This Brief was prepared by Mr Nicholas Marlow from ASERNIP-S.
Summary of findings

The MRIdian system incorporates two existing technologies (MRI and cobalt radiotherapy) into one cohesive unit, bringing significant potential advantages, however, the efficacy and safety of combining these two technologies into a single unit are yet to be established. The few studies available (one level III-3 study and a series of conference abstracts) only report technical aspects of MRIdian’s treatment planning system. The safety and effectiveness and safety of the MRIdian system has not been reported, and there are no ongoing clinical trials of the technology. However, as the MRIdian system represents convergence of two well known existing, and validated technologies, it is understandable that clinical trials specifically investigating this technology may not be forthcoming.

This technology is more about doing radiotherapy better rather than doing it more efficiently. For example, it has the potential to really improve the quality of some treatments with its real-time tracking and image capabilities, but this is highly tumour stream-dependent.

Further studies are required that report on the efficacy and safety of the associated treatment planning software, since this could have a significant impact on the accuracy of the calculated dose compared to the actual delivered dose. The possible limitations of a Co-60 based treatment device compared to traditional linear accelerator-based radiotherapy are not defined (e.g. length of treatment times) and the image guidance potential based on MRI, and the use of this for radiotherapy field positioning intervention in comparison to existing kV image guidance, are yet to be established.

The concurrent development and commercialisation of MRI/linear accelerator-based radiotherapy technology is likely to compete with the MRIdian system, which funders and providers will have to consider.

HealthPACT Advice

Although the MRIdian system may potentially offer some benefits for treating some tumour types, there is currently no evidence of any incremental clinical or cost effectiveness over existing radiotherapy modalities. Therefore, HealthPACT does not support investment of this technology by, nor its introduction into, clinical practice at this time.
Technology, Company and Licensing

Register ID WP214
Technology name MRIdian™ system
Patient indication Patients with soft tissue lesions and tumours. In particular, patients with tumours that are likely to move, change shape or size through treatment, or are located in close proximity to organs that are likely to move during radiation treatment.

Description of the technology

Radiation therapy is one of the primary modalities used to treat cancer. It involves identifying cancerous tissue and irradiating it with high-energy particle beams, thereby killing the cancer cells by damaging their DNA. Care has to be taken to spare the healthy tissue surrounding the tumour.

Radiation can be delivered in the following ways for localised treatment:

1) Placing sealed-source radioactive material in the body near the cancer cells (brachytherapy);
2) Applying external beams of radiation using a machine (external beam radiation therapy).

In addition, for disseminated disease, unsealed radioactive materials may be administered systemically either orally or by injection (therapeutic nuclear medicine).

External beam radiation therapy (EBRT) is the most widely used modality and is most commonly delivered using a high-energy (megavoltage, MV) X-ray machine, called a linear accelerator (LINAC), to direct radiation to the tumour. There are many terms used for different types of EBRT of varying complexity including 3D conformal radiation therapy (3DCRT), intensity-modulated radiation therapy (IMRT), volumetrically modulated arc therapy (VMAT), tomotherapy, stereotactic radiotherapy (SRT), image-guided radiation therapy (IGRT), 4D-radiotherapy, radiosurgery, stereotactic ablative body radiotherapy (SABR, or SBRT).1 The EBRT used by the MRIdian system is technically delivered from a MRI cobalt machine.

A treatment plan is developed, optimised, verified and approved for each patient undergoing external beam radiation therapy by a multi-disciplinary team (including radiation therapists, radiation oncology medical physicists and radiation oncologists, under the responsibility of a lead radiation oncologist) in a process called simulation and treatment planning. Simulation involves taking detailed scans of the patient’s tumour and of the surrounding normal tissue, on a CT-simulator. These may be supplemented by registering and fusing additional images from magnetic resonance imaging (MRI), positron
emission tomography (PET) or ultrasound to provide complementary imaging that can better help define target volumes.

After simulation the radiation oncologist determines the exact treatment volume and the relevant normal tissue organs at risk nearby, across all scans, and defines the dose prescription. The latter includes the total radiation dose to be delivered to the tumour; a set of dose-volume requirements for the dose distribution to target volume; and, dose-volume constraints to the organs at risk, (including the maximum radiation dose allowable for normal tissues around the tumour, and the safest paths for radiation delivery). A specific technical treatment plan is then developed by a radiation therapist, to optimise the radiation delivery to as close as possible to the set of prescription requirements. Plans are checked, often directly dosimetrically verified. Once approved by the radiation oncologist, plans are transferred to the treatment unit for radiation therapy to commence.¹

The type of cancer being treated, the complexity of tumour and organs-at-risk anatomy and the clinical dosimetry requirements determine the complexity of external beam radiation used. IGRT is especially useful for cancers located in parts of the body prone to movement, such as the lungs and liver, and for sites near major organs and tissues that should not receive radiation.² IGRT is used or for detecting changes during treatment to enable ongoing treatment modifications (‘adaptive radiotherapy’, ART). In IGRT, the imaging equipment (megavoltage or kilovoltage X-ray, cone-beam CT (CBCT), MRI or ultrasound) is available in the treatment room, often mounted on, or built into, the machine that delivers the radiation. This allows the radiation oncology team to scan the tumour and the nearby normal tissue organs at risk immediately before, and even at intervals within the radiation treatment. Specialised software then compares these images to the reference images taken during simulation. Any necessary adjustments are then made to the patient’s position and to the radiation beam targeting to more precisely direct radiation at the tumour, enabling treatment margins to be reduced, and minimising irradiation of the surrounding healthy tissue.² This in turn reduces unwanted side effects (toxicity) or allows dose escalation to the target volume for better tumour control whilst keeping the toxicity the same.

IGRT systems can be used for verifying and correcting patient position and radiation beam positioning. The more advanced IGRT systems, e.g. CBCT, can be used in adaptive radiotherapy and re-planning and in motion management for moving targets (using developmental gating and tracking methods). The MRIdian System is a new type of IGRT that combines MRI with a radiation delivery system in a single unit, using cobalt-60 radioactive sources to produce the external radiation beams. It is currently the only commercially available system to do so. The system is designed so that the imaging and radiotherapy fields are synchronised, permitting imaging of the irradiated tissue both before and continuously throughout treatment.³ The MRI component of the MRIdian System has three different functions:

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¹ MRIdian™ System for MRI-guided radiotherapy: July 2015
² MRIdian™ System for MRI-guided radiotherapy: July 2015
³ MRIdian™ System for MRI-guided radiotherapy: July 2015
1) treatment planning—the images can be used in pre- and intra-treatment planning;  
2) patient positioning—the images can be used to guide patient position during treatment; and  
3) treatment gating (soft-tissue tracking)—images can be taken continuously during therapy to control the radiation beam based on anatomic motion.3

The MRIdian system is the first to enable continuous imaging of soft tissues throughout the entire radiation treatment session. This means that adjustments can be made for tumour movement in real time. If a tumour moves beyond a defined boundary, as a result of breathing or other movement, the radiation beam automatically pauses. When the tumour moves back into the target zone, treatment resumes. This minimises unintended irradiation of healthy surrounding tissue. Clinicians can allow for the motion of a patient’s organs by setting both space and time thresholds for pausing treatment delivery.4,5 This can be done on some x-ray IG systems, but with much less detail of the soft tissues and often requiring implantation of metal seeds into the tumour to allow its motion to be visualised.

Figure 1  MRIdian system

The main purported advantages of the MRIdian system are that it:

- provides better soft-tissue contrast than x-ray imaging systems, giving the clinician a clearer view of the patient’s internal organs during treatment;
- does not expose patients to additional radiation, unlike CT-based IGRT;
- more easily enables adjustments to be made for tumour movement in real time;
- does not require implanted or external reference-point markers for targeting.5
To achieve these advantages, however, it uses Co-60 as the radiation beam source. This has some potential disadvantages: of radiation beam energy (penetration and dose distribution), penumbra (‘fuzziness’ of the beam edge), dose rate, and the need to regularly change the radioactive sources.

**Company or developer**

ViewRay Inc., Ohio, United States of America.

**Reason for assessment**

The nominated system purports to enable real-time viewing of the patient anatomy during the radiation therapy process thereby enabling enhanced responsiveness to adaptive treatment changes and improved patient outcomes.

**Stage of development in Australia**

- [ ] Yet to emerge
- [ ] Experimental
- [ ] Investigational
- [x] Established
- [ ] Established but changed indication or modification of technique
- [ ] Should be taken out of use
- [ ] Nearly established

**Licensing, reimbursement and other approval**

The MRIdian system has received 510(k) clearance from the United States Food and Drug Administration (FDA) and the CE mark. It has not been approved by the Australian Therapeutic Goods Administration.

**Australian Therapeutic Goods Administration approval**

- [ ] Yes
- [x] No
- [ ] Not applicable

**Technology type**

Device

**Technology use**

Therapeutic

**Patient Indication and Setting**

**Disease description and associated mortality and morbidity**

Cancer is a disease that occurs when abnormal cells grow in an uncontrolled way. These abnormal cells can damage or invade surrounding tissue, or spread to other parts of the body, causing further damage. Most cancers start in a particular organ, which is then called the primary site or primary tumor. There are many different types of cancer, and usually they are named after the organ or cell type of the primary cancer.
Cancer is the leading cause of disease burden and injury in Australia, accounting for approximately 19 per cent of the total burden of disease in 2010. At current incidence rates, one in three men and one in four women in Australia will be diagnosed with cancer by 75 years of age. The Australian Institute of Health and Welfare (AIHW) estimated that about 128,290 Australians would be diagnosed with cancer (72,110 men and 56,180 women) in 2014. Of these, the most commonly reported are expected to be prostate cancer, followed by bowel cancer, breast cancer, melanoma of the skin and lung cancer. An estimated 149,990 people are expected to be diagnosed in 2020. Between 1982 and 2014 the number of new cancer cases diagnosed more than doubled from 47,417 to 123,920.

It was estimated by the AIHW that nearly 45,780 Australians would die from cancer in 2014; accounting for three in 10 deaths. For all cancers combined, the age-standardised mortality rate is estimated to have decreased by 20 per cent, from 209 per 100,000 in 1982 to 168 per 100,000 in 2014.

Cancer is also a major cause of hospitalisation in New Zealand and a leading cause of morbidity and mortality, accounting for nearly one third of all deaths (28.9%). In 2010, 21,235 people were diagnosed with cancer in New Zealand and 8,593 people died from the disease. In that year, prostate cancer and bowel cancer were the most commonly diagnosed cancers (2,988 registrations for each cancer), followed by breast cancer and melanoma. Lung cancer was the leading cause of cancer-related death, followed by cancer of the bowel, breast and prostate. The total number of cancer registrations in New Zealand is projected to increase by approximately 30 per cent between 2012 and 2022.

**Number of patients**

According to the AIHW procedural data cubes, 7,825 radiation procedures of relevance to this technical brief were performed in 2012–2013 (procedure numbers 15239-00, 15254-00, 15269-00, 15600-00, 15600-01 and 15600-03). No similar data for New Zealand was readily available.

**Speciality**

Oncology and Radiotherapy

**Technology setting**

General Hospital, Specialist Hospital

**Impact**

The MRIdian System is a substitution technology. Given that it combines an image guidance system and a radiation therapy delivery system (Co-60) in the one device, it is expected to directly replace existing machines that have an x-ray IGRT imaging system and LINAC-based radiotherapy delivery system. If MRI-based simulation and planning becomes more widely accepted, it could potentially replace current imaging technology used to develop a patient’s treatment plan as well as technology used to deliver radiation therapy.
Current technology

There are several types of IGRT used to deliver external beam radiation. Almost all LINACs since the late 1980s have been equipped with electronic portal imaging devices (EPIDs), which directly image using the (MV) treatment beams, and which replaced the use of port films. Since the mid-2000s, most new LINACs have been supplied with add-on low-energy (kilovoltage, kV) x-ray sources and solid state imaging panels that allow kV images and kV cone-beam CT scanning for IGRT. All modern radiotherapy uses EPIDs at least for image guidance of patient set up and most advanced and complex radiotherapy techniques (eg IMRT, VMAT, SRS, SBRT) require at least one or other of the more sophisticated IGRT systems (eg kV or MV CBCT).

Diffusion of technology in Australia

The MRIdian System is not currently used in Australia. A position paper on techniques and technologies in radiation therapy produced by the Royal Australian and New Zealand College of Radiologists in 2013, states that the IGRT is essential (‘clinically indicated’), must be available in every department and is an essential component for IMRT. The document noted that at that point MRI-guided IGRT was in development, mentions its advantages and states that uptake in Australia and New Zealand was ‘will depend on further development, research and the production of more advanced MRI-LINAC modles’.

International utilisation

<table>
<thead>
<tr>
<th>Country</th>
<th>Level of Use</th>
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<tbody>
<tr>
<td></td>
<td>Trials underway or completed</td>
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<tr>
<td></td>
<td>Limited use</td>
</tr>
<tr>
<td></td>
<td>Widely diffused</td>
</tr>
<tr>
<td>United States of America</td>
<td>✔</td>
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<tr>
<td>Italy</td>
<td>✔</td>
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</tbody>
</table>

Cost infrastructure and economic consequences

The MRIdian system comprises a split magnet MRI system, with a low field magnet (field strength 0.35T), a rotating gantry assembly, with 3 Co-60 sources at 120 degree intervals, a patient couch, various control consoles, an on-board ‘Monte Carlo’-based adaptive treatment planning system (TPS) and IMRT capability. The System costs about USD 8.5 million, with vault construction to house the system potentially costing an additional USD 1.5 million.

Adaptive radiation therapy, with immediate re-planning requires fast and accurate image registration and manipulation and then rapid planning for a smooth efficient adaptive workflow. The company states that a full treatment plan using MRIdian can be done in under two minutes, compared with 15 to 20 minutes for most other Monte Carlo-based systems.
Ethical, cultural, access or religious considerations
No cultural, religious, or access considerations for the MRIdian system were identified.

Evidence and Policy

Safety and effectiveness
One non-randomised comparative study (level III interventional evidence) and five conference abstracts of case series studies (level IV interventional evidence) were identified for inclusion in this report. However, all but one of these studies assessed only technical aspects of the treatment planning capabilities of the MRIdian system and typically planning on CT image data sets, not on MRI image datasets. Patient outcomes related to the radiotherapy treatment were not reported in any study.
<table>
<thead>
<tr>
<th>Study / Design</th>
<th>Inclusion criteria</th>
<th>Number of patients</th>
<th>Conflicts of interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saenz et al 2014</td>
<td>Patients who received previous radiation therapy; head and neck, lung and prostate</td>
<td>N=14</td>
<td>NR</td>
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<tr>
<td>III-3 USA</td>
<td></td>
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<td></td>
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<tr>
<td>Wooten et al 2014</td>
<td>Patients who had previously received treatment with linear accelerators</td>
<td>N=10</td>
<td>Honoraria, travel expenses, advisory board, employee stock options reported amongst authors</td>
</tr>
<tr>
<td>III-3 USA</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Parikh et al 2014</td>
<td>Patients undergoing image-guided radiation therapy for cancer in the abdomen, head/neck, thorax and pelvis</td>
<td>N=14</td>
<td>Research Grant from MRIdian</td>
</tr>
<tr>
<td>III-3 USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olsen et al 2014</td>
<td>Patients undergoing radiation therapy</td>
<td>N=19</td>
<td>One author has stock options with MRIdian, another has received a research grant from MRIdian</td>
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<tr>
<td>IV USA</td>
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<td></td>
<td></td>
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<tr>
<td>Mutic et al 2014</td>
<td>NR</td>
<td>N=5</td>
<td>Honoraria, travel expenses, research grants, stock options and employee of MRIdian were reported for several authors</td>
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<tr>
<td>IV USA</td>
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**Saenz et al 2014**

Saenz et al 2014 compared the homogeneity index (HI) and conformity index (CI) scores of treatment plans and the volume of tissue receiving 20 per cent of the prescribed dose for the MRIdian planning system and Co-60 beams to those planned in the Pinnacle TPS for a 6MV LINAC. TPS versions were: MRIdian system, version 3.4.0.2, and Pinnacle version 9 (Pinnacle Systems, Inc., California, USA). The HI is a measure for uniformity of dose distribution over the target volume, while CI indicates how well the distribution of radiation conforms to the shape of the target tissue.

Planning objectives and treatment planning information including CT images, structure sets, and points of reference, were exported from the Pinnacle system into the MRIdian system. Two approaches using the MRIdian system were examined: ‘A’ used the same number of beams as the Pinnacle plan (number of beams not reported), and ‘B’ used 54 beams as an
extreme test. Data from 14 patients receiving radiotherapy treatment in the head and neck (n=6), lung (n=4) and prostate (n=4) were analysed with both software systems.

**Effectiveness**

The MRIdian HI score increased (ie worse homogeneity) for each of the three target areas in comparison to the Pinnacle score for all approaches except for two 54-beam plans. The head and neck group showed the lowest HI score increase (1-4 per cent), compared with 1-7 per cent for the lung, and 3-11 per cent for the prostate. Overall, the MRIdian treatment plans were stated to be comparable with the Pinnacle plans and had good radiation dose delivery for head and neck tumours. Varied results were identified in the CI comparison between MRIdian and Pinnacle treatment plans. The CI for the head and neck tumour group decreased by 22 per cent (worse conformity). CI scores for the lung treatment group showed a modest improvement (4%) with MRIdian, compared with the Pinnacle plan, whereas results from the three prostate cancer plans were inconclusive. These are compatible with expectations from using Co-60, compared to 6MV, taking into account the beam characteristics (personal communication).

**Safety**

It was identified that management was required to mitigate MRIdian system skin hot-spots, particularly for prostate treatments. One example of a hot-spot was noted of around 10% greater than for the 6 MV plan.

**Wooten et al 2014**

Wooten et al 2014 reported on the treatment planning capabilities of the MRIdian for 10 selected patients with cancers in the head and neck (n=2), thorax (n=2), breast (n=2), abdomen (n=1), bladder (n=1) and prostate (n=2), who had previously received radiation treatment with LINAC. The same CT datasets from the previous therapy were used to create the plans with MRIdian. For all cases, the mean doses to relevant organs at risk (OAR), target coverage and target homogeneity were compared between the MRIdian and LINAC plans.

**Effectiveness**

For patients with head and neck, breast, thorax and bladder cancers, only minor differences in mean dose were observed between the MRIdian and LINAC plans for OAR (parotids, larynx, lungs, heart and rectum). The MRIdian plans were generally similar to the LINAC plans, but the LINAC plans offered better OAR-sparing in some individual cases.

**Safety**

No safety outcomes were reported.
Parikh et al 2014

A conference abstract by Parikh et al 2014 reported on the comparative visualisation of patient anatomy using the MRIdian system versus cone-beam computed tomography (CBCT)/megavoltage computed tomography (MVCT). Fourteen patients undergoing IGRT for cancer in the abdomen (n=3), head/neck (n=3), thorax (n=2) and pelvis (n=6) were enrolled. CBCT/MVCT image sets used for routine treatment localisation were collected for each patient within two weeks of MRIdian MRI. Both images sets were displayed side-by-side on image-viewing software and were independently reviewed by three radiation oncologists. Each physician was asked to evaluate which image set offered better visualisation of the target and OARS.

Effectiveness

Fifteen to 24 OARS were evaluated per anatomical site (abdomen, n=15; head/neck, thorax and pelvis, n=24). A total of 234 OARs and 10 unique target structures were compared by each physician. At least two of the three physicians reported that MRI offered better visualisation for 71 per cent of the structures. CBCT offered better visualisation in nine per cent of the structures and equivalent visualisation to MRI for 19 per cent of structures. For 74 per cent of the structures analysed, the physicians agreed unanimously on which image set offered the best visualisation. There was agreement between two of the three physicians for 99 per cent of the structures evaluated. For one per cent no consensus was reached. Structures that were better visualised by MRI 100 per cent of the time included the anal canal, bladder, blood vessels, brachial plexus, brain, colon, duodenum, oesophagus, most heart structures, kidneys, liver, optic chiasm and nerve, parotids, penile bulb, prostate, rectum, seminal vesicles, small bowel, spleen, stomach, submandibular glands, spinal cord, uterus and vagina.

Safety

No safety outcomes were reported.

Olsen et al 2014

A conference abstract by Olsen et al 2014 reported on the feasibility of visualising radiation targets and OAR with cine MRI using the MRIdian system in 19 patients undergoing radiation therapy. A total of 35 cine image sets were taken. Three radiation oncologists evaluated all radiation therapy targets and OAR within the imaging field of view for each dataset. Physicians were asked if the image quality was suitable for the purpose of treatment gating (soft-tissue tracking).
**Effectiveness**

A total of 21 target structures and 321 OAR were evaluated in 35 image sets. This included 13 unique targets and 58 unique OAR. All three physicians agreed that image quality was suitable for manual gating or tracking in 54 per cent (7/13) of the targets and 76 per cent (44/58) of the OAR. Unanimous consensus was reached for 90 per cent (19/21) of targets and 96 per cent (308/321) of critical structures evaluated. Targets which were well visualised included tumours of the: cervix, liver, lungs, nasopharynx and breast lumpectomy cavity. OAR that were well visualised included the aorta, heart, tongue, bladder, brain, breast, lung structures and vessels, intestine, oesophagus, femur, kidney, larynx, liver, eye structures, pelvic bones and vessels, penis and prostate, rectum, rib, sacrum, spinal cord, spleen, stomach, trachea, uterus and vertebral body.

**Safety**

No safety outcomes were reported.

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**Motic et al 2014**

Motic et al 2014 evaluated the first five patients from a registry designed to monitor the MRIdian system. Those on the registry included a patient with colon cancer invading the abdominal wall, a patient with an unresectable intra-abdominal desmoid tumour, a patient with a fourth lung cancer over a 14 year interval, a patient with lung cancer iliac metastasis, and a patient with isolated, nodal breast cancer recurrence at the aortic arch with prior chest wall radiation therapy. One patient was unable to complete treatment due to medical reasons and was excluded from the analysis. All cases were evaluated for any additional findings on daily MRI, localisation ability based on MRI, and the degree of tumour and surrounding anatomy motion.

**Effectiveness**

Patient outcomes regarding radiation therapy with MRIdian were not reported. Additional bone metastases were found with MRIdian that were not visible on planning CT scans. Physicians reported that tumours were easily located using MRIdian.

**Safety**

No safety outcomes were reported.

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**Noel et al 2012**

The conference abstract by Noel et al 2012 investigated the feasibility of using the MRIdian system to track bowel movement in real time during radiation therapy for abdominal
cancer. The study assessed two bowel-tracking algorithms, a normalised cross-correlation (NCC) and a weighted NCC (WNCC), in five patients.

**Effectiveness**

Both algorithms successfully tracked 31 of 32 cine MRI sets (movie-like MRI images) in 100 per cent of the frames. The WNCC algorithm was faster than the NCC algorithm and captured a greater range of motion in all cases.

**Safety**

No safety outcomes were reported.

**Economic evaluation**

No economic evaluation of the MRIdian system was identified.

**Ongoing research**

A search of clinicaltrials.gov and the Australian New Zealand Clinical Trials Registry did not identify any clinical trials on the MRIdian system.

**Other issues**

There are a number of research programs developing MRI-LINAC systems for MRI image-guided RT, e.g. the pioneering work in Utrecht, the Netherlands (in collaboration now with Elekta and Philips), in Canada (University of Alberta) and in Australia (lead from the University of Sydney); however, these are some way from being clinical and are currently research and development programs only. The Australian MRI-LINAC program is a $16 million project at Liverpool Hospital comprising a collaboration between the Radiation Physics Laboratory at the University of Sydney, the Ingham Institute for Applied Medical Research in Western Sydney and the Centre for Medical Diagnostic Technologies at the University of Queensland. The program, led by Professor Paul Keall, is reported to be the only one of its kind in the southern hemisphere.  

An additional study by Kishan et al (2015) was identified examining differences between MRIdian patient plans and a LINAC-based IGRT system in patients with soft-tissue carcinomas, however this study is as yet unpublished and consequently unavailable.

A common group of authors collaborated on the majority of the conference papers included in this report. It is important to note several conflicts of interest amongst these authors (see table 1) where direct funding has been received from ViewRay Incorporated, the manufacturer of the MRIdian system.
Number of studies included

All evidence included for assessment in this Technology Brief has been assessed according to the revised NHMRC levels of evidence. A document summarising these levels may be accessed via the HealthPACT web site.

Total number of studies: 6
Total number of Level III-3 studies: 3
Total number of Level IV studies: 3

Search criteria to be used (MeSH terms)

“MRI guided radiotherapy”.

“MRI guided radiation”

“magnetic resonance imaging-guided radiation therapy”

“magnetic resonance imaging guided radiation therapy”

“magnetic resonance imaging-guided RT”

“magnetic resonance imaging guided RT”

“magnetic resonance imaging-guided radiotherapy”

“magnetic resonance imaging guided radiotherapy”

Literature Search Date

17/02/2015

References


