁹.

The outpatient price weights apply to a single service event, which is defined as: “An interaction between one or more healthcare provider(s) with one non-admitted patient, which must contain therapeutic/clinical content and result in a dated entry in the patient's medical record”²⁰.

Understanding the current pricing structure is important as it highlights the need for accurate costing data, and recognition of the service models under which costs actually occur in a patient journey for the purposes of funding these services. Of note is the use of ‘planning’ within the service model and the resources consumed (and costs) in the delivery of this service event, compared to other treatment or consultation events. This has raised questions as to the appropriateness of the current funding model.

¹⁸ [IHPA Tier 2 Non-admitted Services Definitions Manual 2013–2014](#), p22, 12 Sep 2013

¹⁹ [IHPA Tier 2 Non-admitted Services Definitions Manual 2013–2014](#), p72, 12 Sep 2013

²⁰ Quoted in [IHPA Tier 2 Non-admitted Services Definitions Manual 2013–2014](#), p8, 12 Sep 2013

6 The NHCDC Round 16 data

6.1 Overview - Activity

The following data overview of radiotherapy services uses the cost data set supplied to the NHCDC Round 16 collection for 2011-12 admitted and non-admitted service interactions (defined as separations and occasions of service).

In consultation with IHPA, the radiotherapy cohort was defined as episodes that had a cost in one or more of the three AHPCS centres/areas, which are:

- Radiation Medicine
- Radiation Oncology
- Radiotherapy Suites.

The data set revealed that all jurisdictions had episodes that met this criterion.

Upon reviewing this data, the project team felt that the activity did not fully represent radiotherapy services within Australia as both volume and costs appeared to be significantly low.

It should be also be noted that while the patient cohort is defined by patients that have consumed costs across these three cost centres, the total costs reported in this section refer to the total *consolidated* cost per service interaction.

These consolidated costs include all costs of care, that is, the radiotherapy component plus other related costs such as ward nursing and medical costs, outpatient department costs, pathology, imaging, and allied health and pharmacy costs.

Table 2 below provides an overview of the data supplied to the project team by IHPA by Jurisdiction.

Table 2 NHCDC Round 16 Radiotherapy Service, Service Interactions – All Products

Jurisdiction	Number of Service Interactions or Activity	% of Total Service Interactions or Activity	Total Patient Service Costs (Radiotherapy + all other associated costs)	% of Total Costs
ACT	4,457	2%	\$7,352,973	1%
NSW	4,438	2%	\$38,964,659	7%
VIC	14,465	6%	\$67,639,286	12%
QLD	165,325	70%	\$322,643,259	57%
SA	232	0%	\$5,095,035	1%
WA	26,316	11%	\$114,506,296	20%
TAS	19,688	8%	\$6,106,211	1%
NT	1,027	0%	\$3,070,472	1%
Total	235,948	100%	\$565,378,192	100%

It should be noted that for Australian Public Hospitals, Medicare data indicates that for 2012-13, 1,683,815 radiation oncology occasions of service were reported across Australia. This data demonstrates that there are still reporting discrepancies across collections which may be a function of

out of scope services, services costed, but not reported for reliability purposes, or that they are currently not costed²¹.

Further to these figures is the number of costed service interactions reported by jurisdictional level in the Round 16 collection. The initial observations are:

- Data received was heavily skewed by service interactions reported by Queensland with over 70% of service interactions and 57% of the total cost
- The activity for NSW and SA was significantly lower than expected as these services have yet to be costed or submitted to IHPA through the NHCDC
- Through sensitivity testing against Victorian data (following the SyRis reviewed documentation noted earlier and which was later confirmed by the Department of Health (Victoria)), the data indicates that the Victorian contribution was relatively low given both the number of service interactions reported, its total costs and percentage of service interactions of the total national cohort.

Data was then examined by Program Group for further analysis.

Table 3 NHCDC Round 16 Radiotherapy Service, Service Interactions – Program Group

Jurisdiction	Acute	Emergency	Outpatients	Sub Acute	Total
ACT	239	0	4,148	70	4,457
NSW	4,359	0	0	79	4,438
VIC	4,204	0	10,212	49	14,465
QLD	27,472	15,956	120,651	1,246	165,325
SA	223	0	0	9	232
WA	2,653	0	23,612	51	26,316
TAS	0	0	19,688	0	19,688
NT	0	0	1,027	0	1,027
Total	39,150	15,956	179,338	1,504	235,948
% of Total	17%	7%	76%	1%	100%

The analysis in Table 3 led to further discussions between the project team, IHPA and some jurisdictional representatives to ensure that the assumptions of using the three radiotherapy related cost areas Radiation Medicine, Radiation Oncology and Radiotherapy Suites were correct in capturing the appropriate cohort for this review. The consensus view was that given the format of the cost data, this approach appeared the most logical.

The data presented in Table 3 generally provides a picture of the type of data that is submitted to the NHCDC and could be interpreted in two ways. Firstly it may highlight the level of maturity of jurisdictional costing under the ‘All Product Methodology’ and secondly that it may indicate that some activity is perhaps costed, but not submitted to IHPA.

To understand the costing and submission processes, all jurisdictions were invited to participate in this review. Table 4 below provides a summary response from each jurisdiction:

Table 4 Jurisdictional Response to Radiotherapy Review

Jurisdiction	Response to review
ACT	Jurisdictional response late into project - no further follow up or data
NSW	Jurisdictional response - Not costing non admitted patients

²¹ Medicare Australian Statistics. 21012/13, Group T2 Radiation Oncology.

Jurisdiction	Response to review
VIC	Jurisdictional response - Provide the full VCDC database and VRMS data set and access to hospital representatives
QLD	Jurisdictional response - Provide access to hospital representatives
SA	Jurisdictional response - Not costing non admitted, withdrawn from study
WA	Jurisdictional response - Access to Sir Charles Gardiner Hospital representatives and WA Cancer Network Clinician
TAS	No jurisdictional response
NT	Jurisdictional response - Withdrawn, data not available

Upon discussions with the jurisdictions it was evident that radiotherapy costing was mixed. For some jurisdictions the development of non-admitted activity costing is still a work in progress, and for others the development of funding models meant that costing was well progressed.

Further details on the methodologies are provided in section 8 Jurisdictional and Industry Consultation and Sample Industry data.

6.2 Radiotherapy Cost Data Analysis

Prior to finalising each round of the NHCDC, each jurisdiction is provided with the opportunity to validate their data based upon their own jurisdictional processes and the required national validations and quality checks. Once these are completed each jurisdiction will ‘sign off’ on their submission, hence branding it final.

It should be noted that following these validations, no further exclusions are made by IHPA to the cost data set, the data is considered ready for use for funding model development.

The following analysis is based on this final cost data and is provided at aggregate (total) and average levels, across a number of different variables (by program, volume, jurisdiction etc).

Figures 1 and 2 show that the acute cohort dominates the total costs with over \$400m, however subacute service interactions incur the higher average cost per service patient/interaction across all program groups.

Figure 1 NHCDC Round 16 Radiotherapy Cohort - Total Consolidated Costs

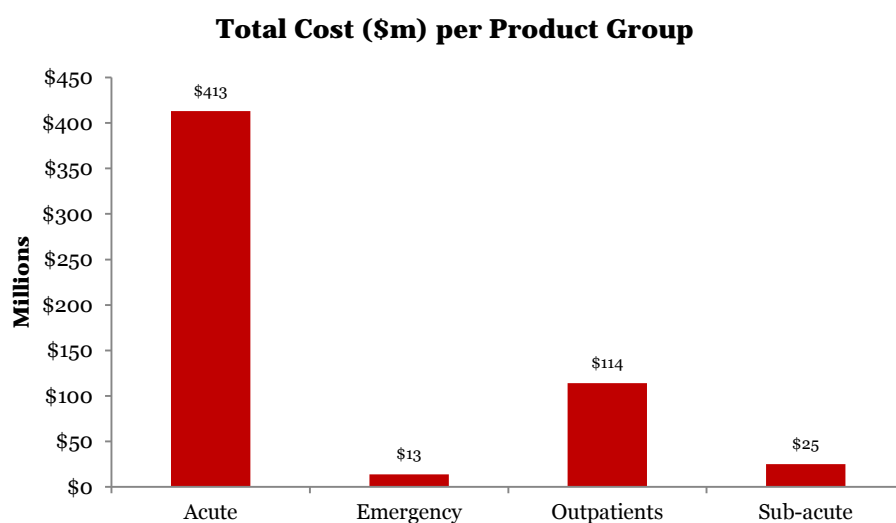


Figure 2 NHCDC Round 16 Radiotherapy Cohort - Average Consolidated Costs

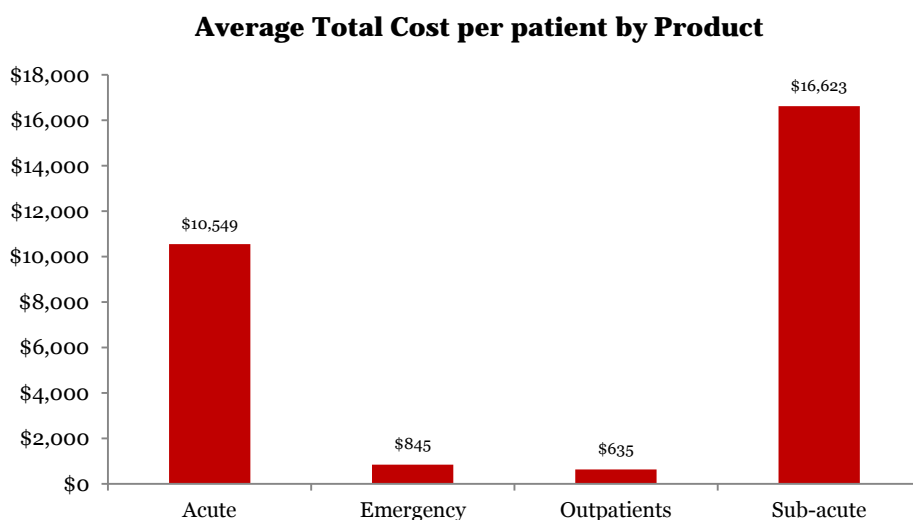


Figure 3 and 4 provide an overview of both the total consolidated costs of service interactions and average cost per service interactions by Jurisdiction. As noted earlier Queensland with the highest volume of submitted costed records dominate the total costs with around \$323m of total costs for this cohort at a relatively low average cost per service interaction of \$1,952. This is driven by the volume of non-admitted service events submitted. South Australia’s high costs are driven by its reported 250 episodes in the admitted cohort, which are not offset by lower non-admitted costs, due to them not costing this product at this time.

Given its volume of reported episodes and jurisdictional feedback for non-admitted costing, the Queensland volume should be further investigated should further pricing adjustments be made to the IHPA model for radiotherapy services.

Figure 3 NHCDC Round 16 Radiotherapy Cohort Total Consolidated Costs – By Jurisdiction

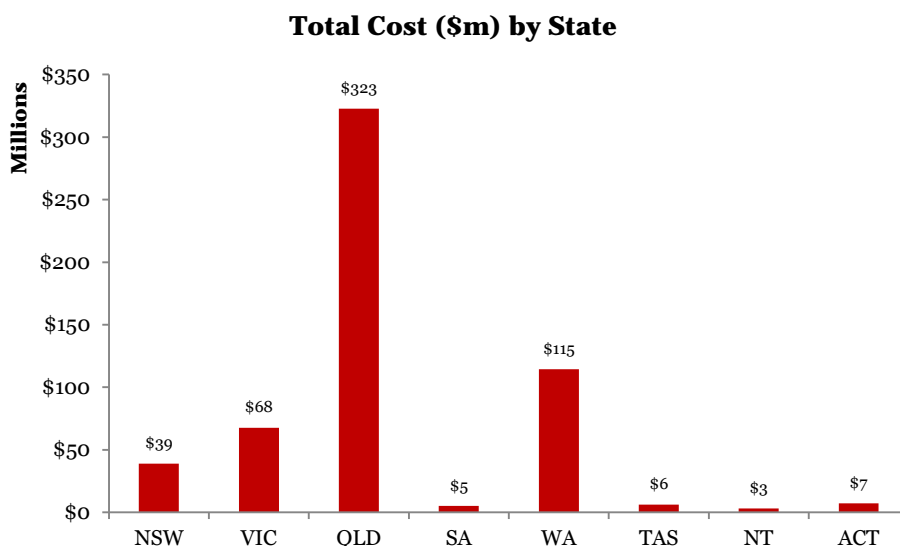
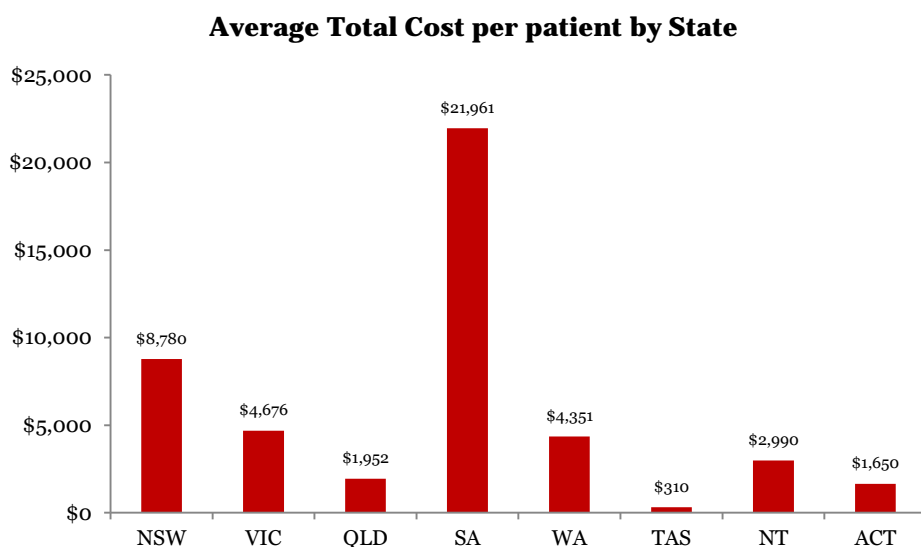


Figure 4 NHCDC Round 16 Radiotherapy Cohort Average Consolidated Costs – By Jurisdiction



The next step is to understand the **radiotherapy component** of the total consolidated cost for this cohort which is presented in Figure 5 and 6. The radiotherapy component refers to the three cost centres of Radiation Medicine, Radiation Oncology and Radiotherapy Suites. The non-radiotherapy costs include costs such as ward nursing, medical, pathology, allied health and pharmacy.

Figure 5 NHCDC Round 16 Radiotherapy Component Costs - By Jurisdiction

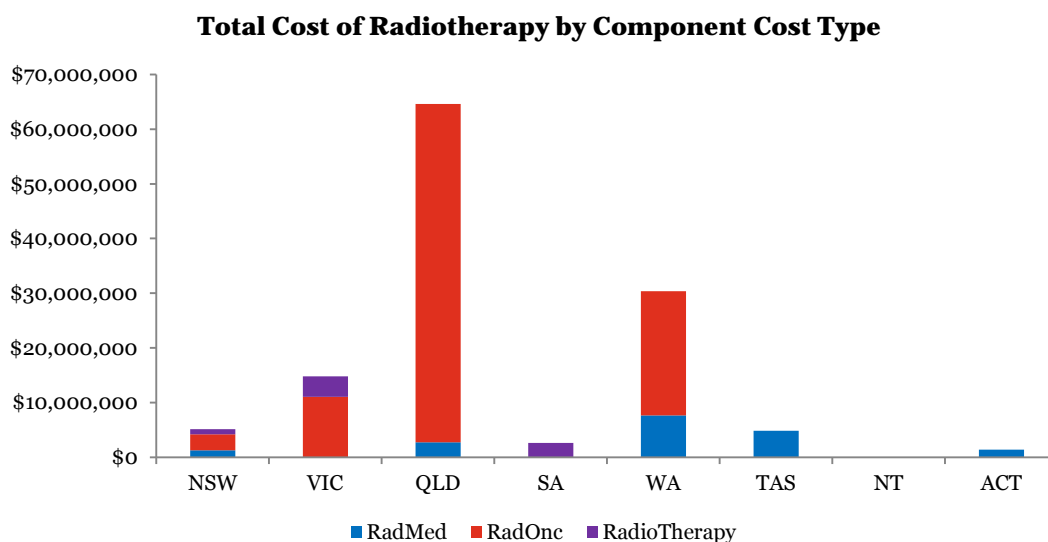
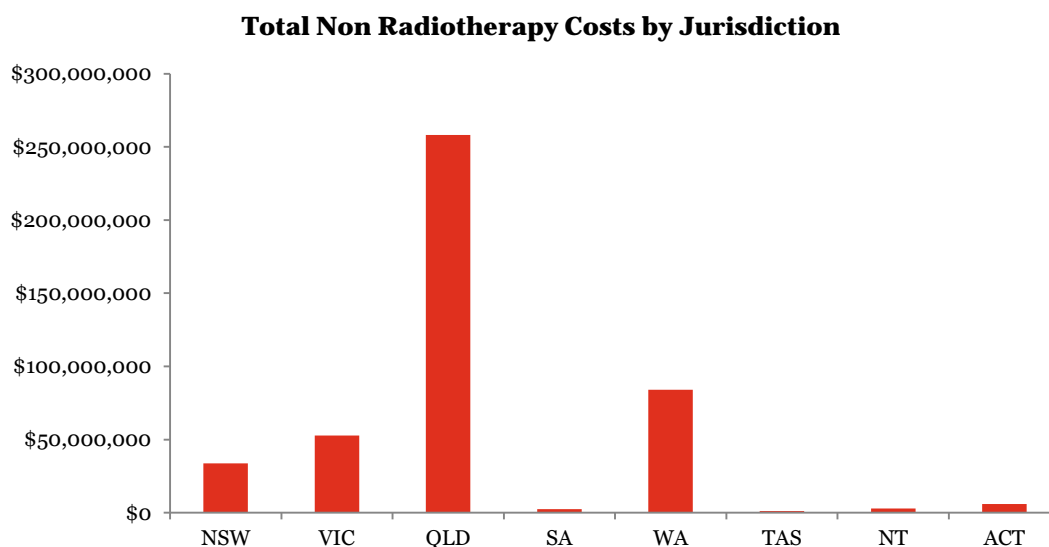


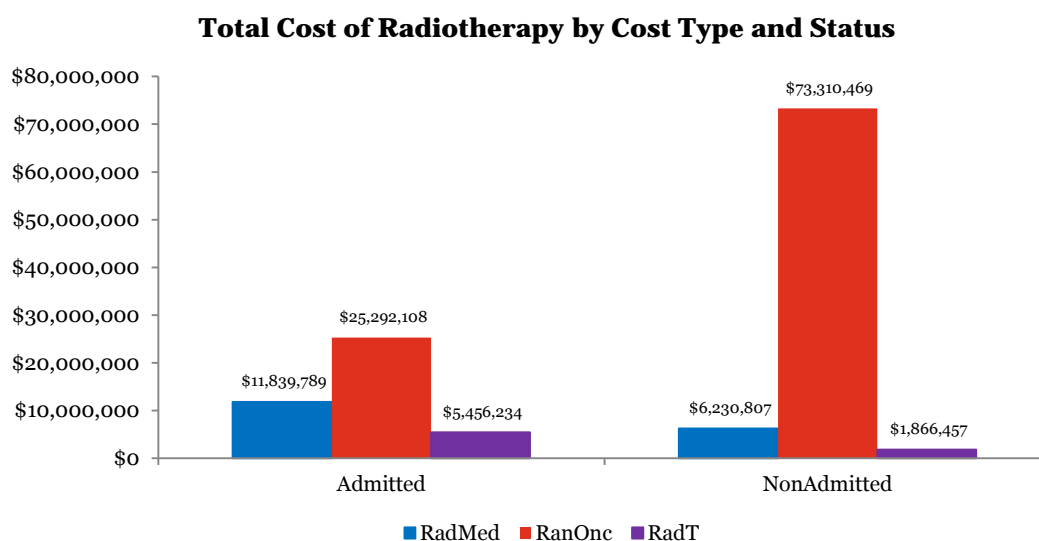
Figure 6 NHCDC Round 16 Non Radiotherapy Component Costs - By Jurisdiction



Of note again is Queensland’s proportion of costs in comparison to other states. For its patient cohort, radiation oncology costs are the largest, comprising approximately 40% of the total costs, in Victoria it is approximately 35% and in Western Australia approximately 30%.

The data also demonstrates variation in which AHPCS centres / areas are used in the allocation process and their cost composition. This may reflect service composition or perhaps a need for expanding the relevant areas for cost allocation purposes, which may provide greater cost data insight should further work be required in pricing these services.

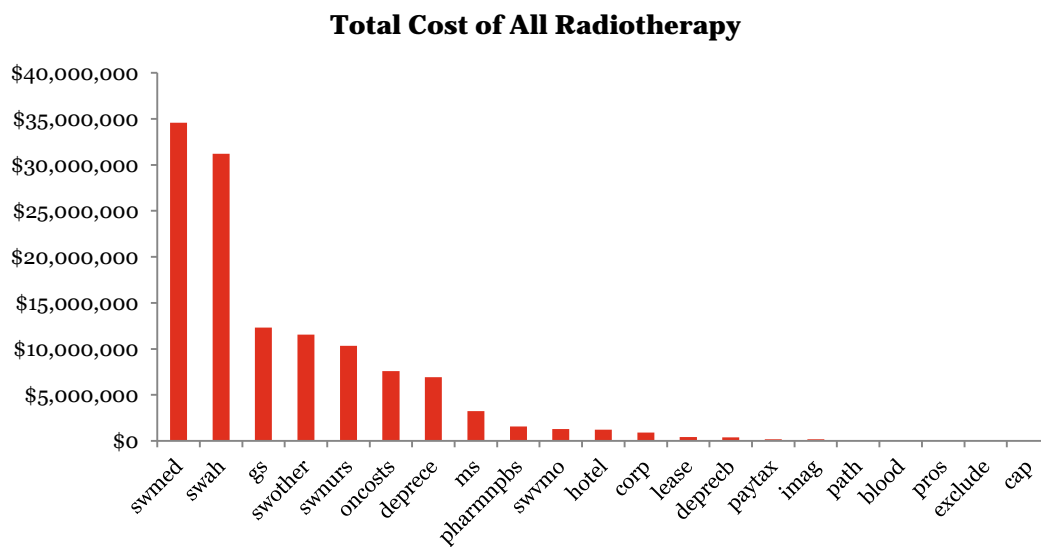
Figure 2 NHCDC Round 16 Radiotherapy Component Costs by Admission Status



The bulk of the costs for radiotherapy services sit within the non-admitted cohort, here defined as the outpatient program only.

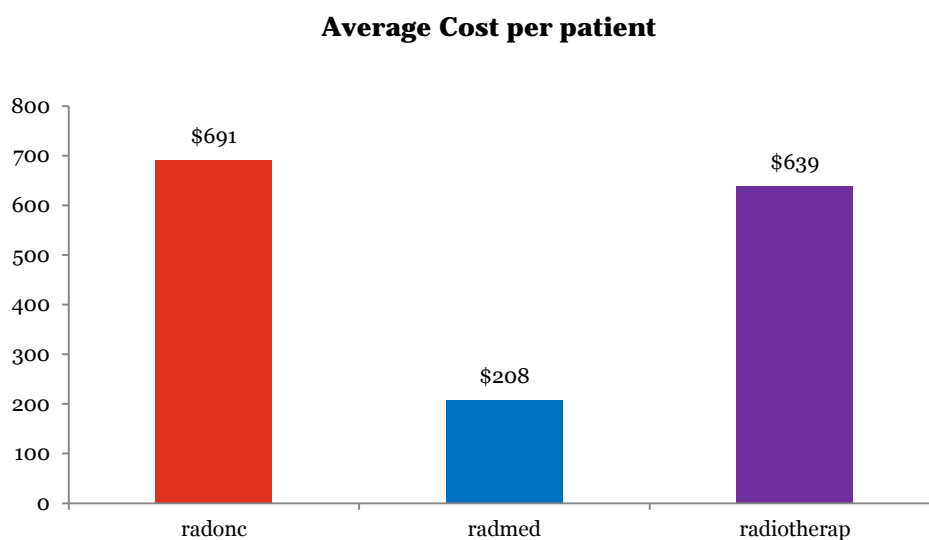
These costs are generally comprised of medical, allied health and nursing staff, goods and services as shown in Figure 7

Figure 7 NHCDC Round 16 Radiotherapy Component Costs by AHPCS Item



The average cost per radiotherapy cost per service interaction is provided in Figure 8.

Figure 8 NHCDC Round 16 Radiotherapy – Average Radiotherapy Component Cost per Service Interaction



6.2.1 Analysis of Admitted Service Type Costs

The data was then examined by volume to determine what acute admitted activity (DRGs) had radiotherapy services and hence had radiotherapy costs allocated to it.

This data was trimmed to include only those DRGs where the percentage of radiotherapy costs (as defined by the three APCHS cost centres) to total patient service costs was greater than 10%. The data in Table 5 presents the top 20 DRGs by volume (or activity) with radiotherapy costs.

Table 5 NHCDC Round 16 Top 20 (Trimmed) DRGs with Radiotherapy Costs – Admitted Acute Separations

DRG	Number of Separations	Total Patient Service Costs (Radiotherapy + all other associated costs)	3 Radio Area Component CostsRad	% 3 Radio to Total Service Cost
R63Z Chemotherapy	685	\$1,292,464	\$263,960	20.42%
R64Z Radiotherapy	514	\$506,937	\$207,657	40.96%
R04B Other Neoplastic Disorders W Other OR Procedures W/O CC	432	\$1,559,811	\$312,686	20.05%
K64B Endocrine Disorders W/O Catastrophic or Severe CC	407	\$3,085,460	\$725,339	23.51%
I65B Musculoskeletal Malignant Neoplasms W/O Catastrophic CC	406	\$4,714,232	\$1,701,359	36.09%
D60A Ear, Nose, Mouth and Throat Malignancy W Catastrophic or Severe CC	372	\$6,158,577	\$2,370,584	38.49%
Z64B Other Factors Influencing Health Status, Sameday	351	\$815,454	\$406,793	49.89%
G70A Other Digestive System Diagnoses W Catastrophic or Severe CC	341	\$3,209,444	\$676,692	21.08%
E71B Respiratory Neoplasms W/O Catastrophic CC	316	\$2,248,134	\$728,795	32.42%
E62B Respiratory Infections/Inflammations W Severe or Moderate CC	314	\$1,979,694	\$210,314	10.62%
D60B Ear, Nose, Mouth and Throat Malignancy W/O Catastrophic or Severe CC	301	\$1,452,109	\$573,474	39.49%
R61B Lymphoma and Non-Acute Leukaemia W/O Catastrophic CC	287	\$3,987,459	\$749,896	18.81%
B66A Nervous System Neoplasm W Catastrophic or Severe CC	270	\$4,686,023	\$1,619,125	34.55%
I65A Musculoskeletal Malignant Neoplasms W Catastrophic CC	240	\$4,897,208	\$1,513,404	30.90%
E71A Respiratory Neoplasms W Catastrophic CC	224	\$3,379,107	\$825,003	24.41%
Q60A Reticuloendothelial and Immunity Disorders W Catastrophic or Severe CC	217	\$3,417,517	\$357,308	10.46%
N09Z Conisation, Vagina, Cervix and Vulva Procedures	211	\$1,855,690	\$463,184	24.96%
B76B Seizure W/O Catastrophic or Severe CC	192	\$556,576	\$56,129	10.08%
R61A Lymphoma and Non-Acute Leukaemia W Catastrophic CC	180	\$6,581,085	\$1,080,518	16.42%
G67A Oesophagitis and Gastroenteritis W Cat/Sev CC	175	\$1,520,153	\$192,606	12.67%

This top 20 cohort comprised 16% of the total separations that reported a radiotherapy cost and represented 38% of the total radiotherapy costs allocated to the acute admitted cohort.

The volume was dominated by both the radiotherapy and chemotherapy DRGs and a range of casemix where it would be expected that radiotherapy services would be offered as part of the patient stay for cancer treatment.

The data was then examined to understand which outputs were allocated the greatest share of radiotherapy costs. As in Table 5, Table 6 demonstrates that radiotherapy costs are found in a range of acute admitted casemix which are reasonable in expecting attendance for cancer treatment.

This data is not trimmed as its purpose is to demonstrate that there are two effects within the casemix. Firstly, total radiotherapy costs allocated to each DRG presents the total of where costs are incurred

across the casemix spectrum. Secondly, by providing the radiotherapy costs as a percentage of the total consolidated patient costs, it can be demonstrated how radiotherapy services are provided in ‘adjacency’ to the core components of care. For example, it may be the case that on a percentage basis the radiotherapy costs of care are lower on a DRG by DRG basis, but the component costs are significant at an aggregate level. This example is highlighted in the A06B Tracheotomy DRG.

Table 6 NHCDC Round 16 Top 20 DRGs with the Highest Share of Radiotherapy Costs – Admitted Acute Separations

DRG	Number of Separations	Total Patient Service Costs (Radiotherapy + all other associated costs)	3 Radio Area Component CostsRad	% 3 Radio to Total Service Cost
D60A Ear, Nose, Mouth and Throat Malignancy W Catastrophic or Severe CC	372	\$6,158,577	\$2,370,584	38.49%
I65B Musculoskeletal Malignant Neoplasms W/O Catastrophic CC	406	\$4,714,232	\$1,701,359	36.09%
B66A Nervous System Neoplasm W Catastrophic or Severe CC	270	\$4,686,023	\$1,619,125	34.55%
I65A Musculoskeletal Malignant Neoplasms W Catastrophic CC	240	\$4,897,208	\$1,513,404	30.90%
R61A Lymphoma and Non-Acute Leukaemia W Catastrophic CC	180	\$6,581,085	\$1,080,518	16.42%
E71A Respiratory Neoplasms W Catastrophic CC	224	\$3,379,107	\$825,003	24.41%
A06B Trach W Vent >95 hours W/O Cat CC or Trach/Vent >95 hours W Cat CC	190	\$18,352,512	\$768,182	4.19%
R61B Lymphoma and Non-Acute Leukaemia W/O Catastrophic CC	287	\$3,987,459	\$749,896	18.81%
E71B Respiratory Neoplasms W/O Catastrophic CC	316	\$2,248,134	\$728,795	32.42%
K64B Endocrine Disorders W/O Catastrophic or Severe CC	407	\$3,085,460	\$725,339	23.51%
G70A Other Digestive System Diagnoses W Catastrophic or Severe CC	341	\$3,209,444	\$676,692	21.08%
G60A Digestive Malignancy W Catastrophic CC	134	\$2,088,183	\$638,760	30.59%
D60B Ear, Nose, Mouth and Throat Malignancy W/O Catastrophic or Severe CC	301	\$1,452,109	\$573,474	39.49%
E62A Respiratory Infections/Inflammations W Catastrophic CC	343	\$5,364,288	\$519,360	9.68%
A07Z Allogeneic Bone Marrow Transplant	53	\$5,698,456	\$505,698	8.87%
R62A Other Neoplastic Disorders W CC	113	\$1,560,228	\$499,272	32.00%
N60A Malignancy, Female Reproductive System W Catastrophic CC	57	\$1,066,177	\$489,179	45.88%
N09Z Conisation, Vagina, Cervix and Vulva Procedures	211	\$1,855,690	\$463,184	24.96%
R03A Lymphoma and Leukaemia W Other OR Procedures W Catastrophic or Severe CC	57	\$2,526,827	\$440,388	17.43%
N60B Malignancy, Female Reproductive System W/O Catastrophic CC	109	\$1,000,479	\$439,210	43.90%

Further, it may also be the case that by trimming by volume when examining radiotherapy costs, a distorted view of service provision could be generated. A good example of this is the A07z Bone Marrow Transplant DRG. With 53 cases nationally reported to the NHCDC, it might be considered a small volume, however, the radiotherapy costs represent 8.87% of the total consolidated patient costs,

and therefore the volume of costs allocated to this DRG is significant and represents a significant cost of care.

6.2.2 Analysis of Non-Admitted Service Type Costs

The non-admitted clinics related to radiation oncology for both treatment and consultation are the top two ranked clinics by volume which is expected in the data as presented in Table 7. However, there are also a range of other clinics which have drawn a radiotherapy cost. Whilst some appear plausible given cross functional/specialty consultation and planning, others may require further examination by jurisdictions as part of their cost data reviews.

Table 7 NHCDC Round 16 Top 10 Outpatient Service Events with Radiotherapy Costs – Outpatients

Clinic	Service Events	Total Cost	Average cost per Service Event
10.12 Radiation Oncology (Treatment)	95,793	\$53,281,862	\$556
20.43 Radiation Oncology (Consultation)	49,359	\$33,224,920	\$673
20.23 Orthopaedics	10,420	\$3,646,414	\$350
20.42 Medical Oncology (Consultation)	3,433	\$2,745,193	\$800
30.01 General Imaging	1,329	\$336,721	\$253
20.07 General Surgery	958	\$780,629	\$815
20.18 Ear, Nose and Throat (ENT)	920	\$2,916,703	\$3,170
40.31 Burns	772	\$234,830	\$304
20.36 Urology	769	\$766,156	\$996
20.4 Obstetrics	757	\$246,475	\$326

The data for clinics 10.12 and 20.43 was then explored further to understand jurisdictional activity and costs. Table 8 presents a number of issues in the reporting of costs within these clinics.

As discussed earlier, the full complement of non-admitted activity does not appear to be received by IHPA. This is likely to be either because jurisdictions are yet to cost this activity or do not submit as it is outside of scope for ABF activity.

The range of average cost per service event within clinic settings by jurisdiction varied significantly and should be subject to future review. Data at health service level appeared to have a consistent amount allocated to each service event, which was likely to be event driven (i.e. where expenditure is spread across the number of events), or time driven with time either a function of say “new” or “review” patients with an arbitrary allocation of minutes per event used to allocate cost.

Some other factors which may influence this cost variation include

- The proportion of expenditure split between inpatient and outpatient activity
- The inclusion of all relevant expenditures such as expenditure reported in other costs centres which are not mapped to the appropriate clinical department .
- How expenditure is divided amongst hub and spoke service arrangements

Table 8 NHCDC Round 16 Clinics 10.12 Radiation Oncology treatment and 20.43 Radiation Oncology Consultation

Jurisdiction	10.12 Service Events	10.12 Total Cost	10.12 Average cost per Service Event	20.43 Service Events	20.43 Total Cost	20.43 Average cost per Service Event
NSW						
VIC	5,656	\$1,548,171	\$274	746	\$6,058,657	\$8,122
QLD	70,013	\$41,444,706	\$592	29,782	\$13,325,515	\$447
SA						
WA	4,814	\$5,995,624	\$1,245	18,550	\$16,828,879	\$907
TAS	16,818	\$5,204,699	\$309			
NT				1,027	\$3,070,474	\$2,990
ACT	4,149	\$636,887	\$154			
Total	101,449	\$54,830,086	\$540	50,105	\$39,283,525	\$784

6.3 Observations following the NHCDC Data Review

The following observations are made of the radiotherapy cohort data submitted to the Round 16 NHCDC:

- A radiotherapy cohort can be defined within the NHCDC data via the radiotherapy cost centres
- The NHCDC data includes both admitted and non-admitted service interactions
- Through the NHCDC, it appears that the IHPA does not receive all costed activity for radiotherapy services. This appears to be a function of:
 - Some health services currently not costing non-admitted services, or if they have, are not submitting to IHPA as they feel the data is unreliable
 - Jurisdictions only submitting cost data that is defined as within scope of ABF.
 - For example, the Victorian jurisdiction has indicated that their interpretation of clause A6 of the National Health Reform Agreement, indicates that the IHPA at present will only receive radiotherapy service events that have a funding source as public. This includes only a very small proportion of radiotherapy services across the Victorian jurisdiction
- In the admitted cohort, the costs of radiotherapy would appear to be an adjunct service cost as they are found in a range of casemix activity
- There is variability within the average cost per non-admitted service events. This requires further review nationally, and would be supported through a bottom up costing review across some sampled health services.

6.4 Recommendation – NHCDC Radiotherapy Costing

We recommend that more work to be undertaken in understanding the methodologies and drivers of these costs for future pricing developments (whether that be for price weight stability purposes or for any loading provided to this cohort). This could be undertaken by:

- Tabling as a priority to the newly formed NHCDC Advisory Committee
 - This would provide a central avenue to methodology, especially for those jurisdictions that are now embarking on non-admitted costing (where it is

acknowledged that over 90 per cent of radiotherapy activity occurs) and those that are refining the costing within this cohort

- In conjunction with the jurisdictions, undertaking a pointed cost study, by reviewing the cost data received by IHPA, cost data that exists within existing patient costing systems within health services and then bottom up costing the data against a sampled clinical or resource pathway
- Further discussion at Jurisdictional Advisory Committee Level regarding the submission of Non-ABF activity to IHPA for the purposes of “robust cost and price weight development”.

7 Data Analysis Framework

7.1 Inpatient Radiotherapy Cost Analysis

In a previous Victorian Cost Study Review of Radiotherapy Services using the Victorian cost data for 2009-10, SyRis Consulting determined that inpatient radiotherapy costs comprise approximately 6 per cent of the total radiotherapy department cost.

An analysis was undertaken on the NHCDC Round 16 radiotherapy cohort and The Canberra Hospital, Hunter New England, Royal Prince Alfred, Peter MacCallum and Royal Adelaide Hospital were chosen to observe the impact of radiotherapy provision against a subset of 22 DRGs with significant radiotherapy involvement at these five selected health services.

These are shown in Table 9 below.

Table 9 DRGs with Significant Radiotherapy Costs from five Selected Sites

DRG	Total Separations	Private Separations	Public Separations	Low Boundary Point	High Boundary point	Number of Inlie rs	Average Length of Stay
I65B Musculoskeletal Malignant Neoplasms W/O Catastrophic CC	197	60	137	2	18	115	7.81
K64B Endocrine Disorders W/O Catastrophic or Severe CC	88	24	64	1	9	64	2.41
B66A Nervous System Neoplasm W Catastrophic or Severe CC	123	41	82	2	26	73	10.67
I65A Musculoskeletal Malignant Neoplasms W Catastrophic CC	107	32	75	3	35	67	13.81
E71B Respiratory Neoplasms W/O Catastrophic CC	121	37	84	1	16	79	4.51
N09Z Conisation, Vagina, Cervix and Vulva Procedures	86	24	62	1	3	42	1.38
D60A Ear, Nose, Mouth and Throat Malignancy W Catastrophic or Severe CC	136	27	109	3	29	65	12.48
E71A Respiratory Neoplasms W Catastrophic CC	94	24	70	3	29	54	11
G70A Other Digestive System Diagnoses W Catastrophic or Severe CC	86	25	61	2	18	47	6.57
R62A Other Neoplastic Disorders W CC	61	20	41	1	18	38	7.24
B66B Nervous System Neoplasm W/O Catastrophic or Severe CC	28	9	19	1	15	15	6.13
G60B Digestive Malignancy W/O Catastrophic CC	46	8	38	1	14	36	4.31
M06B Other Male Reproductive System OR Procedures W/O CC	92	39	53	1	6	53	1.28
E62B Respiratory Infections/Inflammations W Severe or Moderate CC	31	12	19	1	16	18	5.5
D67A Oral and Dental Disorders Except Extractions and Restorations	35	8	27	1	8	16	4.81
K62A Miscellaneous Metabolic Disorders W Catastrophic or Severe CC	31	5	26	2	21	22	5.45
D60B Ear, Nose, Mouth and Throat Malignancy W/O Catastrophic or Severe CC	65	17	48	1	9	40	2.15
R62B Other Neoplastic Disorders W/O CC	17	5	12	1	7	11	3.09

DRG	Total Separations	Private Separations	Public Separations	Low Boundary Point	High Boundary point	Number of Inliers	Average Length of Stay
N60B Malignancy, Female Reproductive System W/O Catastrophic CC	36	10	26	1	9	17	2.59
N60A Malignancy, Female Reproductive System W Catastrophic CC	16	4	12	2	27	11	11.55
J69A Skin Malignancy W Catastrophic CC	21	15	6	4	38	5	14.6
M60A Malignancy, Male Reproductive System W Catastrophic or Severe CC	16	7	9	2	23	9	7.89
Total Selected Radiotherapy Episodes	1,533	453	1,080			897	

To ensure a reasonable cohort, the data was trimmed to remove outliers that may skew the analysis. Data was trimmed using the NWAU13 trim points and the average inlier costs for public inliers could then be observed as demonstrated in Table 10.

Table 10 The Average Cost per Separation for Radiotherapy Patients with and without Radiotherapy from 5 Selected Sites NHCDC Round 16.

DRG	Public Inliers Separations	Average Length of Stay	Total Inlier Cost	Radiot herapy Inlier Cost	Exclud ed Radiot herapy Inlier Cost	Avg Total Consoli dated Inlier Cost / Sep	Avg Radiot herapy Inlier Cost / Sep	Avg Inlier Cost / Sep Excludi ng Radiot herapy	Radiot herapy Loadi ng
I65B Musculoskeletal Malignant Neoplasms W/O Catastrophic CC	115	7.81	\$1,509,691	\$541,691	\$968,000	\$13,128	\$4,710	\$8,417	56%
K64B Endocrine Disorders W/O Catastrophic or Severe CC	64	2.41	\$316,919	\$176,796	\$140,122	\$4,952	\$2,762	\$2,189	126%
B66A Nervous System Neoplasm W Catastrophic or Severe CC	73	10.67	\$1,239,880	\$333,545	\$906,335	\$16,985	\$4,569	\$12,416	37%
I65A Musculoskeletal Malignant Neoplasms W Catastrophic CC	67	13.81	\$1,556,581	\$422,569	\$1,134,011	\$23,233	\$6,307	\$16,926	37%
E71B Respiratory Neoplasms W/O Catastrophic CC	79	4.51	\$517,375	\$153,872	\$363,503	\$6,549	\$1,948	\$4,601	42%
N09Z Conisation, Vagina, Cervix and Vulva Procedures	42	1.38	\$295,373	\$74,449	\$220,924	\$7,033	\$1,773	\$5,260	34%
D60A Ear, Nose, Mouth and Throat Malignancy W Catastrophic or Severe CC	65	12.48	\$1,329,721	\$370,089	\$959,631	\$20,457	\$5,694	\$14,764	39%
E71A Respiratory Neoplasms W Catastrophic CC	54	11	\$912,316	\$228,190	\$684,126	\$16,895	\$4,226	\$12,669	33%
G70A Other Digestive System Diagnoses W Catastrophic or Severe CC	47	6.57	\$497,870	\$97,051	\$400,818	\$10,593	\$2,065	\$8,528	24%
R62A Other Neoplastic Disorders W CC	38	7.24	\$410,767	\$125,877	\$284,890	\$10,810	\$3,313	\$7,497	44%
B66B Nervous System Neoplasm W/O Catastrophic or Severe CC	15	6.13	\$144,851	\$47,444	\$97,407	\$9,657	\$3,163	\$6,494	49%
G60B Digestive Malignancy W/O Catastrophic CC	36	4.31	\$221,075	\$42,390	\$178,685	\$6,141	\$1,178	\$4,963	24%
M06B Other Male Reproductive System OR Procedures W/O CC	53	1.28	\$303,909	\$61,584	\$242,325	\$5,734	\$1,162	\$4,572	25%
E62B Respiratory Infections/Inflammations W Severe or Moderate CC	18	5.5	\$178,618	\$52,003	\$126,614	\$9,923	\$2,889	\$7,034	41%
D67A Oral and Dental Disorders Except Extractions and Restorations	16	4.81	\$149,396	\$45,732	\$103,664	\$9,337	\$2,858	\$6,479	44%
K62A Miscellaneous Metabolic Disorders W Catastrophic or Severe CC	22	5.45	\$187,485	\$40,813	\$146,672	\$8,522	\$1,855	\$6,667	28%
D60B Ear, Nose, Mouth and Throat Malignancy W/O Catastrophic or Severe CC	40	2.15	\$214,586	\$73,132	\$141,454	\$5,365	\$1,828	\$3,536	52%

DRG	Public Inliers Separations	Average Length of Stay	Total Inlier Cost	Radiotherapy Inlier Cost	Excluded Radiotherapy Inlier Cost	Avg Total Consolidated Inlier Cost / Sep	Avg Radiotherapy Inlier Cost / Sep	Avg Inlier Cost / Sep Excluding Radiotherapy	Radiotherapy Loading
R62B Other Neoplastic Disorders W/O CC	11	3.09	\$57,000	\$13,284	\$43,716	\$5,182	\$1,208	\$3,974	30%
N60B Malignancy, Female Reproductive System W/O Catastrophic CC	17	2.59	\$99,852	\$41,362	\$58,490	\$5,874	\$2,433	\$3,441	71%
N60A Malignancy, Female Reproductive System W Catastrophic CC	11	11.55	\$189,805	\$62,506	\$127,299	\$17,255	\$5,682	\$11,573	49%
J69A Skin Malignancy W Catastrophic CC	5	14.6	\$94,617	\$25,197	\$69,419	\$18,923	\$5,039	\$13,884	36%
M60A Malignancy, Male Reproductive System W Catastrophic or Severe CC	9	7.89	\$114,769	\$30,236	\$84,534	\$12,752	\$3,360	\$9,393	36%
Total	897		\$10,542,455	\$3,059,813	\$7,482,642	\$11,753	\$3,411	\$8,342	41%

This table demonstrates that once the radiotherapy costs have been separated out from all other non radiotherapy component (or department costs) within the episode, radiotherapy costs within these DRGs appear significant.

When expressed as a cost of care loading or an adjunct service on the non radiotherapy inlier cost, the radiotherapy component adds approximately 41% of costs across this DRG cohort.

In order to test this finding of a 41% loading for radiotherapy it was planned to compare the average cost excluding Radiotherapy above, with the average public inlier cost of these DRGs at sites that do not provide Radiotherapy. However, this data was unavailable given the time constraints of this review.

7.2 Comparison of Public Inlier Average Costs with Untrimmed Victorian Total Average Costs

Noting the data limitations in the Inpatient Radiotherapy Cost Analysis section earlier, a comparative analysis of the public inlier average costs for the 22 DRGs selected across the cohort of five sites was undertaken against the Victorian untrimmed B2 cost data that included the costs of patients from the 3 radiotherapy cost areas submitted to the Round 16 NHDC.

The Victorian cost data was chosen as it was recognised by the Radiotherapy Steering Committee and some jurisdictional stakeholders in consultations, that the Victorian data is likely the most robust given their focus on radiotherapy costing and funding over the past five years.

Table 11 NHDC Round 16 Radiotherapy Cohort Comparison of the Average Costs per Public Inlier for five sampled sites against the Victorian Untrimmed Non Radiotherapy Cost

DRG	Inlier Avg Total Consolidated Inlier Cost / Sep	Inlier Avg Radiotherapy Inlier Cost / Sep	Inlier Avg Cost / Sep Excluding Radiotherapy	All Victorian Avg Untrimmed Cost / Sep Non Radiotherapy Costs All Victorian Radiotherapy Cohort	% All Victorian untrimmed Non Radiotherapy Costs / Avg Inlier Cost / Sep Excluding Radiotherapy
I65B Musculoskeletal Malignant Neoplasms W/O Catastrophic CC	\$13,128	\$4,710	\$8,417	\$4,919	58%
K64B Endocrine Disorders W/O Catastrophic or Severe CC	\$4,952	\$2,762	\$2,189	\$3,216	147%
B66A Nervous System Neoplasm W Catastrophic or Severe CC	\$16,985	\$4,569	\$12,416	\$8,544	69%
I65A Musculoskeletal Malignant Neoplasms W Catastrophic CC	\$23,233	\$6,307	\$16,926	\$9,604	57%

DRG	Inlier Avg Total Consolidated Inlier Cost / Sep	Inlier Avg Radiotherapy Inlier Cost / Sep	Inlier Avg Cost / Sep Excluding Radiotherapy	All Victorian Untrimmed Cost / Sep Non Radiotherapy Costs All Victorian Radiotherapy Cohort	% All Victorian untrimmed Non Radiotherapy Costs / Avg Inlier Cost / Sep Excluding Radiotherapy
E71B Respiratory Neoplasms W/O Catastrophic CC	\$6,549	\$1,948	\$4,601	\$3,708	81%
N09Z Conisation, Vagina, Cervix and Vulva Procedures	\$7,033	\$1,773	\$5,260	\$2,153	41%
D60A Ear, Nose, Mouth and Throat Malignancy W Catastrophic or Severe CC	\$20,457	\$5,694	\$14,764	\$7,345	50%
E71A Respiratory Neoplasms W Catastrophic CC	\$16,895	\$4,226	\$12,669	\$8,227	65%
G70A Other Digestive System Diagnoses W Catastrophic or Severe CC	\$10,593	\$2,065	\$8,528	\$6,052	71%
R62A Other Neoplastic Disorders W CC	\$10,810	\$3,313	\$7,497	\$6,646	89%
B66B Nervous System Neoplasm W/O Catastrophic or Severe CC	\$9,657	\$3,163	\$6,494	\$3,614	56%
G60B Digestive Malignancy W/O Catastrophic CC	\$6,141	\$1,178	\$4,963	\$2,602	52%
M06B Other Male Reproductive System OR Procedures W/O CC	\$5,734	\$1,162	\$4,572	\$2,157	47%
E62B Respiratory Infections/Inflammations W Severe or Moderate CC	\$9,923	\$2,889	\$7,034	\$4,507	64%
D67A Oral and Dental Disorders Except Extractions and Restorations	\$9,337	\$2,858	\$6,479	\$3,027	47%
K62A Miscellaneous Metabolic Disorders W Catastrophic or Severe CC	\$8,522	\$1,855	\$6,667	\$6,443	97%
D60B Ear, Nose, Mouth and Throat Malignancy W/O Catastrophic or Severe CC	\$5,365	\$1,828	\$3,536	\$3,149	89%
R62B Other Neoplastic Disorders W/O CC	\$5,182	\$1,208	\$3,974	\$2,829	71%
N60B Malignancy, Female Reproductive System W/O Catastrophic CC	\$5,874	\$2,433	\$3,441	\$3,832	111%
N60A Malignancy, Female Reproductive System W Catastrophic CC	\$17,255	\$5,682	\$11,573	\$10,801	93%
J69A Skin Malignancy W Catastrophic CC	\$18,923	\$5,039	\$13,884	\$5,190	37%
M60A Malignancy, Male Reproductive System W Catastrophic or Severe CC	\$12,752	\$3,360	\$9,393	\$6,694	71%
Total	\$11,753	\$3,411	\$8,342	\$4,264	51%

When this average untrimmed cost for non radiotherapy costs for Victorian sites is compared to the average cost excluding Radiotherapy for the five sampled sites, it demonstrates that the finding of a 41% loading for radiotherapy may be a conservative estimate. In the majority of DRGs the average untrimmed Victorian Non Radiotherapy cost was significantly below the inlier average excluding Radiotherapy cost of the sampled sites.

7.3 Comparison of Untrimmed Average Total Costs within the Victorian IHPA data

As the comparisons in previous sections may be deemed as unreliable given the inability to match the public inlier episodes for radiotherapy against the public inlier average cost from multiple jurisdictions and within the same output groups further analysis was undertaken to understand the radiotherapy cost.

To enable this analysis, IHPA provided the cost data records for all NHCDC Round 16 episodes.

Untrimmed Peter MacCallum episodes were compared to the untrimmed Victorian health services where no radiotherapy costs were incurred for a range of selected DRGs. The results are demonstrated in Table 12. This table demonstrates that when this comparison is made, the loading (or the additional radiotherapy cost) to the Peter MacCallum cohort is 93% of the average untrimmed cost.

Table 12 Comparison of Peter MacCallum Average DRG Costs Against Non Radiotherapy Victorian Sites

DRG	PMCC Separations	PMCC Avg Cost	PMCC Tot Cost	Non-Radio Separations	Non-Radio Avg Cost	Non-Radio Tot Cost	Radio Loading	Loading Applied
B66A Nervous System Neoplasm W Catastrophic or Severe CC	79	\$15,932	\$1,258,596	279	\$8,544	\$2,383,787	86%	\$583,617
B66B Nervous System Neoplasm W/O Catastrophic or Severe CC	14	\$8,372	\$117,204	556	\$3,614	\$2,009,659	132%	\$66,601
D60A Ear, Nose, Mouth and Throat Malignancy W Catastrophic or Severe CC	133	\$13,432	\$1,786,416	46	\$7,345	\$337,889	83%	\$809,476
D60B Ear, Nose, Mouth and Throat Malignancy W/O Catastrophic or Severe CC	162	\$4,779	\$774,253	174	\$3,149	\$547,841	52%	\$264,194
D67A Oral and Dental Disorders Except Extractions and Restorations	23	\$10,049	\$231,119	762	\$3,027	\$2,306,624	232%	\$161,497
E62B Respiratory Infections/Inflammations W Severe or Moderate CC	18	\$8,503	\$153,046	3128	\$4,507	\$14,097,359	89%	\$71,924
E71A Respiratory Neoplasms W Catastrophic CC	77	\$14,075	\$1,083,792	385	\$8,227	\$3,167,415	71%	\$450,309
E71B Respiratory Neoplasms W/O Catastrophic CC	104	\$6,512	\$677,201	548	\$3,708	\$2,031,928	76%	\$291,580
G60B Digestive Malignancy W/O Catastrophic CC	101	\$3,203	\$323,541	768	\$2,602	\$1,998,023	23%	\$60,780
G70A Other Digestive System Diagnoses W Catastrophic or Severe CC	92	\$9,647	\$887,552	2101	\$6,052	\$12,715,807	59%	\$330,744
I65A Musculoskeletal Malignant Neoplasms W Catastrophic CC	83	\$17,314	\$1,437,095	163	\$9,604	\$1,565,387	80%	\$639,996
I65B Musculoskeletal Malignant Neoplasms W/O Catastrophic CC	256	\$7,659	\$1,960,735	608	\$4,919	\$2,990,945	56%	\$701,390
J69A Skin Malignancy W Catastrophic CC	13	\$16,841	\$218,935	14	\$5,190	\$72,665	224%	\$151,460
K62A Miscellaneous Metabolic Disorders W Catastrophic or Severe CC	23	\$9,586	\$220,477	1010	\$6,443	\$6,507,394	49%	\$72,289
K64B Endocrine Disorders W/O Catastrophic or Severe CC	33	\$4,815	\$158,900	703	\$3,216	\$2,260,980	50%	\$52,766
M06B Other Male Reproductive System OR Procedures W/O CC	89	\$5,768	\$513,383	80	\$2,157	\$172,548	167%	\$321,424
M60A Malignancy, Male Reproductive System W Catastrophic or Severe CC	8	\$13,128	\$105,025	97	\$6,694	\$649,304	96%	\$51,474
N09Z Conisation, Vagina, Cervix and Vulva Procedures	43	\$15,081	\$648,463	3606	\$2,153	\$7,761,953	601%	\$555,905
N60A Malignancy, Female Reproductive System W Catastrophic CC	9	\$14,018	\$126,158	54	\$10,801	\$583,262	30%	\$28,948
N60B Malignancy, Female Reproductive System W/O Catastrophic CC	52	\$7,478	\$388,872	182	\$3,832	\$697,421	95%	\$189,609
R62A Other Neoplastic Disorders W CC	69	\$7,847	\$541,416	176	\$6,646	\$1,169,668	18%	\$82,853
R62B Other Neoplastic Disorders W/O CC	26	\$4,065	\$105,702	138	\$2,829	\$390,368	44%	\$32,154
Total	1507	\$9,103	\$13,717,880	15578	\$4,264	\$66,418,225	93%	\$5,970,987

This comparison is impacted within a number of DRGs by practice differences between the sites. It should also be noted that given Peter MacCallum's specialist nature, it would be expected that there would be a number of high cost high outlier episodes. Whilst for other non specialist sites, there may exist a significant number of same day episodes that reduces the average DRG cost.

However without the demographic (B1) data for all other Victorian cases, the data could not be trimmed to remove this issue. Further this comparison has a number of shortfalls as the project team were unable to exclude the impact of public vs. private throughput and the proportion of same day admissions or high inliers from the analysis.

7.4 Recommendation - Inpatient Loading via NHCDC Data

Radiotherapy occurs as an additional service to the inpatient stay.

Radiotherapy is often not the primary reason for the inpatient admission; it is an adjunct to the care of the patient while they are an inpatient. The coding of radiotherapy does not significantly impact the DRG of the patient which indicates that patients coded to a DRG at a radiotherapy site can have a significantly higher cost than a patient coded to the same DRG at a non-radiotherapy site.

This review demonstrates that the average inlier cost per DRG for episodes that include Radiotherapy treatments is conservatively estimated to be 40% more than the inlier cost for that component of the episode which is not radiotherapy related for a sampled cohort of 22 DRGs for five health services.

For consideration to pricing of radiotherapy services for 2014/15, it is suggested that

- A specific NWAU loading for Radiotherapy would present as a more equitable distribution of funds between Radiotherapy providers and other sites, however, further analysis would be advised prior to any loading to ensure the appropriate loading is derived.
- Given the time constraints of this review, it is recommended that IHPA confirms this loading prior to undertaking any further analysis for inpatient radiotherapy price adjustments.

The project team also noted the model that is in use within the Victorian jurisdiction. Victoria has created a VIC-DRG 6.0x of R64Z Radiotherapy for non-same day non-surgical episodes that include a radiation oncology procedure according to specific coding criteria.

Whilst this maybe an alternative, the project team and Steering Committee felt that this required further discussion as

- If created, further checks would be required on both activity and cost data to ensure that non radiotherapy hospitals do not code to this DRG (which may further confuse costs and undermine the funding model)
- The DRG Grouper itself would require modification, which may be a longer term option, but would not be an appropriate solution for the 2014/15 NEP.

7.5 Non-Admitted Radiotherapy Costs

Radiotherapy services are generally undertaken in the non-admitted patient setting. A significant amount of the workload of radiotherapy is delivered as non-admitted activity; this is estimated to be 94%. Much of this activity is not reported to IHPA. Much of the effort required to deliver radiotherapy is expended in the planning and simulation of the treatments.

As discussed previously a large volume of non-admitted data is not submitted to IHPA as some jurisdictions are not costing these products and some jurisdictions are not submitting this activity as it is viewed as Non-ABF activity following interpretation of the National Health Reform Agreement.

Given the data that is submitted to IHPA for this product, it cannot be used to reliably inform an analysis about the costs of non-admitted radiotherapy. For example; only 5% of the Peter MacCallum non-admitted radiotherapy costs were submitted to IHPA for the Round 16 NHCDC.

To enable further analysis for this review, both the Department of Health (Victoria) and Peter MacCallum made the full radiotherapy cost data set available for FY2011/12. This data was used to observe how the patient costing is performed and what information could be available to IHPA if it was not edited at the jurisdiction level.

7.6 Radiotherapy Encounter Review across the Peter MacCallum, VCDC and IHPA Cost Data Sets

Within Victoria, information is collected on each course of care within the radiotherapy centres. The course of care relates to the prescription of radiotherapy and this is stored within the radiotherapy systems under the PlanId

A typical course of care was selected from the VRMDS for a public course of non-admitted radiotherapy. This was observed across the three cost data sets to observe the cost data records from source hospital costing system to cost record loaded into the IHPA national costing data base.

For this analysis, cost data was made available from Peter MacCallum Cancer Institute. Peter MacCallum, is a major teaching public hospital within Victoria whose casemix is specifically cancer related. It operates a hub and spoke model.

The public course selected is detailed in Table 13

Table 13 Peter MacCallum Sample Public Course of Care FY 2011/12

Encounter Number	URN O	Financial Class	StartDateTime	EndDateTime	Extra: Program	Extra: DhKey	DirCost	Activity
1		MP	31/08/2011 16:52	31/08/2011 16:52	R		\$589.06	Dosimetry
2		MP	31/08/2011 11:51	31/08/2011 11:51	R		\$112.81	Simulation
3		MP	1/09/2011 17:56	1/09/2011 17:56	R		\$38.77	Treatment
4		MP	1/09/2011 17:59	1/09/2011 17:59	R		\$38.77	Treatment
5		MP	2/09/2011 17:17	2/09/2011 17:17	R		\$38.77	Treatment
6		MP	3/09/2011 11:46	3/09/2011 11:46	R		\$38.77	Treatment
7		MP	5/09/2011 8:58	5/09/2011 8:58	R		\$38.77	Treatment
8		MP	6/09/2011 12:27	6/09/2011 12:27	R		\$38.77	Treatment

A general pattern of costs occurs across the course of care, with dosimetry and simulation performed at the start of the course and treatments continuing to the end of the course. In general the planning (dosimetry) costs are five to eight times higher than the treatment service events.

The products from the Peter MacCallum database applied to the Dosimetry service event (1) above are demonstrated below in Table 14

Table 14 Peter MacCallum Sample Public Course of Care FY 2011/12 – Sample Encounter Output from Costing System Dosimetry

Encounter Number	ServiceDate	Cost Area	Intermediate product	Quantity	Direct Cost
1	31/08/2011 16:52	A6652_Rad Onc Med Officers	Radiotherapy Med-RT-EM-DOS-PL-DOS3-W	1	\$25.01
1	31/08/2011 16:52	A6652_Radiotherapy Interns - Planning	Radiotherapy Interns-RT-EM-DOS-PL-DOS3-W	1	\$62.04
1	31/08/2011 16:52	A6652_Radiotherapy Planning	Radiotherapy-RT-EM-DOS-PL-DOS3-W	1	\$502.01
Total					\$589.06

The most significant intermediate product cost within this episode is the DOS or dosimetry product. Within this case this is reported as a low level DOS3 planning event for a palliative course of care. Upon review of this cost data set, the more significant events such as a DOS6 are often in the order of \$1,200 per event. This highlights the range of resource costs which can be identified through the intermediate product and may provide an avenue for future funding model refinement or development.

The products from the Peter MacCallum costing system applied to the treatment service event are shown in Table 15

Table 15 Peter MacCallum Sample Public Course of Care FY 2011/12 – Sample Encounter Output from Costing System Treatment

Encounter Number	ServiceDate	Cost Area	ServiceCode	Quantity	Direct Cost
2	1/09/2011 17:59	A1752_Radiotherapy - MVT	Radiotherapy-RT-EM-MVT-TX-MVT2-KKK	2	\$23.63
2	1/09/2011 17:59	A1752_Radiotherapy - Nurses	Radiotherapy Nurses-RT-EM-MVT-TX-MVT2-KKK	2	\$8.76
2	1/09/2011 17:59	A6652_Radiotherapy Interns - MVT	Radiotherapy Interns-RT-EM-MVT-TX-MVT2-KKK	2	\$6.38
Total					\$38.77

Within the VCDC this episode information is collected against the eKey and the CourseID information is recorded in the DHKey Field. Whilst we could not publish the key information in Table 16 below the project team confirm that there is no information within the VCDC to identify the Dosimetry or other relevant service events, only the Tier 2 clinic is recorded against the service events

Table 16 Peter MacCallum Sample Public Course of Care FY 2011/12 – As reported in the VCDC

Peter Mac: URNO	PMCC:DHKEY	Peter Mac: EncounterNumber			IHPA:EpiNo		
ur	DHKEY	eKey					
			31Aug2011:16:52	MP	40315	\$589.06	Dosimetry
			31Aug2011:11:51	MP	40851	\$112.81	Simulation
			01Sep2011:17:59	MP	315772	\$38.74	Treatment
			01Sep2011:17:56	MP	315773	\$38.74	Treatment
			02Sep2011:17:17	MP	315753	\$38.74	Treatment
			03Sep2011:11:46	MP	316393	\$38.74	Treatment
			05Sep2011:08:58	MP	315752	\$38.74	Treatment
			06Sep2011:12:27	MP	315451	\$38.74	Treatment

The IHPA data set uses the EpiNo as the linking key which utilises the relevant VCDC record field. As Table 17 demonstrates there is no information to identify the type of service event within the IHPA dataset.

Table 17 Linking the VCDC to IHPA Data Set

VCDC:hs_record

EpiNo	ProdType	Program Group	NHCDC Clinic	Direct Cost
OP41	OP	O	10.12	\$589.06
OP42	OP	O	10.12	\$112.81
OP43	OP	O	10.12	\$38.74
OP44	OP	O	10.12	\$38.74
OP45	OP	O	10.12	\$38.74
OP46	OP	O	10.12	\$38.74
OP47	OP	O	10.12	\$38.74
OP48	OP	O	10.12	\$38.74

Within this analysis the linking of the data with the original source data was made more difficult by the introduction of the HS_Record number within the VCDC.

This number formed the basis of the EpiNo within the IHPA database, but is unknown at the Peter MacCallum site. In order to explain the costs within the IHPA database, the Peter MacCallum source information needed to be mapped against the VCDC.

There is also no provision for a DHKey, or a CourseId number within the IHPA database, which makes the observation of courses of care more difficult.

Once the data was mapped within all three systems, it could be seen that the information is filtering through to IHPA, but there is no way to easily identify the dosimetry or planning events.

Due to this, there is no easy way of observing the costs of planning events against the treatment events within IHPA.

7.7 Review of the pattern of cost across radiotherapy encounters within the PMCC Dataset

As the IHPA non-admitted patient costs are incomplete, it was intended to use the VCDC to observe if there is a consistent pattern of costs across the radiotherapy encounter (series of linked episodes).

An extract of the VCDC was obtained for all Program R (Radiotherapy) reported costs from the Department of Health (Victoria). The distribution of these costs can be observed in Table 18 below:

Table 18 VCDC FY 2011/12 Program R Radiotherapy Costs

Campus	Site	Program	Episodes	Direct Cost	Indirect Cost	Total Cost
A	1	R	204,566	\$55,077,176	\$18,035,778	\$73,112,954
B	1	R	23	\$18,320,049	\$4,489,583	\$22,809,633
C	2	R	1,753	\$6,749,851	\$2,274,883	\$9,024,734
D	3	R	28,459	\$8,238,300	\$1,442,173	\$9,680,473
E	4	R	30,971	\$18,788,302	\$2,090,392	\$20,878,694

Due to time constraints, we were unable to apply the VRMDS information against the VCDC to attempt to identify the initial events and determine if there are cost differences.

As the only reliable way to determine the type of service event was to use the product code within the Peter MacCallum dataset, to observe the cost differences.

Within the Peter MacCallum dataset, it could be seen that there are three high cost service events, and then lower cost treatment events. The higher cost events were predominantly Dosimetry, the lower cost events were Treatment, Simulation and Mould Room. The average costs of these events at Peter MacCallum for 2011-12 across inpatient and non-admitted activities were shown in Table 19.

Table 19 Peter MacCallum Sample Public Course of Care FY 2011/12 – Costs by Service Event

Service Event	Event	Average Total Cost per Service Event	Service Cost
Treatment	141,971	\$22.57	\$32,308,443
Mould Room	3,197	\$71.57	\$228,817
Simulation	6,835	\$170.26	\$1,163,716
Dosimetry	8,919	\$1,188.25	\$10,597,968
All	160,922	\$275.28	\$44,298,944

In collating or binding all events to either Dosimetry or other events the following profile was observed in Table 20

Table 20 Peter MacCallum Sample Public Course of Care FY 2011/12 – Collating Costs by service Event

Service Event	Event	Average Total Cost per Service Event	Service Cost
Other Events	152,003	\$221.71	\$33,700,976
Dosimetry	8,919	\$1,188.25	\$10,597,968
All	8,919	\$275.28	\$44,298,944

The effort and cost involved in planning, and specifically Dosimetry, is significantly greater than the cost of treatment or other activities within radiotherapy.

7.8 Recommendation – Non-Admitted Clinics

In order to identify Dosimetry events within radiotherapy and to enable the targeting of NWAU and funding to these events, consideration should be given to the 10.12 Radiation Oncology (Treatment) Clinic Definition being revised to split Planning (Dosimetry and Simulation) from Treatment.

8 Jurisdictional and Industry Consultation and Sample Industry data

To supplement the NHCDC data the project team sought further information on the methodology applied in costing radiotherapy services and greater data in the form of intermediate products which is available in the hospital's clinical costing systems. This data was sought to understand the type of radiotherapy product costs developed, validate the responses on costing approach and to understand the type of intermediate products developed to inform any future options.

The following jurisdictional and industry representatives were either consulted or provided further data:

- Sir Charles Gardiner
- WA Cancer & Palliative Care Network
- Townsville Hospital and Health Services
- Princess Alexandra Hospital
- The Alfred
- Austin Health
- Peter MacCallum Cancer Institute
- Department of Health (Victoria)

Due to time constraints PwC were unable to consult with Royal Perth Hospital and Fremantle Hospital during this project but did perform some analysis on the NHCDC data that they provided. PwC did consult with Sir Charles Gardiner Hospital and WA Department of Health

The following is a list of questions and topics which were sent out to participating jurisdictions:

Questions/ topics of interview with participating jurisdictions

How would you describe the status of your radiotherapy costing against other costed services?

What expenditure is included in the radiotherapy cost centres?

What is the scope (what expenditures are included, excluded such as special purpose or trust funds)

If Hub and spoke arrangements are in place, how are these handled from both a expenditure and activity perspective for costing purposes?

What feeders are used for costing purposes?

Where do they come from?

Do you utilise data from the Radiotherapy Department (from the linac)?

How would you describe the breadth and depth of your costing?

What types of intermediate products are built (for example treatment, simulation etc)

Can you given an example?

Do you change your costing methodology to accommodate a particular type of patient cohort (such as private patients)

Are there further comments you would like to make in regard to radiotherapy costing?

8.1 Sir Charles Gardiner Hospital (WA)

The following points provide a summary of the discussion held with costing staff at Sir Charles Gardiner Hospital:

- The costing methodology applied in the costing of radiotherapy services is no different to those of any other hospital service

- The costs allocated for the Radiation Medicine, Radiation Oncology and Radiotherapy Suites are expenditures relevant to these areas specifically, any external expenditure is charged out.
 - Where possible the AHPCS V2.0 is followed.
- All relevant costs are allocated to patients through the linking process
- The major radiotherapy feeder is ARIA, and this collects the relevant radiotherapy information (such as treatment, treatment type, staff and volumes)
- Only inpatient costing occurs as the ARIA system which captures the non admitted activity does not “talk” to the Patient Admission System (PAS) so costing cannot occur at the non admitted level.
- Therefore over 90% of radiotherapy volume to the Sir Charles Gardiner cohort is not attached to activity. This expenditure of approximately \$20m is “dead-ended”.
- Would support further guidance in this area from a national perspective.

8.2 Western Australian Cancer & Palliative Care Network

- The following points provide a summary of the discussion held with the WA Cancer and Palliative Care Network:
- Work done in Victoria provides an example of the (costing) frameworks that can be undertaken within radiotherapy, with other studies from NSW and international work such as that in Canada.
- The costing methodology is important
 - How the base expenditure is determined
 - Which expenditures are included for costing purposes –are all medical expenditures included in the relevant cost centres for costing purposes? For example expenditures reported in trusts which represent the cost of service provision but are generally excluded in patient level costing.
 - How are hub and spoke arrangements measured and costed?
 - What forms of weightings are used to attribute different service level activities to determine costs? Many defer to the CMBS, but these may not reflect the workload required within patient cohorts.
 - Nationally which feeders are used? Information can come from Linacs and in some cases billing systems – we need to understand how the activity is represented and applied in the costing system.
- Reimbursement models can impact heavily on the costing methodology
- The ABF arrangements need to consider a course of treatment model. Treatment regimes can be very different per patient within the same cohort. This can be driven by the patient’s demographics (such as weight) or the medical approach to the proposed treatment plan.

8.3 Townsville Hospital and Health Services (QLD)

The following points provide a summary of the discussion held with costing staff at Townsville Hospital and Health Services (THHS):

- The costing methodology applied in the costing of radiotherapy services is no different to those of any other hospital service
- The costs allocated for the Radiation Medicine, Radiation Oncology and Radiotherapy Suites are expenditures relevant to these areas specifically, any external expenditure is charged out, all special procedure funds or trusts are excluded also.
 - Costing guidelines and approach is also advised by Queensland Health

- Where there is a shared or off site service (such as Telehealth), the activity is not held by THHS, so it is not costed as part of the THHS submission. This expenditure is ‘journalled’ as part of the Service Level Agreement to the site receiving the service.
- There is no of site activity held also to cost these off site services.
- All relevant costs are allocated to patients through the linking process
- Only inpatient costing occurs.
- To ensure the inpatient expenditure is as accurate as possible for the costing of this cohort, the costing team works with the radiotherapy business managers to isolate admitted and non-admitted related expenditure (as in Inpatient Fractioning) and the admitted expenditure is used as a cost base, whilst the non-admitted component is costed to the dummy patient.
- Would support further guidance in this area from a national perspective.

8.4 Princess Alexandra Hospital (QLD)

The following points provide a summary of the discussion held with costing staff at Princess Alexandra Hospital:

- The costing methodology applied in the costing of radiotherapy services is no different to those of any other hospital service
- The costs allocated for the Radiation Medicine, Radiation Oncology and Radiotherapy Suites are expenditures relevant to these areas specifically, any external expenditure is charged out.
 - Costing guidelines and approach is also advised by Queensland Health
- All relevant costs are allocated to patients through the linking process
- Inpatient and outpatient costing occurs
 - No differences in costing methodology for inpatients
 - Outpatient costing, a feeder is taken from the outpatient booking system and products are built based on time split between “new” and “review” for each clinic
- Recommend that contact be made with Queensland Health as they may be submitting non-admitted data from their own internal costing driven by the activity by Tier 2 clinic. This may explain the huge volume of non-admitted activity and it may be an even spread in cost allocation
- Would support further guidance in this area from a national perspective.

8.5 The Alfred (VIC)

The following points provide a summary of the discussion held with costing staff at The Alfred:

- The costing is undertaken independently from the patients’ status as an inpatient or an outpatient.
- The Syris study undertaken in Victoria was used as reference to the costing methodology,
- The costs allocated for the Radiation Medicine, Radiation Oncology and Radiotherapy Suites are expenditures relevant to these areas specifically, any external expenditure is charged out
 - Cost according to the Victorian Cost Data Collection Guidelines.
 - A Guideline on the costing of Radiotherapy Services was provided by the Department of Health and the Clinical Costing Standards Association of Australia and this forms the basis for costing Radiotherapy services.
- All relevant costs are allocated to patients through the linking process
- Inpatient and outpatient costing occurs
- The approach is to:

- Define all relevant expenditure within the radiotherapy service
- Separate (or sub)cost areas are created for expenditure lines that provide similar services within these radiotherapy departments such as radiotherapy nurses, medical staff, allied health staff
- Two extracts form the basis of the activity that are attached to each sub cost centre:
 - 1 Victorian Radiotherapy Minimum Data Set (VRMDS) which provides patient demographic information such as the primary diagnosis and a course ID for each encounter and
 - 2 A “Transition Report” from the Clinical Administration system (a billing system) which is extracted monthly and holds the treatment information of each patient such as the CMBS procedure codes, the patient UR number and date and time of treatment.
- Intermediate products are e.g. ‘MED:ConsInt’ or ‘RT:MVT’, where MED stands for Medical and RT for Radiotherapist The unit costs attached to these include those of the doctor, nurse, therapist and physicist. A consumable costs is also included for each intermediate product.
- RVUs have been developed within the health service as the CMBS was found to not truly represent some of the intensity required in providing some services or the differences within certain patient cohorts of some services. The methodology which is a relative time based and consumable based for medical supplied and goods and services unit is shown below:

MBS Description	Service Event	Product	number of doctors (MED)	minutes per doctor	number of nurses (NUR)	minutes per nurse	number of physicists (PHY)	minutes per physicist	number of therapists (RT)	minutes per therapist	Relative RT consumable intensity
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- Costing staff are looking to further refine the RVU model to build them against the intermediate products themselves, and not to each MBS code.
- Would support further guidance in this area from a national perspective.

8.6 Peter MacCallum Cancer Institute (VIC)

The following points provide a summary of the discussion held with costing staff at Peter Mac:

- The costing methodology applied in the costing of radiotherapy services is no different to those of any other hospital service.
- From a costing perspective there is no incentive to not include all operating costs attached to your costed patient cohort. Costing is undertaken primarily so the health service understands its business; therefore all effort is made to reflect the relevant costs attached to patients.
 - Cost according to the Victorian Cost Data Collection Guidelines.
 - A Guideline on the costing of Radiotherapy Services was provided by the Department of Health and the Clinical Costing Standards Association of Australia and this forms the basis for costing Radiotherapy services.
- The costs allocated for the Radiation Medicine, Radiation Oncology and Radiotherapy Suites are expenditures relevant to these areas specifically, any external expenditure is charged out. The approach is to:
 - Define all relevant expenditure within the radiotherapy service
 - Peter MacCallum has spoke sites. In these cases, the relevant expenditures from cost centres that may be held at the hub campus are “reclassified out” to the spoke site at the cost centre level (planning and non-admitted patients).
 - The (feeder) activity is generally held at the spoke site and all costing is undertaken for the relevant site based on their cost centre structure and activity.
- All relevant costs are allocated to patients through the linking process

- Inpatient and outpatient costing occurs
- RVUs have been created in conjunction with SyRis Consulting following their work in radiotherapy.

8.7 Department of Health (Victoria)

The Department of Health was most cooperative with the study and provided the project team with all cost data related to its Program 'R' Radiotherapy for the 2011/12 VCDC cost data set and VRMDS data set.

In responding to the variation in volume and costs reported to IHPA, the Department indicated that it took into consideration the role of IHPA and their interpretation of the national reform arrangements NHRA, in particular referencing clause A6. They further indicated that discussions with other jurisdictions indicated differential treatment across states and hence the differences in volumes being observed.

The Department of Health Victoria, has also suggested that further developmental work to the pricing of radiotherapy services could also consider the weighted Activity Unit (WAU) approach currently in use within the jurisdiction as an alternative funding approach.

They have further advised the project team that IHPA apply the Victorian modification for radiotherapy services or apply a specific fixed block price adjustment across all DRGs.

9 Program ‘R’ Radiotherapy –the Victorian Cost Data Set

The Department of Health (Victoria) has significantly invested in the costing and funding of radiotherapy services over the past 4 years as it has acknowledged that these types of services have required a separate model in their casemix funding environment.

This work has involved a Steering Committee comprised of Departmental staff representing various sections within the Department, Radiation Therapists, Radiation oncologists and costing staff from the major radiotherapy health services within Victoria.

The Department has also commissioned SyRis Consulting to undertake staged work on the costing and funding of these services which has led to the sector developing a clinical costing guideline to fund these services and a Weight Activity Unit funding model for the funding of radiotherapy services.

The business rules for reporting to the Victorian Cancer Data Collection are outlined in the 'VCDC Business Rules for Reporting 2011-12 Cost Data Business rules'²², where a program field (episodeProgram) identifies the type of cost episode reported.

Where an episodeProgram has a value ‘R’, it is considered valid for episodes that relate to the provision of radiotherapy services, including treatment and consultations. The provision of any non-admitted radiotherapy services to an individual patient on a single day are to be reported as a separate program R episode.

When allocating costs to these episodes, the following service events are included:

- Consultations
- Planning (includes the processes involved in creating a treatment plan from the Radiation Oncologist’s prescription and simulation stages)
- Treatment
- Course.

Victorian Hospitals report to the VCDC annually according to the VCDC business rules. The Department of Health (Victoria) then undertakes a QA process on the data before it is prepared for other agencies.

The table below (Table 21) clearly presents a greater volume of data in terms of activity and cost than has been supplied through the NHCDC process which was highlighted in Table 2 and Figure , and indicates most likely the volume of non-ABF data that is not reported to IHPA. As highlighted earlier, Victoria is not alone in this reporting approach

²² see VCDC Business rules page 15 http://www.health.vic.gov.au/hdss/vcdc/vcdc_reporting_reqs_201112.pdf

Table 21 Victorian Cost Data - Program 'R' Radiotherapy 2011/12

Site	Service Interactions	Indirect Cost	Direct Cost	Total Cost
A	204,566	\$18,035,778	\$55,077,176	\$73,112,954
B	1,776	\$6,764,466	\$25,069,900	\$31,834,366
C	28,459	\$1,442,173	\$8,238,300	\$9,680,473
D	30,971	\$2,090,392	\$18,788,302	\$20,878,694

The data provided by Victorian Department of Health is acknowledged widely as the most useful base of information on radiotherapy costs and volume, and their open participation in this study is gratefully appreciated.

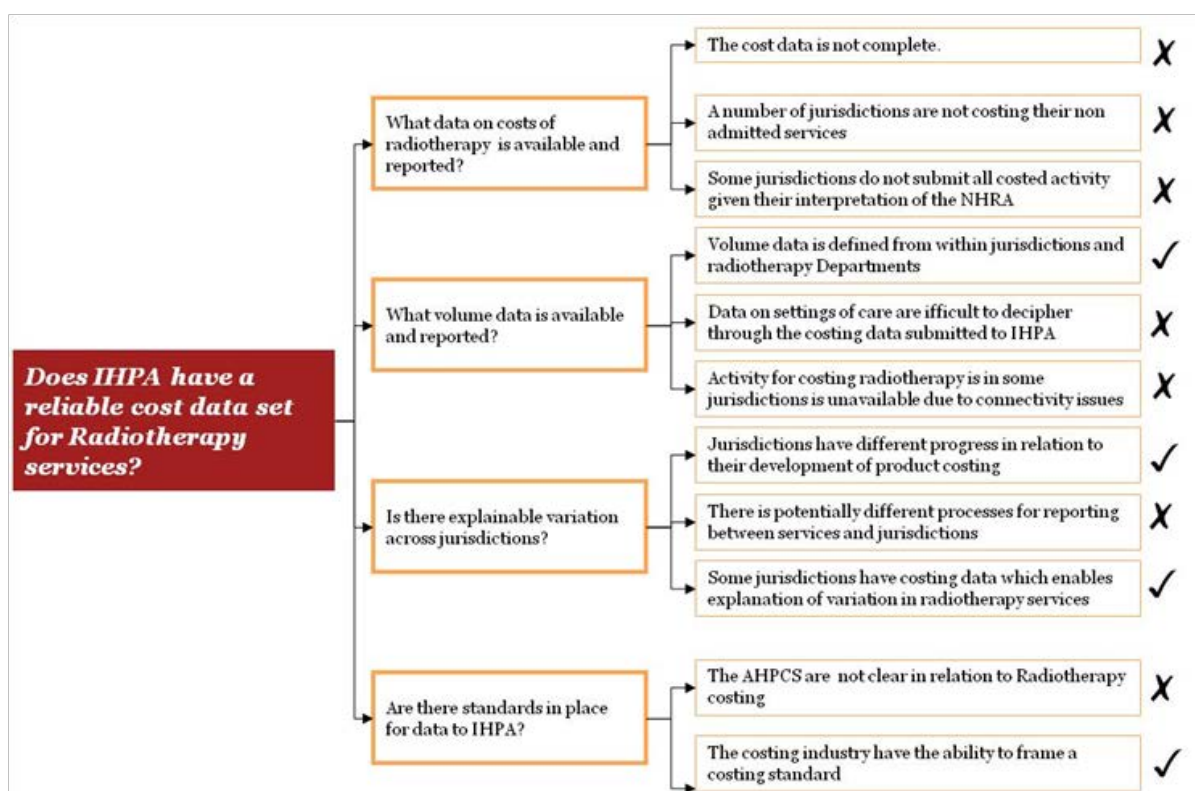
10 Findings and Conclusions

Following the analysis conducted on available data and consultation with a range of jurisdiction and industry participants, a number of findings are evident and are described below.

Central to this review and what was made more apparent as the project team received the NHCDC Round 16 cost data for the radiotherapy cohort was the question “Does IHPA have a reliable cost data set for radiotherapy services”.

The flow chart highlighted below in Figure 9 demonstrates some of the issues surrounding the answer to this question.

Figure 9 Radiotherapy Costing Data Submitted to IHPA - Issue Tree



It became evident during this review that a range of cost data had not been submitted to IHPA as some jurisdictions are yet to have health services costing non-admitted activity – which comprise the bulk of radiotherapy services, whilst other jurisdictions do not forward on data to IHPA given that some radiotherapy activity is considered Non-ABF.

Upon jurisdictional and industry consultation, it became more apparent that there were costing issues relating to the capture of activity or volume within existing radiotherapy systems to enable costing, and the need for further guidance on how to cost these services to truly reflect service provision.

What was also clear is that some jurisdictions have made progress in costing these services and have been able to do this in a manner to reflect the varied level of services offered to consumers of radiotherapy services. As this review has demonstrated, industry developed radiotherapy costing guidelines exist, which should enable the NHCDC Advisory Committee to pursue further should this be agreed as part of their work plan.

Following a data review for both admitted patients and non-admitted patients, the following recommendations are made to the Radiotherapy Steering Committee and IHPA:

Findings and Conclusions

- 1 A specific NWAU loading for admitted inpatient Radiotherapy would present as a more equitable distribution of funds between Radiotherapy providers and other sites.

This derived as the analysis found that radiotherapy services within the cohort examined present an inlier adjunct cost of approximately 40% of the total consolidated episode costs.

However, further analysis including further data and trimming would be advised prior to any loading to ensure the appropriate loading is derived.

- 2 In order to identify Dosimetry events within radiotherapy and more enable the targeting of NWAU and funding to these events, consideration should be given to the 10.12 Radiation Oncology (Treatment) Clinic Definition being revised to split Planning (Dosimetry and Simulation) from Treatment.
- 3 Promote further costing development of radiotherapy services through the newly formed NHCDC Advisory Committee and through a pointed bottom up costing of specific radiotherapy services

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Appendix A Acknowledgement

The project team would like to acknowledge the support and substantial contribution of the Victorian Department of Health, and in particular the assistance of Dr Phuong Nguyen, Adam Chapman and Katie Karanika.

We would also like to acknowledge the provision of cost data from Peter MacCallum Cancer Institute.

This input was pivotal in analysing available information and in the formulation of findings that underpin the recommendations from this review.

Appendix B List of Stakeholders

Dr Tony Sherbon (IHPA)

James Downie (IHPA)

Dr Phuong Nguyen (Department of Health (Victoria))

Dr Dion Forstner (RANZCR)

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Tyrone Patterson (Department of Health (Victoria))

Simon Jarman (Peter MacCallum Cancer Centre)

Peter Davey (Austin Health)

Marco Luthe (Alfred Health)

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Dr Rhonda Coleman (WA Cancer and Palliative Care Network)

Phillip Bamford (Sir Charles Gardiner Hospital)

Ian Massingham (Sir Charles Gardiner Hospital)

Heather Meachem (Princess Alexandra Hospital)

Liz Lea (Townsville Hospital and Health Service)

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