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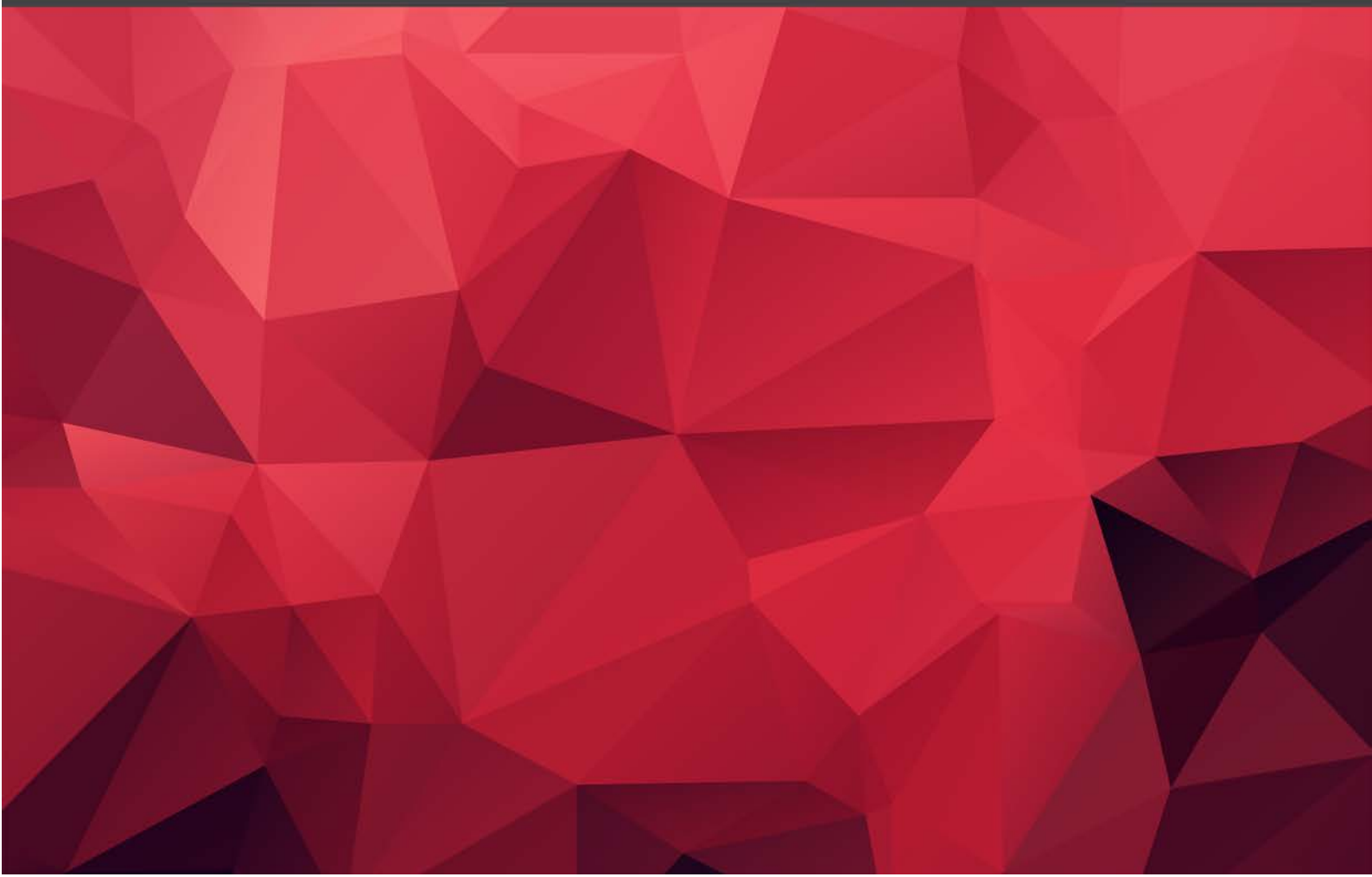


The team who delivered the work comprised Tracey Davies, Philip Jones and Katrina Febry.

Contents

Day to day operations are well managed, but increasing demand, significant workforce challenges, aging equipment and weak strategic planning are leading to reporting backlogs and other risks to future delivery.

Summary report

Background

1 Radiology is a key diagnostic and interventional service for the NHS and supports the full range of specialties in acute hospitals primary care and community services. Hospital-based clinicians, including consultants, other doctors, and in agreed circumstances, non-medical practitioners, often refer patients for radiology imaging, as do general practitioners.

2 Diagnostic radiologists employ a range of different imaging techniques and sophisticated equipment to produce a wide range of high-quality images of patients. Images include plain x-ray, non-obstetric ultrasound (US) and computed tomography (CT) as well as sophisticated techniques such as magnetic resonance imaging (MRI).

3 Clinical radiologists[1] are doctors who use images to help diagnose, treat and manage medical conditions and diseases. They have a key role in the clinical management of a patient's condition, selecting the best imaging technique to enable diagnosis and minimise radiation exposure. Interventional radiologists have a more direct role in treating patients. They use radiological imaging to enable minimally invasive procedures, such as stopping life-threatening haemorrhages, and day-case procedures such as oesophageal stenting and angioplasty.
All radiologists work as part of the multidisciplinary teams which manage patient care.

4 Rapid advances in technology and understanding about how the features of disease present themselves on diagnostic images have allowed imaging to be used at earlier stages of the diagnostic process. This is especially the case in cancer and stroke imaging. Similarly, changes in the characteristics of disease with treatment can be better detected, and imaging is frequently used to monitor progress. From the patient's point of view, early radiological detection can improve the outcome of treatment and prevent unnecessary pain and suffering. It can also reduce the scale and cost of treatment.

[1] In this report, where reference to radiologists is made, this includes consultant radiologists, middle-grade doctors, specialist registrars and junior doctors. Where there is any variation from this, the report content will specify that, eg consultant radiologists.

5 Demand for radiology services continues to increase year on year. The increase is driven by a number of factors, including demographic changes, new clinical guidelines, lower thresholds for scanning and referral to enable earlier diagnosis, surveillance work for surviving patients, a growth in screening, and increasing image complexity.

6 **The Future Delivery of Diagnostic Imaging Services in Wales** (2009)[2] showed that demand for some types of imaging had been increasing by 10% to 15% per year. Recent reports by the Auditor General on **NHS Waiting Times for Elective Care in Wales** (January 2015)[3], and **Orthopaedic Services** (June 2015)[4] showed that the increasing demand for radiology services is resulting in long waits for radiological diagnostic procedures and that sustainable solutions were needed to address this.

7 The Welsh Government has introduced delivery plans to improve the treatment of major health conditions such as stroke[5], cancer[6] and heart disease.[7] The plans all highlight the importance of efficient and effective radiological services. The associated care pathways emphasise the need for rapid referral processes, rapid diagnostic testing at particular stages in the pathway, the right equipment and staff who are appropriately skilled.

8 While there is a need to deliver long-term solutions to manage and meet increasing demand for radiology services, there is general recognition that the UK consultant radiologist workforce is under significant pressure. In 2015, 9% of consultant radiologist posts in the UK were unfilled, with 7%[8] of Welsh consultant radiologist posts unfilled. For the period 2015 to 2020, consultant workforce attrition due to retirement is likely to be higher in Wales than in any other part of the UK. Around 30% of consultants in Wales are expected to retire if the retirement age is 60, compared to 20% for the UK as a whole[9].

[2] Welsh Assembly Government, **The Future of Diagnostic Imaging Services in Wales**, 2009

[3] Wales Audit Office, **Elective Care in Wales**, January 2015

[4] Wales Audit Office, **Orthopaedic Services**, June 2015

[5] Welsh Government, **Together for Health**, **Stroke Delivery Plan**, 2012

[6] Welsh Government, **Together for Health**, **Cancer Delivery Plan**, 2012

[7] Welsh Government, **Together for Health**, **A Heart Disease Delivery Plan**, 2013

[8] The Royal College of Radiologists, **Clinical radiology UK workforce census 2015 report**, 2016

[9] The Royal College of Radiologists, **Clinical radiology UK workforce census 2015 report**, 2016

9 The use of interventional radiology (IR) is growing. Such techniques rely on the use of radiological images to precisely target therapy. IR techniques can be used for both diagnostic and treatment purposes. The demand for these techniques is increasing and this places further pressure on already stretched radiology services' staffing resources. It is widely accepted by radiology professions that the numbers of interventional radiologists across Wales, similar to other parts of the UK, are too low. Within Wales, the National Imaging Programme Board (NIPB) has a programme of work which is considering interventional radiologist capacity and how it can be addressed.

10 The NIPB is the primary source of advice, knowledge and expertise for the planning of imaging services in Wales. It is made up of clinical and management representatives from organisations involved in the delivery of imaging services in Wales. In 2010 the NIPB was given delegated authority for developing and implementing a programme of strategic work for radiology through to 2016, and for adopting all-Wales standards and protocols for imaging services in NHS Wales. Although progress is being made at national level, a number of significant challenges are yet to be fully addressed. For example, there are ongoing difficulties in recruiting general and specialist radiology staff and concerns about the information systems that support radiology services.

11 Given the challenges set out above, the Auditor General decided that it was timely to undertake a review of radiology services across all health boards in Wales. The work examined the actions health boards are taking to address the growing demand for radiology services, and the extent to which these actions are providing sustainable and cost-effective solutions to the various challenges that exist. The review also examined key radiology imaging techniques, or modalities, as well as interventional radiology in acute settings. It excluded therapeutic radiology.

12 We undertook the fieldwork at the Abertawe Bro Morgannwg University Health Board (the Health Board) between June and August 2016. Appendix 1 provides more details of the audit approach and methodology.

13 In addition to this local audit work at the Health Board, the Auditor General for Wales is conducting a value-for-money examination of the NHS Wales Informatics Service, which will, amongst other things, look at the implementation of RADIS[10] and PACS[11] across Wales. The findings from that work are due to be published in late spring 2017.

Contextual information

14 The Health Board has two separate radiology services, one of which is part of Morriston Hospital Delivery Unit and the other which is part of Princess of Wales Hospital Delivery Unit. The two services cover four main sites, Morriston and

[10] RADIS – Wales Radiology Information System

[11] PACS – Picture Archiving and Communications System

Singleton Hospitals, and Princess of Wales and Neath Port Talbot Hospitals, respectively. They provide a range of imaging and interventional procedures.

Our main findings

15 Overall, we concluded that day to day operations are well managed, but increasing demand, significant workforce challenges, aging equipment and weak strategic planning are leading to reporting backlogs and other risks to future delivery

Exhibit 1: our main findings

Table detailing our main findings.

Our main findings
Factors affecting patient experience Waiting times targets are being achieved despite increasing demand, however, reporting times vary, and some environment issues may affect patient experience: • open access to radiology services differs across the Health Board; • despite significant increases in demand, patients receive their radiological examination within eight weeks across all modalities; • reporting backlogs and reporting times vary across sites, and there are barriers to improvement; • both units have their own programme of clinical audit and some joint audits take place each year, although the level of peer review of reporting quality is low; and • staff are encouraged to report complaints and incidents, and patient feedback mechanisms have improved, while some environment issues may affect patient experience.
Demand and capacity issues affecting service performance Increasing demand is largely beyond local control, and while productivity is above average there are significant workforce challenges, although there is potential to improve booking arrangements and to further optimise weekend working: • the major factors driving up demand for radiological services are largely beyond the Health Board's control; • the Health Board relies on national referral guidelines, although the absence of an electronic request system creates a risk, and while the quality of radiologist advice is good, it is not always easily accessible; • a lack of coordinated appointment booking arrangements limits the ability to further improve waiting list management, although some session capacity is protected to accommodate urgent activity; • the number of radiologists and radiographers approaching retirement is higher than the Wales average, and recruitment to fill radiology vacancies is very challenging; • staff carry out more examinations than the Wales average and the radiology workforce profile is just above the Wales average; • radiologists and sonographers are less likely to be compliant with statutory and mandatory training than other staff, and staffing constraints hinder training opportunities; and • the number of scanners is broadly in line with the Wales average, although some have shorter operating hours, and whilst there is potential to further optimise weekend usage, this may cost the service more.

Our main findings
Extent to which radiology services are well managed While management and accountability arrangements are clear, planning is weak, there needs to be a greater Health Board focus on delivery of radiology services, and some older equipment presents significant risks: • health board radiology services lack a joint strategic plan, and there are no detailed annual operational plans or financial plans, although there is a workforce plan; • management and accountability arrangements are clear at delivery unit and executive level, although there is a need to focus on delivery of a radiology service for the Health Board as a whole, and some key joint radiology meetings no longer take place; • the service is not well represented on Board committees and sub-committees; • service expenditure has been close to budget in recent years, although savings targets have not been achieved and appear to be unrealistic; • while there is no capital allocation budget, each radiology service produces an equipment replacement programme, and some older equipment poses significant risks to patient care and service continuity; • the lack of a clear timeframe for a single core radiology system limits the development of more joined up radiology services; and • radiology performance is regularly reviewed at service level and through corporate performance team meetings, although there is more limited reporting of radiology performance at unit level.

Recommendations

16 As a result of this work, we have made a number of recommendations which are set out in Exhibit 2.

Exhibit 2: recommendations

Table outlining our recommendations to the Health Board.

Factors affecting patient experience	
R1	The two radiology services should establish a joint action plan, by mid-2017, parts of which may need to be achieved as resources become available, to ensure that peer review of reporting quality is carried out in line with the requirements of professional standards.

Demand and capacity issues affecting service performance	
R2	The two radiology services should set out a joint plan to identify ways in which they can reinforce the need for other services to communicate with them about initiatives and changes that will affect the provision of radiology services
R3	The two radiology services should record radiology outpatient appointment DNA rates and include them in radiology service performance reports.
R4	The two radiology services should jointly review and address the coordination of radiology appointments within specialties and across sites, to help distribute demand effectively and to reduce variations in waiting times.
R5	The Health Board should set out capital replacement plans, and contingency plans, for equipment which poses a particular risk to service continuity and patient care.
R6	The two radiology services should jointly examine the costs and benefits of increased scanning hours during the week and at weekends, and if appropriate, develop a business case for an increase in scanning hours.
Extent to which radiology services are well managed	
R7	The two radiology services should establish a joint radiology strategic plan, by mid-2017, to: • show where they are now in terms of demand, capacity and available resources; • set out a collective view of where they need to be; • establish how they will work together to achieve their collective aims; and • inform the development of annual operational plans.
R8	The two radiology services should set clear financial plans to inform their annual operational plans.
R9	The Health Board should, by mid-2017, establish arrangements to help ensure director oversight of a Health Board-wide strategic focus on radiology, which should be in addition to that currently given to the separate radiology services.
R10	The Health Board should ensure clear representation of radiology services on its key committees and groups, by mid-2017.

Detailed report

Waiting times targets are being achieved despite increasing demand, however, reporting times vary, and some environment issues may affect patient experience

Open access to radiology services differs across the Health Board

17 Open-access services[12] are widely recognised as a means to reduce the time it takes for patients to access imaging. However, the approach can lead to demand management challenges, particularly when used for more complex imaging. It also has the potential to raise patient expectations and encourage over testing. For example, if a patient with lower back pain has an x-ray, it will not improve their condition. They may insist that the GP refers them for an x-ray because they feel as though something is being done for them. The decision to refer may not be supported when the radiology department or other referral screening service reviews the request. This can lead to a tension between patient expectations and the correct professional response.

18 While most radiology departments offer some form of open access to services, the extent of access varies. Typically, it is limited to plain x-ray only, such as a chest x-ray. If the referring medical professional has determined that a plain film x-ray is necessary, they complete a request form which the patient takes to the radiology department during opening times to receive, if appropriate, the requested x-ray. Morriston Hospital Delivery Unit (MHDU) offers GPs open access to plain film x-ray, MRI and CT imaging. Princess of Wales Hospital Delivery Unit (POWHDU) offers open access to GPs for plain film x-ray, and more limited access for complex imaging. These differences across the Health Board have been determined as a response to available local resources, and different demand management approaches.

19 NICE cancer guidelines indicate that for patients with Urgent Suspected Cancers, there should be open access to the relevant service within a 10 day period. The Health Board acknowledges that it has performed poorly on cancer pathways in the past, and is working to improve performance but is not yet able to achieve this level of access. We were told that it takes around ten days for Urgent Suspected Cancer patients to be seen by a consultant in an outpatient's clinic. It takes a further ten days for any consequent imaging request to be booked and carried out. The overall elapsed time for an Urgent Suspected Cancer patient from GP referral to diagnostic imaging is currently around 20 days.

[12] Where an open-access service is provided, a GP can refer a patient to be seen that day by the relevant x-ray department.

20 Where open access is not available, for example for more complex imaging, the referral should specify the degree of urgency. Typically, referrals are classed as urgent (outpatient) routine priority (outpatient), or urgent suspected cancer (outpatient). This ensures that the patients with the most critical needs are seen first. Urgent referrals will be seen as soon as they can be accommodated. For all other referrals, the patient will be added to the waiting list, with urgent referrals prioritised. The Health Board uses these three categories in order to prioritise its waiting lists.

21 Patients with emergency health needs may need access to prompt radiology diagnostics and care outside standard radiology working hours. The Health Board provides some emergency radiology services out of hours. It maintains a list of the core procedures provided, which is available to all referrers on the Health Board intranet. The service leads are satisfied that out of hours service needs can be met by the current arrangements. The following cover is provided out of hours:

- CT scans – at all four main sites;
- MRI scans – at MHDU; POWHDU does not currently provide out of hours cover;
- Ultrasound scans – consultants and non-consultants can make a referral at POWHDU and MHDU;
- Interventional Radiology – cover is not guaranteed out of hours due to insufficient resources; and
- Neuroradiology cover – at MHDU, and receiving patients referred from POWHDU.

Despite significant increases in demand patients receive their radiological examination within eight weeks across all modalities

22 All NHS bodies in Wales are required to comply with the Welsh Government diagnostic waiting times target which states that no patients should wait more than eight weeks to receive their diagnostic test. The diagnostic waiting time target applies to all radiological interventions including magnetic resonance imaging (MRI), computed tomography (CT), and non-obstetric ultrasound (US), fluoroscopy, barium enema, and nuclear medicine. The Welsh Government target does not apply to plain film x-rays.

23 Since 2009 waiting times for radiological tests have also formed part of the referral to treatment target[13]. Health boards in Wales are required to ensure that 95% of all patients waiting for elective treatment, receive their treatment within 26 weeks from

[13] Welsh Health Circular (2007) 014 – **Access 2009 – Referral to Treatment Time Measurement**, Welsh Health Circular (2007) 051 – **2009 Access – Delivering a 26 Week Patient Pathway – Integrated Delivery and Implementation Plan** and Welsh Health Circular (2007) 075 – **2009 Access Project – Supplementary Guidance for Implementing 26-Week Patient Pathways**

the point at which the referral was received. For many of these patients, diagnostic tests help decide which treatment is the best option.

24 The radiology services at MHDU and POWHDU maintain separate waiting lists. While this suggests that the waiting times in each unit would be different, our audit work found that they are consistent.

25 The all-Wales radiology waiting times[14] for consultant and GP referrals shows that for August 2016 there were 6,811 patients waiting for radiology diagnostic imaging at the Health Board: 47% for non-obstetric US, 29% for MRI, 22% for CT, and 2% for nuclear medicine imaging.

26 In August 2016, 1,944 patients were waiting for an MRI scan at the Health Board, of which none were waiting over eight weeks (Exhibit 3).

[14] **NWIS Diagnostic and Therapy Services Waiting Times** – NHS Wales Informatics Services (accessed via StatsWales on 30 October 2016)

Exhibit 3: MRI waiting times for August 2016

Table showing that the Health Board has no patients waiting over eight weeks for an MRI scan, which is significantly below the all-Wales figures.

	Total number of patients waiting for an MRI scan					Percentage of patients waiting more than 8 weeks
	Up to 8 weeks	Over 8 weeks and up to 14 weeks	Over 14 weeks and up to 24 weeks	Over 24 weeks	Total waiting	
Morriston Hospital	907	–	–	–	907	0%
Neath Port Talbot Hospital	441	–	–	–	441	0%
Princess of Wales Hospital	596	–	–	–	596	0%
Singleton Hospital	–	–	–	–	–	–
Abertawe Bro Morgannwg University Health Board	1,944	–	–	–	1,944	0%
All Wales[1]	11,662	913	66	163	12,804	9%

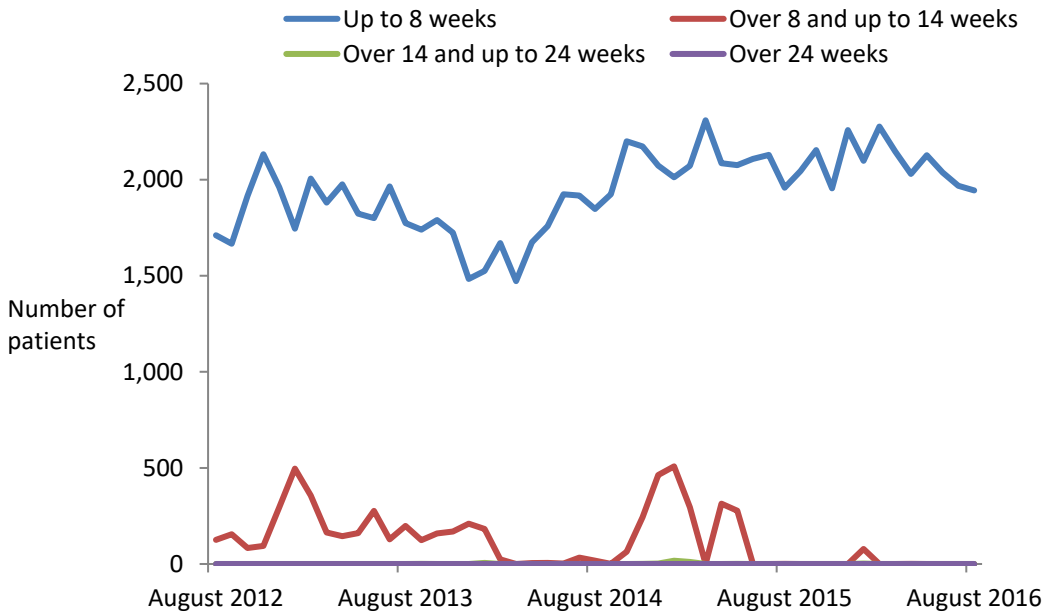
[1] All-Wales figures include all patients waiting for a diagnostic scan at Welsh health boards

Source: **Diagnostic and Therapy Services Waiting Times**, NHS Wales Informatics Services (accessed StatsWales, on 30 October 2016)

27 The total number of patients on the waiting list for an MRI scan at the Health Board increased by 21% between August 2012 and August 2016. Despite this increase the percentage waiting more than eight weeks was 0% in both August 2012 and August 2016 (Exhibit 4). However, between these periods the waiting times target was exceeded.

Exhibit 4: MRI waiting times trend from August 2012 to August 2016

Graph showing some variation in the number of patients waiting over eight weeks during the last five years, and growth in the number of patients. However, during this period, no patients waited longer than fourteen weeks and the eight week target was maintained for almost all of the period between August 2015 and August 2016.



Source: **Diagnostic and Therapy Services Waiting Times**, NHS Wales Informatics Services (accessed via StatsWales, on 30 October 2016)

28 In August 2016, 1,509 patients were waiting for a CT scan at the Health Board, of which none were waiting over eight weeks (Exhibit 5).

Exhibit 5: CT waiting times for August 2016

Table showing that the Health Board does not have any patients waiting over eight weeks for a CT scan compared to the all-Wales figures.

	Total number of patients waiting for a CT scan					
	Up to 8 weeks	Over 8 weeks and up to 14 weeks	Over 14 weeks and up to 24 weeks	Over 24 weeks	Total waiting	Percentage of patients waiting more than 8 weeks
Morriston Hospital	422	–	–	–	422	0%
Neath Port Talbot Hospital	389	–	–	–	389	0%
Princess of Wales Hospital	346	–	–	–	346	0%
Singleton Hospital	352	–	–	–	352	0%
Abertawe Bro Morgannwg University Health Board	1,509	–	–	–	1,509	0%
All Wales[1]	7,293	63	51	11	7,418	2%

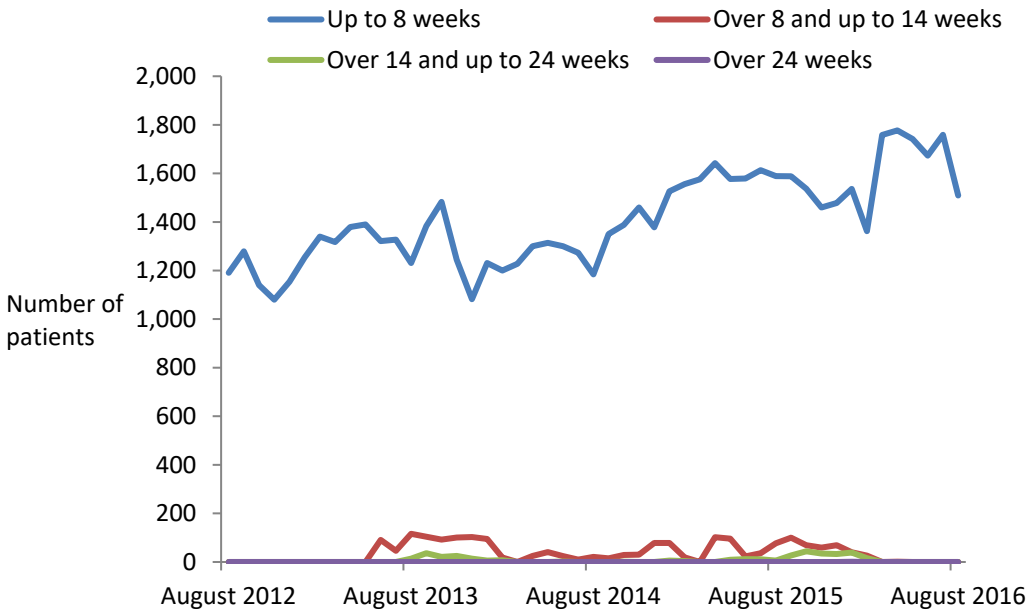
[1] All-Wales figures include all patients waiting for a diagnostic scan at Welsh health boards

Source: **Diagnostic and Therapy Services Waiting Times**, NHS Wales Informatics Services (accessed via StatsWales, on 30 October 2016)

29 The total number of patients on the waiting list for a CT scan at the Health Board increased by 21% between August 2012 and August 2016, and the percentage of patients waiting more than eight weeks in August 2012 and August 2016 was 0% (Exhibit 6).

Exhibit 6: CT waiting times trend from August 2012 to August 2016

Graph showing growth in the numbers of patients waiting for a CT scan over a four year period. Although a relatively small number of patients waited longer than eight weeks during this period, the Health Board managed to accommodate the significant increase in demand for CT scans.



Source: **Diagnostic and Therapy Services Waiting Times**, NHS Wales Informatics Services (accessed via StatsWales, 30 October 2016)

30 In August 2016, 3,186 patients were waiting for a non-obstetric US scan at the Health Board, of which none were waiting over eight weeks (Exhibit 7).

Exhibit 7: non-obstetric US scan waiting times for August 2016

Table showing that the Health Board has no patients waiting over eight weeks for non-obstetric US scans, which is significantly lower than the all-Wales figures.

	Total number of patients waiting for a non-obstetric US scan					
	Up to 8 weeks	Over 8 weeks and up to 14 weeks	Over 14 weeks and up to 24 weeks	Over 24 weeks	Total waiting	Percentage of patients waiting more than 8 weeks
Morriston Hospital	703	–	–	–	703	0%
Neath Port Talbot Hospital	894	–	–	–	894	0%
Princess of Wales Hospital	1,117	–	–	–	1,117	0%
Singleton Hospital	472	–	–	–	472	0%
Abertawe Bro Morgannwg University Health Board	3,186	–	–	–	3,186	0%
All Wales[1]	18,944	1,999	626	133	21,702	13%

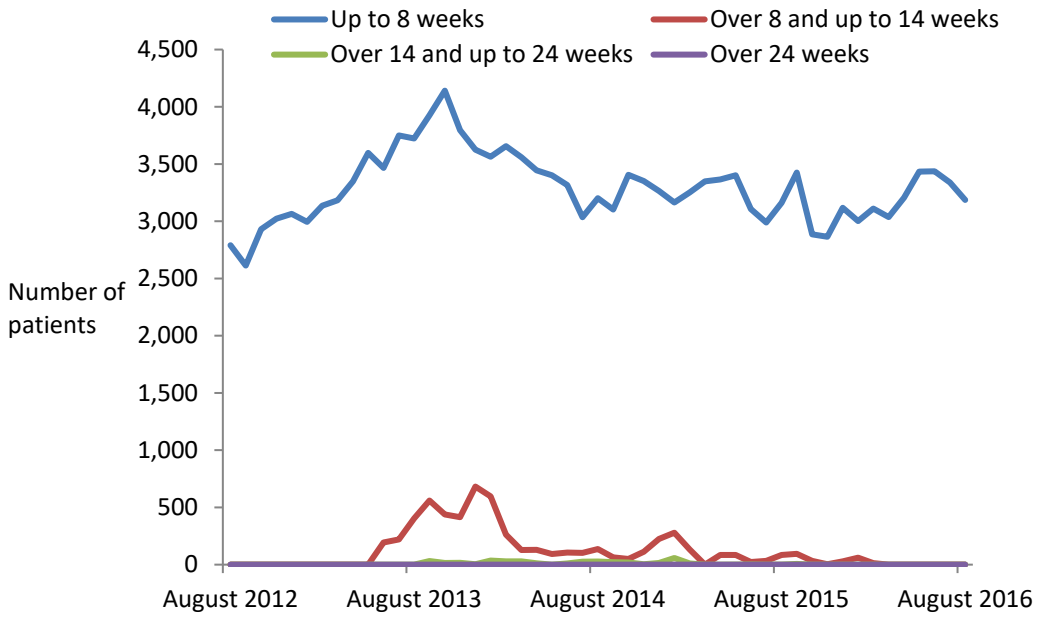
[1] All-Wales figures include all patients waiting for a diagnostic scan at Welsh health boards

Source: **Diagnostic and Therapy Services Waiting Times**, NHS Wales Informatics Services (accessed StatsWales, 30 October 2016)

31 The total number of patients on the waiting list for a non-obstetric US scan at the Health Board increased by 12% between August 2012 and August 2016, and the percentage of patients waiting more than eight weeks in August 2012 and August 2016 was 0% (Exhibit 8).

Exhibit 8: non-obstetric US scan waiting times trend from August 2012 to August 2016

Graph showing an initial sharp increase and corresponding decrease in the number of patients waiting for non-obstetric US scan between 2012 and 2014. The number of patients waiting more than eight weeks has fallen since 2013, to around zero in 2016.



Source: **Diagnostic and Therapy Services Waiting Times**, NHS Wales Informatics Services (accessed StatsWales, 30 October 2016)

Reporting backlogs and reporting times vary across sites, and there are barriers to improvement

32 Effective management of patient care requires timely reporting of radiology images, by a qualified authorised practitioner, generally a radiologist. The report is a record of the interpretation of the scan, used to make further decisions on the care of the patient. Any delays in reporting can adversely affect patient outcomes.

33 All images must be reported and provided to the referring clinician in appropriate time in accordance with the patient's needs and clinical condition. The Welsh Reporting Standards for Radiology Services 2011 (the Standards) were produced in order to clarify previous guidance and regulations. The Standards set out that radiology should aim to provide reporting turnaround times as follows:

- urgent – immediately/same working day
- inpatient – within one working day
- A&E – within one working day
- GP – within three working days
- outpatient – within ten working days

34 The Health Board aims to adhere to these standards, although managers recognise that they are not always achieved.

35 Reports on waiting times are available through RadCentre (MHDU) and RADIS (POWHDU). The radiology services in both units have recognised that reporting backlogs exist, and have been working to address the situation. The recent introduction of Fujifilm PACS enables the creation of workstreams (or worklists), allowing films to be allocated to staff who are currently available to report them.

36 Superintendent radiographers vet (review) the request forms to find those which fall outside the request guidance. Electronic requesting, while not currently available, would enable them to give an immediate response to the clinician making the request, potentially expediting the process leading up to imaging.

37 Consultants in both MHDU and POWHDU told us that there can be delays in the reporting of plain film x-rays. The target for plain film x-rays in emergency departments is 24 hours, but consultants told us this is not always achieved. Where backlogs have been identified, radiology managers have offered additional sessions to radiologists and radiographers, to help reduce reporting delays. The POWHDU radiology service trialled outsourcing plain film reporting. They found that inappropriate imaging requests were being allowed, due to an inadequate information base for requests. As a result, an in-house approach has been retained.

38 Consultants also told us that the Emergency Department at POWHDU often receives imaging reports for patients who are no longer in their care. This necessitates forwarding the reports to the relevant consultant team, which adds to the length of time it takes before a report is available to the clinician managing that patient's care. Staff said that this could be addressed by more robust electronic patient records and integrated systems.

39 Our review found that average reporting turnaround times for plain x-ray are significantly higher in Princess of Wales Hospital and Neath Port Talbot Hospital than elsewhere in the Health Board. Neath Port Talbot Hospital also has the highest average reporting times for CT, MRI and US (Exhibit 9). Similarly, Princess of Wales Hospital and Neath Port Talbot Hospital have seen the longest report turnaround times for plain x-ray, by a significant margin, across the Health Board (Exhibit 10). Morriston Hospital had the highest actual numbers of unreported examinations, i.e. those still unreported more than 10 days since the examination date (Exhibit 11). Consultants at both MHDU and POWHDU told us that reporting of more complex imaging could sometimes take several days for inpatients.

Exhibit 9: average report turnaround time as at 31 March 2016

Table showing that average turnaround times are significantly longer for plain x-ray in Princess of Wales Hospital and Neath Port Talbot Hospital, and that Neath Port Talbot Hospital has longer average report turnaround times across each of the main modalities.

	Average report turnaround time (days)			
	CT	MRI	Plain x-ray	US
Morriston Hospital	1	3	0	1
Neath Port Talbot Hospital	3	4	8	2
Princess of Wales Hospital	1	2	10	1
Singleton Hospital	2	3	4	2

Source: Wales Audit Office, **Health Board Survey**

Exhibit 10: longest report turnaround time as at 31 March 2016

Table showing that the longest report turnaround times were for plain x-ray at Princess of Wales Hospital and Neath Port Talbot Hospital, while CT and MRI report turnaround was shorter at Singleton Hospital.

	Longest report turnaround time (days)[1]			
	CT	MRI	Plain x-ray	US
Morriston Hospital	12	14	11	14
Neath Port Talbot Hospital	9	15	30	7
Princess of Wales Hospital	9	11	31	0
Singleton Hospital	8	6	10	11

[1] Longest report times exclude any obvious outliers

Source: Wales Audit Office, **Health Board Survey**

Exhibit 11: number of examinations not reported between 1 April 2015 and 31 March 2016

Table showing that the actual number of examinations not reported for three of the four main modalities were greatest at Morriston Hospital.

	Number of examinations not reported[1]			
	CT	MRI	Plain x-ray	US
Morriston Hospital	32	29	348	14
Neath Port Talbot Hospital	0	0	116	0
Princess of Wales Hospital	0	0	207	0
Singleton Hospital	9	6	106	44

[1] Unreported examinations are those that have remained unreported more than 10 days since the examination date

Source: Wales Audit Office, **Health Board Survey**

40 Both radiology services produce fortnightly reports on the numbers of unreported plain x-ray reports, indicating how long they have gone unreported. They also audit reporting times for complex imaging modalities. Outcomes are audited, where a complaint has been made. The departments also report each month, on an exception basis, in relation to image reporting for Urgent Suspected Cancer patients. There are monthly department and managers meetings which, in addition to the eight week wait target, consider reporting turnaround times.

41 Extended practice radiographers receive extra training to interpret and report some types of images, typically less-complex scans, such as plain x-rays. For patients attending the emergency department and receiving a plain x-ray in normal hospital hours, the use of extended practice radiographers increases the likelihood that a report will be produced whilst the patient is still in the department. Where x-rays are reported by radiologists only, the formal report may not be produced until hours, and sometimes days, after the patient has left the hospital. In these instances, x-rays will be initially assessed by a clinician without the benefit of a formal radiology report to assist them. The use of extended practice radiographers can help to reduce the number of patient recalls caused by initial incorrect x-ray interpretation.

42 Senior radiology staff told us that they are very supportive of the development of extended roles, to provide models of care which can help to overcome shortages in other staff groups, such as radiologists. However, there is significant pressure on existing radiographer and ultrasonographer resources from increasing demand and vacancies. Therefore they are concerned that there is not the capacity to support further development of this type of role. The training of radiographers for extended roles also requires radiologist time, which is at a premium. Furthermore, in order to

get the depth of knowledge required for extended role reporting, radiographers need to spend more time in the particular specialty for which they are training. This reduces the potential to rotate staff through the teams, an approach which is recognised as good professional practice.

43 The Health Board has invested in a number of radiographers and sonographers who are trained to carry out reporting of plain film x-ray and other images (Exhibit 12)

Exhibit 12: numbers of extended role radiographers and sonographers employed in the Health Board, by hospital site

Table showing that extended role radiographers and sonographers, for plain x-ray and sonographic images, are present at each of the main Health Board hospital sites.

	Radiographers (reporting plain film x-rays)	Sonographers (reporting other images, except where stated)
Princess of Wales	2	8
Neath Port Talbot	2	(1 plain film x-ray) 8 other images
Singleton	1	10
Morriston	3	8

Source: Wales Audit Office, Heal Source: Wales Audit Office, **Health Board Survey**

44 Our review found that typically, extended practice radiographers make use of the skills for which they have received training. In MHDU, the use of extended radiographer roles significantly contributed to reducing a recent plain film x-ray reporting backlog delay, from three months to around two days.

45 Managers recognise the scope for greater use of extended role radiographers in future, such as in plain film x-ray, appendicular (the limbs and their supporting skeletal framework) work and also for abdominal imaging. However, as mentioned above, a lack of the necessary supervisory capacity limits further progress in this area. Also, while all existing extended practice reporting radiographers hold the necessary diploma, there is little audit of this aspect of their work.

46 Exhibit 13 shows that between April 2015 and March 2016 the percentage of scans reported by radiologists, radiographers and other staff was largely consistent across the Health Board, and with the rest of Wales. However, the number of US scans reported by radiographers at Morriston Hospital was significantly lower than elsewhere. Subsequent to completing our survey, the Health Board informed us of a slight error in their MRI reporting figures at NPTH. They should have indicated 95% radiologist reporting and 2% radiographer reporting. We have left the exhibit unchanged as the corrected figures have only a very minimal impact on the Wales average.

Exhibit 13: percentage of scans reported by radiologists, radiographers and other staff between 1 April 2015 and 31 March 2016

Table showing that the percentage of scans reported by Health Board radiologists, radiographers and other staff is broadly in line with the rest of Wales, although significantly fewer US scans are reported on by radiographers at Morriston Hospital than elsewhere in the Health Board or in Wales as a whole.

		% of scans reported by		
		Radiologist	Radiographer[1]	Others[2]
CT	Morriston Hospital	100%	0%	0%
	Neath Port Talbot Hospital	100%	0%	0%
	Princess of Wales Hospital	100%	0%	0%
	Singleton Hospital	100%	0%	0%
	Abertawe Bro Morgannwg University Health Board	100%	0%	0%
	Wales	98%	0%	2%
MRI	Morriston Hospital	99%	0%	1%
	Neath Port Talbot Hospital	100%	0%	0%
	Princess of Wales Hospital	100%	0%	0%
	Singleton Hospital	100%	0%	0%
	Abertawe Bro Morgannwg University Health Board	100%	0%	0%
	Wales	98%	1%	1%
Plain x-ray	Morriston Hospital	55%	18%	28%
	Neath Port Talbot Hospital	51%	38%	10%
	Princess of Wales Hospital	64%	23%	13%
	Singleton Hospital	93%	3%	4%
	Abertawe Bro Morgannwg University Health Board	62%	21%	17%
	Wales	63%	23%	14%
US	Morriston Hospital	46%	54%	0%
	Neath Port Talbot Hospital	21%	79%	0%
	Princess of Wales Hospital	29%	71%	0%
	Singleton Hospital	18%	82%	0%
	Abertawe Bro Morgannwg University Health Board	26%	74%	0%
	Wales	26%	71%	3%

[1] Radiographers includes ultrasonographers and medical physics technicians.

[2] Others category also includes auto-reported and non-reported images. (Auto-reporting is performed by the referring clinician rather than the radiology team.)

Source: Wales Audit Office, **Health Board Survey**

47 Constraints on the availability of radiologists led to the introduction of a national contract to provide extra, outsourced radiology in November 2014. The contract, awarded to Radiology Reporting Online Limited (RROL), was to provide outsourced reporting capacity across Wales, initially for two years, with an option to extend the contract for an additional year. The contract value across Wales was for £1.5 million (excluding VAT) for both years. But, increasing demand, particularly in CT and MRI reporting, meant that usage has been significantly in excess of the predicted levels. The NIPB has estimated that the actual spend will be almost double the original contract value.

48 While MHDU only outsources reporting of urgent CT head scans between 11pm and 8pm, POWHDU outsources reporting of all scans during this period. It also outsources some reporting during core hours because there is no consultant cover for some CT and MRI sessions. Some radiology consultants at MHDU would like to outsource more reporting, to reduce the pressure of workload on them, but there is no plan to do that.

49 Radiology managers at MHDU and POWHDU record and report the number of outsourced reports. This is done separately because the service in each unit is billed separately for use of the contract. The response time for outsourced reporting is considered to be good. Any clinical issues which arise may be subject to a complaints procedure, and discrepancies are recorded and reported to RROL as part of internal arrangements. RROL provides a client report each month, covering key aspects of service provision, and will include feedback to the Health Board on any issues which have arisen.

Both units have their own programme of clinical audit and some joint audits take place each year, although reporting quality is seldom peer reviewed

50 Radiology services must ensure that clinical performance always meets the appropriate standards for patient treatment and care. They need to comply with the National Diagnostic Imaging Framework (NDIF). The NDIF draws together a wide range of standards that apply and have relevance to radiology, such as waiting times targets, Healthcare Standards for Wales, and national delivery plans for specific conditions.

51 Radiology departments need to monitor clinical performance to ensure compliance with standards and maintain a clear programme of clinical audit. The Royal College of Radiologists' **Good Practice Guide for Clinical Radiologists** sets out good practice in relation to the design and delivery of clinical audit. This includes AuditLive, a tool which sets out a collection of audit templates, providing a framework identifying best practice in key stages of the audit cycle, covering over 100 radiology topics.

52 There is a regular programme of radiology clinical audit in both MHDU and POWHDU, and representatives of all clinical staff groups attend. The programme and meetings are balanced in content, and also consider and action any relevant IR(ME)R audit findings. Although there are separate clinical audit programmes in

place, the two services hold joint audits three times a year. Managers monitor and review plain film x-ray reporting turnaround times on a fortnightly basis. Ongoing audit of in hours and out of hours referrals can help identify issues with particular referrers and types of referral. Superintendent radiographers told us that this kind of audit is not routinely carried out.

53 We were told that peer review of the quality of reporting is only occasionally carried out. With the emphasis on achieving the eight-week reporting time target, there has been less emphasis on this kind of performance evaluation, even though radiographers are meant to audit 10% of all reports. The results of any audit work should be considered in the multidisciplinary team, and also at discrepancy meetings. Managers recognise that more needs to be done in this area, but there is no clear plan to address the situation.

Staff are encouraged to report complaints and incidents, and patient feedback mechanisms have improved, while some environment issues may affect patient experience

54 Radiology services must ensure that their practices are safe. For example, patients should always be offered appropriate radiological techniques which balance any inherent risks with the potential benefits from diagnosis and treatment. The service should ensure that patients receive the correct radiation dose, and staff should be monitored and protected so that they are not exposed to dangerous doses of radiation in the course of their work. Where errors or incidents are identified, health boards should act decisively and openly to learn lessons and prevent such incidents reoccurring.

55 There are monthly radiology clinical governance meetings for POWHDU and MHDU. They are led by the respective radiology service manager and clinical director, and attended by superintendent radiographers. The meetings use DATIX to look at records, incidents and complaints. MHDU holds a quarterly meeting in place of the local audit meeting, to examine any discrepancies arising during that period. In POWHDU, discrepancies are examined as part of each clinical governance meeting. In addition, joint radiology clinical governance meetings take place between the two radiology services twice a year. Both use the RCR Standards for Learning from Discrepancies.

56 Staff commented that they are encouraged to report incidents and errors. They also told us that there are good processes for learning from incidents and errors. Although there are mostly minor learning points, they are noted in the minutes of clinical governance meetings for dissemination to radiology teams. If any significant incidents occur, they are recorded as risks, and actions are drawn up, which are then signed off by the relevant Health Board director. Reminders are sent to those responsible for actions, to ensure that they are addressed.

57 In 2015, there were 96 reported incidents in diagnostic radiology departments across the Health Board, of which six were classed as moderate severity, and the rest classed as either low severity or causing no harm.

58 Radiology staff must ensure they protect patients and staff members from the risks of radiation. The Ionising Radiation (Medical Exposure) Regulations 2000

(IR(ME)R), and subsequent amendment regulations in 2006 and 2011, provides a set of regulations for medical staff referring patients to radiology, those justifying the examination and those operating the equipment. Healthcare Inspectorate Wales (HIW) is responsible for monitoring compliance against IRMER. There have been two HIW inspections of IR(ME)R at the Health Board since 2014. An inspection of the radiology department at Princess of Wales Hospital in August 2014 provided assurance that it was broadly compliant with IR(ME)R. The report highlighted areas of good practice and some areas for improvement. The areas for improvement subsequently became part of a local action plan, which was followed up by the department. An inspection at Singleton Hospital in November 2016 found six breaches of the regulations, which required immediate action. The inspection team were content that, despite the breaches, at the time of their visit they observed safe and effective practices.

59 Feedback from patients is a vital source of information for radiology services to understand and improve patient experience. Managers referred to the Health Board's Friends and Family scheme, as having a positive impact on the management of the patient experience in radiology. They also said that Patient Advice Liaison Service is very active in reporting and resolving issues in a proactive way, helping to prevent unnecessary escalation. There is a programme of patient surveys through the year, as part of the national All Wales Survey. Each month, patients from a different parts of the two radiology services are surveyed for their views on areas such as communication, privacy, dignity and cleanliness.

60 In POWHDU, patient experience is evaluated for those receiving CT, US, or MSK imaging. POWHDU reported carrying out patient satisfaction surveys of patients accessing their walk-in service, although there had been a low response rate. Radiology staff characterised the amount of patient feedback they receive as being limited. A relatively small number of compliments and complaints were received by radiology services across the Health Board in 2015-16. However, whilst patients may generally make a small number of complaints, it does not necessarily demonstrate that there is little to do to improve patient experience of aspects of service such as referral processes, imaging procedures, treatment, facilities, and staff attitude.

61 Radiographers we spoke to referred to various issues that have an impact on patient experience. At MHDU these included:

- poor inpatient facilities at Singleton Hospital;
- outpatient clinic rooms located on a thoroughfare at Singleton Hospital; and
- no patient waiting areas in some areas.

62 At POWHDU, we heard that there are some environmental issues that have an impact on patient experience, including:

- insufficient space to accommodate trolleys in some areas, which means that patients have to wait in thoroughfares;
- MRI and CT waiting areas are cramped, and can mean that there is standing room only on busy days;
- cramped ultrasound facilities inhibit patient flow; and

- a lack of separate inpatients and outpatients areas for CT scanning.

63 The Imaging Services Accreditation Scheme (ISAS) is a patient-focused accreditation scheme that helps imaging services to manage the quality of their services and make continuous improvements. In Wales, the introduction of ISAS is being overseen by the NIPB. However, there is recognition that progress at individual health bodies has been limited by a lack of staff resources to enable coordination of the work associated with the accreditation process. The Health Board has not made any significant progress in adopting the ISAS framework to date, for this reason.

Increasing demand is largely beyond local control, and while productivity is above average there are significant workforce challenges, although there is potential to improve booking arrangements and to further optimise weekend working

The major factors driving up demand for radiological services are largely beyond the Health Board's control

64 The increasing role of radiology in clinical care has led to growing demand for radiological examinations, in particular for CT and MRI scans. Whilst figures are not available for Wales, the most recent data available for England shows that there was a 42% increase in the number of radiology examinations undertaken per year between 2003 (28.8 million scans) and 2014 (40.9 million scans)[15]. The Royal College of Radiologists has predicted that by 2022 the number of radiological examinations carried out in England will be around 62 million[16] per year driven by further innovation and demographic growth.

65 As well as the number of scans undertaken annually increasing, scans are also becoming more complex. The biggest percentage rise in volume for radiological examinations has been for CT and MRI scans as they play an increasing role in the early diagnosis of many diseases. The Royal College of Radiologists predicts that the biggest percentage increase in examinations up to 2022 is expected to be for MRI scans (from 2.7 million scans per year in 2014 to 7.8 million in 2022) and CT scans (5.2 million scans per year in 2014 to 12.3 million in 2022)[17]. MRI and CT scans are complex data examinations, which generally include multiple images,

[15] **Annual Imaging and Radiodiagnostics Data**, NHS England, 2014

[16] Royal College of Radiologists, **Information submitted to Health Education England workforce planning and education commission round 2015-16**

[17] Royal College of Radiologists, **Information submitted to Health Education England workforce planning and education commission round 2015-16**

and therefore, per patient examination, are more labour-intensive for radiologists interpreting images than less-complex scan types, such as plain x-ray scans.

66 Those we spoke to in the Health Board highlighted a number of factors contributing to an increase in demand and knock-on effects, for example:

- external clinical guidelines and pathways – whilst improving standards they drive up demand for imaging; and
- advances in radiological techniques – technological and clinical advances improve options and outcomes for patients, but add further pressure onto radiology services.

67 These factors are generally beyond the control of the radiology services in the Health Board. However, some regional radiology initiatives are being discussed to help manage demand for particular service aspects, such as a diagnostic hub model based at Cwm Taf Health Board.

68 Some local factors also serve to drive up demand either in the short-term or long-term, and could be controlled by the Health Board. They include:

- waiting list initiatives in other specialities – without advance consultation with radiology, they add pressure onto already stretched radiology resources;
- small incremental additions in the numbers on outpatient lists – this leads to a cumulative increase in pressure on radiology services overall, yet they are difficult to plan for because they are small.

The Health Board relies on national referral guidelines but does not have an electronic request system, and while the quality of radiologist advice is good, it is not always easily accessible

69 GPs and consultants refer patients to radiology. Ensuring that patients are referred for the most appropriate diagnostic investigation depends on clear guidance and standards. Guidance should be based on the Royal College of Radiologists' iRefer [18] tool and support medical professionals referring patients to the service to select the most appropriate imaging investigation(s) or intervention for a given diagnostic or imaging problem. Each inappropriate investigative image performed is, in effect, an appointment slot wasted which adversely affects the service's ability to meet NHS waiting times targets and patient need in a timely way.

70 The Health Board's local plain film request guidance document is sent to all GPs. The document clearly sets out the variations in the plain film x-ray services provided across the Health Board. It sets out the type of information required in a request, and is broadly the same as in iRefer guidelines. It also sets out how to make urgent requests. It was not known whether referrers had been involved in their development. The guidance indicates that if there is doubt as to whether an investigation is required, or which investigation is best, the case can be discussed with a consultant radiologist. It also indicates that it is acceptable for referrers to

[18] iRefer is a radiological investigation guidelines tool from The Royal College of Radiologists.

provide details of the clinical problem and to leave the decision as to the appropriate investigation to the consultant radiologist.

71 All other guidance is in the form of the national guidelines contained in ‘iRefer: Making the best use of clinical radiology’. These are available through a link on the intranet, although they are not clearly signposted for clinicians by the radiology service.

72 There is a standard template for making referrals to the radiology service, and a standard MRI referral form. These are used across the Health Board. They require details of the type of imaging or the area to be imaged, a summary of clinical details, and should include details that relate to the safety of the patient during scans.

73 Consultants said that in hospital settings, the quality of advice from radiologists is generally very good and that they had confidence in it. At POWH there is no radiologist ‘consultant of the day’ to phone, so consultants must physically search radiology departments to find a radiologist for advice. However, some consultants commented that they prefer to seek out particular radiologists for specialist advice.

74 As mentioned above, the Heath Board does not have an electronic referral system, so all referrals are paper based. There was general agreement amongst those we interviewed that such a system would help to transform the service. Shortcomings and risks which GPs identified with the current arrangements include:

- the potential for referrals to get delayed or lost within the system;
- potential that GPs may not quickly see rejected paper-based referrals because they are not highlighted quickly enough when they arrive back at the practice, or that the rejected paper-based referral is addressed to a GP who is away;
- potential for mistakes in interpreting a request because of the poor quality of completion, and the need to return requests which were submitted without all of the information required; and
- the lack of a documented audit trail to help monitor and manage referrals.

75 An electronic referral system would help to mitigate these types of risks, and reduce the elapsed time between a referral being made and a scan taking place.

76 Once a referral is made a radiologist or appropriately trained radiographer will justify (review) the referral for its appropriateness and to determine whether there is a sufficient benefit to the patient. Referrals may be declined or a more appropriate alternative investigation suggested. The process of justification helps to ensure that patients do not receive unnecessary exposure to radiation and that appointment slots are not wasted.

77 The Health Board sometimes audits the appropriateness and quality of in-hours and out-of-hours referrals, but not on a routine basis. Consultants we spoke to said that generally they do not often get feedback from radiology about inappropriate or incomplete requests. Sometimes forms are returned with an indication to ‘please discuss’. Radiology managers said that feedback is given on a needs basis. GPs commented that any referrals which need to be returned to them are scanned and sent back to them by email.

78 Some radiology staff were of the view that GPs and other doctors sometimes make referrals for scans because of the pressure made upon them by patients themselves, or from a wish to be seen to be doing something to help the patient. They referred to a culture amongst GPs of blanket requests for scans, to cover all potentialities, including any imaging requirements that a consultant may require, following a wait for an outpatient appointment.

A lack of coordinated appointment booking arrangements limits the ability to further improve waiting list management, although some session capacity is protected to accommodate urgent activity

79 Health boards should ensure that all appointment slots are made use of by keeping patient did not attend rates (DNAs) to a minimum. Some health boards operate partial booking systems. This means that when the patient nears the top of the waiting list, rather than allocating the patient with a set appointment time, the patient is asked to contact the health board to choose a time and (if possible) a place to suit the patient.

80 The Health Board previously offered 'patient focussed booking' which provided some choice about the time, but not the location, of the appointment. While this was helpful where waiting lists were for more than six weeks, the process was not found to be practical for shorter waiting periods. There was insufficient time to offer a choice of appointments, so direct booking was resumed. The location at which patients are offered an appointment is based on their address, or the site to which a GP makes a referral. Radiology outpatient appointment DNA rates are not routinely monitored, although managers are confident that, from the information they see, rates are likely to be low for CT, MRI, and US.

81 Health boards must build in flexibility to the appointment timetable to ensure that emergency referrals for scans can be accommodated. Some modalities, such as MRI scans, take 30 to 40 minutes; therefore, health boards need to be able to accommodate any emergency referrals, but without leaving so many free appointment slots that it impacts negatively on the capacity to see routine referrals.

82 At POWHDU, the biggest challenge is building flexibility into the CT schedule to enable emergency referrals. Completion of the installation of a second CT scanner was imminent at the time of our fieldwork. The expectation is that this will increase flexibility considerably. Activity patterns vary a lot, and they currently try to hold less utilised slots to accommodate these variations. Commonly, the issue is not the availability of scanner time, but whether a consultant radiologist is available to complete urgent reports. Morriston Hospital has a duty radiologist, but the Princess of Wales Hospital does not.

83 Health boards should reduce unnecessary ring fencing of appointments, other than to ensure that emergency and urgent referrals can be accommodated. Ring fencing of appointments is where some or all appointments are reserved for specific sub-groups of patients (for example where referrals are grouped by the type of scan, such as gynaecological scans, breast scans etc.). This leads to the

waiting list being split into sub-lists which increases the likelihood that some patients will wait longer, as sub-lists will differ in length. Similarly, using a single central booking office for the whole health board (rather than for individual hospitals), can help patients to be allocated to the next available appointment rather than potentially waiting longer for a slot to become available at a particular hospital.

84 The Health Board does not operate a single central booking office to co-ordinate radiology appointments across the two radiology services. Similarly, neither of the two services operate their own central booking office. Appointments are made by a mix of clerical and secretarial staff. This limits opportunities for liaison between modalities across different sites to further manage waiting lists and to reduce variation in waits. Not all GPs are aware of the variations in waiting times and there is no arrangement for them to refer cases to the unit where waiting times are shortest.

85 Consideration was given by POWHDU to the introduction of a central booking office. Staff looked at the call centre arrangement at Royal Gwent Hospital, and decided that the amount of investment was prohibitive. At POWHDU, there are some pooled outpatient waiting lists, on which some patients are prioritised according to urgency. No other use of pooled waiting lists was reported.

The number of radiologists and radiographers approaching retirement is higher than the Wales average, and recruitment to fill radiology vacancies is very challenging

86 Radiologists, radiographers, nurses, technical and administrative staff work together to deliver imaging services. It is important to have the right number and skill mix of staff to deliver these services.

87 Our review found that the full-time equivalent (FTE) establishment[19] staffing level of radiologists at the Health Board increased by 5% between 2012 and 2016 (Exhibit 14), compared with 5.9% across Wales[20]. Similarly, the FTE establishment staffing level of radiographers at the Health Board has increased by 4% in the same period, compared with 10.2% across Wales. This suggests limited growth in the staffing establishment of radiographers over the last five years, although the figures for Wales do not include all health boards.

[19] The staffing establishment is the level of staff that the Health Board has determined it needs to provide services and for which funding has been made available.

[20] The Welsh percentage increase figures for radiologists and radiographers/ ultrasonographers are based on Abertawe Bro Morgannwg, Betsi Cadwaladr, Cardiff and Vale, and Hywel Dda University health boards only, as these were the only health boards that could provide data for each year between 2012 and 2016.

Exhibit 14: FTE establishment of radiology staff trend at the Health Board between 2012-2016

Table showing that there has been little growth in the numbers of radiologist and radiographers over the last five years.

	2012	2013	2014	2015	2016	Percentage change 2012–2016
Radiologists	36.8	34.0	38.1	38.1	38.5	5%
Radiographers/ ultrasonographers	167.1	165.9	167.1	169.8	173.6	4%

Source: Wales Audit Office, **Radiology Health Board Survey**. Data is provided as at 31 March each year.

88 The continued increase in demand for complex imaging (CT and MRI scans) has outstripped service capacity across the UK. The mismatch in demand and capacity has been exacerbated by difficulties recruiting radiologists and other staff such as ultrasonographers. NHS Wales has historically had difficulty attracting radiology consultants from outside Wales and traditionally loses two out of every five trainee posts to England or outside of the UK[21]. Across Wales, there is a shortfall of consultant radiologists in interventional, breast, paediatric and nuclear radiology. Across the UK, the number of unfilled consultant radiologist posts in 2015 was 9%, with 7% in Wales[22].

89 Exhibit 15 shows that vacancy levels within the radiology establishment at the Health Board are particularly high in POWHDU, at both Princess of Wales Hospital and Neath Port Talbot Hospital. In MHDU, radiologists are staffed up to the establishment.

[21] NHS Wales, **NHS Wales Health Collaborative Diagnostic Services Modernisation Programme**, December 2015

[22] The Royal College of Radiologists, **Clinical radiology UK workforce census 2015 report**, 2016

Exhibit 15: FTE radiology vacancies, 31 March 2016

Table showing that Princess of Wales Hospital and Neath Port Talbot Hospital have the highest levels of radiologist and radiographer vacancies in the Health Board.

	Number and percentage of FTE radiology establishment posts that are vacant		
	Radiologists	Radiographers/ ultrasonographers	Other radiology staff
Morriston Hospital	– (0%)	2.0 (3%)	2.0 (5%)
Neath Port Talbot Hospital	3.0 (63%)	2.8 (10%)	0.6 (4%)
Princess of Wales Hospital	2.6 (24%)	2.4 (6%)	0.3 (1%)
Singleton Hospital	0.2 (3%)	1.4 (4%)	3.8 (15%)

Source: Wales Audit Office, **Hospital Survey**

90 In POWHDU, consultant radiologist recruitment has been challenging. At the time of our work, consultant vacancies were being covered by locums. There were clear concerns amongst those we interviewed regarding the difficulty in recruiting permanent staff to fill these posts, with some recent recruitment attempts failing to identify suitable candidates.

91 While staff retention amongst radiographers and other staff was reported as generally good, the main concern we heard was that the current establishment has not increased in line with demand. Where vacancies exist, consideration is being given to re-grading the roles from the current band 5 to band 6, in order to attract candidates. However, recruitment is difficult during the period between the annual completion dates of the radiographer training scheme, and this leads to lengthy gaps before these posts can be permanently filled. Although there is a UK-wide shortage of ultra-sonographers, there is only one vacancy in the Health Board.

92 A lack of support staff adds additional pressure to the working day for radiologists. At Morriston Hospital, a team of porters is based adjacent to the main reception area. However, managers told us that the number of porters available does not match peaks and troughs in activity. Staff said that radiographers sometimes have to go to wards to collect patients which means less of their time is spent in the department. It also means that patients may have to wait in the department before someone becomes available to take them back to the ward.

93 Across Wales, the service is likely to lose many older and experienced members of its workforce to retirement in the very near future as 38% of consultant radiologists are aged 55 or over[23]. To provide a future sustainable consultant radiologist

[23] NHS Wales Workforce, Education and Development Services, **NHS workforce census data for June 2016**, 2016

workforce, NHS Wales needs to train radiologists and retain them in NHS Wales. The National Imaging Academy for Wales project is being developed in 2016-2017 to achieve this aim.

94 Fifty-one per cent of the consultant radiologists and 38% of radiographers at the Health Board are aged 50 and over and potentially within five years of retirement (Exhibit 16). Managers are hopeful that in the longer term, the introduction of the National Imaging Academy in Wales will make Wales more attractive for new radiologists, and ensure a better supply of newly qualified staff. In the meantime, they offer part-time working and flexible retirement as a means to attract and retain radiologists.

Exhibit 16: number and percentage of consultant radiologists and radiographers by age as at June 2016

Table showing that compared to the all Wales average, the Health Board has a higher percentage of radiologists aged 50 and over, and a slightly higher percentage of radiographers aged under 39.

		Age					
		Under 39	40–44	45–49	50–54	55–59	60+
Consultant radiologists[1]	Abertawe Bro Morgannwg University Health Board	7 (21%)	7 (21%)	3 (9%)	7 (21%)	6 (18%)	4 (12%)
	All Wales	29 (18%)	43 (27%)	28 (17%)	20 (12%)	20 (12%)	21 (13%)
Radiographers[2]	Abertawe Bro Morgannwg University Health Board	82 (41%)	23 (12%)	17 (9%)	33 (17%)	27 (14%)	16 (8%)
	All Wales	473 (45%)	106 (10%)	103 (10%)	170 (16%)	125 (12%)	74 (7%)

[1] NHS workforce definition: staff with consultant grade code or job role working in radiology – note this includes both diagnostic and therapeutic radiologists.

[2] NHS workforce definition: Staff bands 5–9 with a diagnostic radiography occupation code (S*F).

Source: NHS Wales Workforce, Education and Development Services, **NHS workforce census data for June 2016**, 2016

Staff carry out more examinations than the Wales average and the radiology workforce profile is just above the Wales average

95 We reviewed the numbers of FTE radiologists and radiographers in-post at each of the Health Board's main hospital sites, relative to both population and workload. Such measures provide an overall guide to the appropriateness of the number of staff to meet demand. However, these measures do not take account of the complexity of the imaging undertaken, and thus need to be treated with the appropriate caution.

96 The number of FTE consultant radiologists per 100,000 people in the UK in 2015 was 4.8 (4.8: Wales, 4.7: England, 5.4: Scotland, and 6.2: Northern Ireland)[24]. Exhibit 17 shows that the number of radiologists and radiographers relative to population and workload is just above the all-Wales average, although the Health Board receives some patients from other Health Boards. Therefore the measure based on local population needs to be treated with caution.

Exhibit 17: FTE of in-post radiologists and radiographers, per 100,000 population, June 2016

Table showing, compared to the all-Wales average, the Health Board has more radiologist and radiographers, per 100,000 population.

	In-post FTE consultant radiologists[1] per 100,000 population	In-post FTE radiographers[2] per 100,000 population
Abertawe Bro Morgannwg University Health Board	6.2	32.8
All Wales	4.8	27.2

[1] NHS workforce definition: staff with consultant grade code or job role working in radiology – note this includes both diagnostic and therapeutic radiologists.

[2] NHS workforce definition: Staff bands 5–9 with a diagnostic radiography occupation code (S*F).

Source: NHS Wales Workforce, Education and Development Services, **NHS workforce census data for June 2016**, 2016; and Welsh Government, **Local Authority Population Estimates for Wales**, 2015, accessed 20 October 2016

97 When measuring radiology activity, care is needed to ensure that comparisons are like for like. A single image may count as one unit of activity; however, where a patient receives complex or multiple images this may count as one or more units depending on the Health Board's view.

[24] The Royal College of Radiologists, **Clinical radiology UK workforce census 2015 report**, 2016

98 There is no standardised activity measurement specific to radiology in use in Wales or the UK. However, the general medical classification system – the Systematised Nomenclature of Medicine Clinical Terms (SNOMED CT[25]) – has enabled some radiology activity measurement. SNOMED CT allows clinical data to be recorded in a consistent way, as it uses a standardised set of clinical terminology and codes. NHS England is adopting SNOMED CT as the universal classification and terminology for all health organisations and for all aspects of health. However, in Wales it has only been adopted in radiology and a small number of other specialties. SNOMEDCT provides a standardised way of describing radiology examinations, and automatically applies multiplication for some activities depending on the coding applied. However, comparisons of radiology activity between radiology departments has to be treated with caution as any count of activity is reliant on organisations recording activity using SNOMED CT consistently. Currently in Wales, radiology activity is not consistently recorded which makes it difficult to provide a true comparison of activity.

99 The Health Board follows SNOMED CT rules, which indicate when multipliers should be attached to particular examination types. These multiplier rules are used when counting all radiology activity at the Health Board, although managers recognise that there can still be inconsistencies in the way the rules are applied. Sometimes more than one code may appear to be applicable, and as a result, staff may code differently for the same type of activity.

100 Exhibit 18 highlights that the number of examinations per FTE in-post radiologist is higher than for other parts of Wales, and the figures in the previous exhibit show a higher number of radiologists per 100,000 population.

[25] SNOMED CT, or SNOMED Clinical Terms, is an international, systematically organized, computer processable, collection of medical terms providing codes, terms, synonyms and definitions used in clinical documentation and reporting.

Exhibit 18: number of examinations per full-time equivalent in-post radiologist 2015-16

Table showing that the Health Board undertakes more examinations overall per full-time radiologist than in the rest of Wales.

	Number of examinations per in-post FTE radiologist		
	All examinations	CT	MRI
Abertawe Bro Morgannwg University Health Board	14,704	1,763	783
All Wales[1]	13,742	1,989	724

[1] All-Wales figures excludes Powys Teaching Health Board.

Source: NHS Wales Workforce, Education and Development Services, **NHS workforce census data for June 2016**, 2016; and Wales Audit Office, **Radiology Health Board Survey**

101 Exhibit 19 highlights that the number of examinations per FTE in-post radiographer/ultrasonographer is higher than for Wales.

Exhibit 19: number of examinations per full-time equivalent in-post radiographer/ultrasonographers 2015-16

Table showing that the number of examinations undertaken per full-time equivalent in-post radiographer/ultrasonographer is higher when compared to Wales.

	Number of examinations per in-post FTE radiographer/ultrasonographer			
	All examinations	CT	MRI	US
Abertawe Bro Morgannwg University Health Board	3,097	371	165	620
All Wales[1]	2,465	357	130	523

[1] All-Wales figures exclude Powys Teaching Health Board.

Source: NHS Wales Workforce, Education and Development Services, **NHS workforce census data for June 2016**, 2016; and Wales Audit Office, **Radiology Health Board Survey**

102 The NHS Benchmarking Network (NHSBN) annual radiology survey compares around 80 radiology departments including large teaching hospitals each year. The audit uses various measures to compare staffing with establishment, other than staff in-post, as the workforce measure. For example, bed days and outpatient

activity are used as the denominator. The Health Board should draw on various workforce measures, including NHS benchmarking data to determine how the radiology staffing compares to inform their workforce planning.

Radiologists and sonographers are less likely to be compliant with statutory and mandatory training than other staff, and staffing constraints hinder training opportunities

103 Annual appraisals of staff performance, and continuing professional development reviews are an important part of ensuring that the quality of radiology services is maintained and that staff training needs are properly addressed.

104 We found that all radiologists had received an appraisal and personal development plan in 2015-16, and 75 per cent of radiographers and other staff had been through the same processes[26].

105 The Health Board does keep a register of all registered practitioners and operators engaged to carry out medical exposures, including the date the training was completed and the nature of the training undertaken.

106 While staff said that the provision of initial training for those who are new to their roles is satisfactory, workload constraints make it difficult for staff to access protected time for continuing professional development training. The data shows that radiologists and 'other radiology department staff' are more likely to be compliant with the statutory and mandatory training (as set out in the UK Core Skills and Training Framework) than radiographers and ultrasonographers (Exhibit 20). Constraints on attendance are similar to those mentioned already for other types of training.

[26] 100% of radiologists, 75% of radiographers/ultrasonographers and other radiology staff received an appraisal of their performance; and 100% of radiologists, 75% of radiographers/ultrasonographers and other radiology staff had a personal development plan.

Exhibit 20: percentage of staff compliant with statutory and mandatory training modules, as at July 2016

Table showing that radiologists and 'other radiology department staff' are more likely to be compliant with statutory and mandatory training modules than radiographers and ultra-sonographers.

	Radiologists	Radiographers/ ultrasonographers	Other radiology department staff
Equality, Diversity and Human Rights	87%	62%	82%
Health, Safety and Welfare	data not provided	68%	67%
Fire Safety	83%	67%	88%
Infection Prevention and Control	65%	66%	91%
Moving and Handling	61%	74%	89%
Safeguarding Adults	70%	55%	90%
Safeguarding Children	91%	78%	89%
Resuscitation	78%	55%	69%
Information Governance	70%	84%	96%

Source: Wales Audit Office, Radiology Health Board Survey

The number of scanners is broadly in line with the Wales average, although some have shorter operating hours, and whilst there is potential to further optimise weekend usage, this may cost the service more

107 The UK has a low number of scanners compared with other OECD countries. Across the UK there are 8 CT scanners and 7 MRI scanners per million population; Germany has 19 CT scanners and 11 MRI scanners, Spain has 17 CT scanners and 15 MRI scanners, and France has 14 CT scanners and 9 MRI scanners per million population[27]. Data are not available for the separate countries in the UK.

108 Exhibit 21 shows the number of scanners per million population for Wales in 2016. The Health Board has a higher number of scanners per million population when compared to Wales and the UK. However, when, compared to OEDC countries it has significantly fewer CT and MRI scanners.

[27] Organisation for Economic Cooperation and Development, **OECD Health Statistics 2014 – Frequently Requested Data**, 2014

Exhibit 21: number of CT, MRI and US scanners per million[1] population as at September 2016

Table showing the Health Board has more scanners per million population, compared to the all Wales average.

	CT	MRI	US
Abertawe Bro Morgannwg University Health Board	11.4	7.6	51.4
All Wales[2]	10.1	7.5	46.1

[1] Exhibit expressed as scanners per million population to allow comparison with other countries

[2] The All Wales figure is based on five health boards

Source: Wales Audit Office, **Radiology Equipment Age Survey**; and Welsh Government, **Local Authority Population Estimates for Wales**, 2015, accessed 20 October 2016

109 One way for health boards to ensure that patients waiting for diagnostic radiography scans wait as short a time as possible is to maximise the opening hours. The longer the opening hours, the more patients can be seen; however, there are extra costs associated with longer operating hours. Operating longer results in increased staff costs and scanning equipment lifespans are shortened. This factor has to be considered when assessing the potential for extending operating hours.

110 Most recent data from 2014 (Exhibit 22) shows that on average, the Health Board operated their scanners for between 7 and 10 hours on week days, but made much less use of scanners on weekends.

Exhibit 22: percentage usage of CT, MRI and US scanners, 2014

Table showing that compared to the Wales average, the Health Board has a higher percentage of usage for CT scanners, and a lower percentage of use for MRI and US scanners. Average usage of CT and MRI scanners at weekends is limited at weekends, and US scanners are not used at all.

Type of scanner	Average number of operating hours per scanner on each day		Percentage usage of equipment[1]	
	Monday to Friday	Saturday to Sunday	Health Board	Wales average
CT	8.9	1.6	56%	52%
MRI	9.9	0.6	59%	66%
US	7.4	0.0	44%	46%

[1] Based on the planned operating hours as a percentage of potential operating hours (seven days a week and 12 hours a day).

Source: **NHS Wales All-Wales Gantry Usage/Capacity Report**, November 2015. Data based on the operating hours in 2014.

111 If hospitals at the Health Board were operating 12 hours a day and seven days a week, we estimate that, as a minimum, it may be possible to undertake an extra 245 CT scans, extra 90 MRI scans and an extra 2,540 US scans a week[28].

While management and accountability arrangements are clear, planning is weak, there needs to be a greater Health Board focus on delivery of radiology services, and some older equipment presents significant risks

Health Board radiology services lack a joint strategic plan, and there are no detailed annual operational plans or financial plans, although there is a workforce plan

112 The Health Board should have a clear strategic plan that sets out how it will meet current and future demand for radiology services. The plan should set out how the Health Board will meet current and future demand for radiology services.

[28] The time a scan takes depends on the nature of the scan required. CT scans can take between 10 and 45 minutes, MRI scans between 15 and 90 minutes, and US scans between 15 and 30 minutes. Therefore our minimum estimate is based on a CT scan length of 45 minutes, a MRI scan of 90 minutes, and a US scan of 30 minutes.

113 The POWHDU and MHDU radiology services each have an Integrated Medium Term Plan (IMTP) which serve as strategy documents for the respective services. The IMTPs cover the period April 2015 to March 2018. Each sets out a vision statement and high level statements about how that will be achieved. They go on to set out, in greater detail, the schemes that will be needed in order to move forward. While there is a common structure, the documents are almost entirely distinct in terms of their actual content. There is no strategic overview for radiology services within the Health Board.

114 There is little comparative information in the IMTPs, to help compare the two radiology services within the Health Board. There are references to the position of the Health Board in relation to other bodies, but it is difficult to draw conclusions about the relative contribution of each service to the overall picture. Also, some references to the Health Board are unclear, in that they may refer only to the service for which the IMTP has been prepared.

115 While there are some references to primary and community care, the main focus of both IMTPs is on hospital-based services. There is no specific reference to any external service changes which may have an impact on the provision of radiology services. There was no evidence to suggest that internal and external stakeholders had been engaged in the development of the IMTPs.

116 Each radiology service should have an agreed documented annual operational/ delivery plan. The plan should clearly identify service demand, the workforce and equipment capacity required to meet this demand as well as the finances available and required to deliver the service safely, efficiently and effectively. However, neither of the Health Board's radiology services have an annual operational plan nor specific financial nor workforce plans.

117 There is a consistent approach to capacity and demand modelling across the Health Board. Activity is measured in relation to theoretical capacity on a monthly basis for all modalities, using information from the respective core radiology information systems. This helps to establish any trends. In addition, work was carried out on a capacity and demand paper which was finalised in March 2016, with the intention of using it to inform future annual and longer term planning activities.

118 Radiology operational plans should be informed by service changes and developments in the wider organisation. Almost all clinical specialties rely heavily on radiology to help diagnose, treat or monitor disease or injury. Radiology staff should, therefore, be appropriately involved in any decision making on service developments that will lead to an increase to the number of patients referred for radiology imaging, such as new consultant posts, clinics and services.

119 Across Wales our review found that there was variation in the degree to which radiology teams were involved in decisions made outside of the team that impact on radiology services. As mentioned earlier, Health Board radiography managers told us that they are not always consulted about service changes or waiting list initiatives which will inevitably affect the radiology service.

Management and accountability arrangements are clear at delivery unit and executive level, although there is a need to focus on delivery of a radiology service for the Health Board as a whole, and some key joint radiology meetings no longer take place

120 Effective leadership and clear lines of accountability are vital components of any healthcare service. Radiology is a complex service which comprises radiologists, radiographers and nursing staff working together to produce and interpret images. For a health board to deliver effective radiology services, it needs clear executive leadership, a designated overarching service lead, and a clear operational and professional management structure with clear lines of accountability. It also needs to have sufficient capacity to meet service demand and need in a safe and effective way.

121 Radiology services at POWHDU and MHDU are managed separately in their respective directly managed unit arrangements. Radiology service provision at Princess of Wales Hospital and Neath Port Talbot Hospital are managed together in the East as part of the Clinical Support Services Directorate. The directorate has an overall general manager and a specific clinical director for radiology. Similarly, radiology service provision at Morriston Hospital and Singleton Hospital are managed together in the West as part of a Clinical Support Services Directorate, which is separate to the directorate by the same name in the East. It also has an overall general manager and a specific clinical director for radiology. Performance management arrangements are also distinct, as each directly managed unit reports its own performance to the Executive Board at Health Board level.

122 The two radiology service managers report to their respective directorate managers. There is a clinical director in each of the respective directorates who has responsibility for the radiology service. The directorate manager and the clinical director report to the respective unit manager and unit medical director. Executive leadership is provided by the Medical Director for medical staff, the Interim Director Therapies and Health Science for radiographers, and by the Chief Operating Officer for operational delivery.

123 Senior radiology staff commented that, overall, the new structure is a significant improvement in terms of responsiveness, when compared to the previous arrangements. They anticipate that the full implementation of the new arrangements, from September 2016, will lead to further improvements in the speed of day-to-day decision-making.

124 As discussed above, there needs to be a clear planning and delivery framework for radiology across the Health Board. Managers will need to be accountable for the development and delivery of the framework. There will also need to be clear director oversight of the joint approach, in addition to that given to the separate radiology services, to ensure the benefit for the Health Board as a whole.

125 The radiology services in POWHDU and MHDU each have their own radiology monthly communication meetings, led by the respective radiology manager and clinical director, and includes site superintendent radiographers. In the previous Health Board structure, there were joint radiology meetings across the Health

Board for business issues, clinical support, and education, but these no longer take place. There are no new arrangements to replace these meetings. However, at the time of our review, an informal meeting process was about to commence in order to examine emerging joint issues e.g. the lack of permanent radiologists at NPTH. As mentioned previously, a joint radiology clinical governance meeting continues to take place three times a year across the Health Board.

The service is not well represented on Board committees and sub-committees

126 If radiology is to have sufficient profile within the Health Board, radiology staff should have a regular presence on key Health Board committees such as the Quality and Safety Committee and the Workforce and Organisational Development Committee. Radiology should feature sufficiently often on committee agendas to help ensure wider awareness of the service and its issues.

127 Across Wales we found variation in the degree of radiology team representation on key board committees. We found that the radiology services in the Health Board are not directly represented by service managers, on any of the key Board committees. Nonetheless, managers at the services at POWHDU and at MHDU are increasingly confident that they are able to highlight issues and risks appropriately with unit managers. However, it is too early to say whether their issues and risks are being highlighted appropriately to the Board or other committees through this new structure.

Service expenditure has been close to budget in recent years, although savings targets have not been achieved and appear to be unrealistic

128 Ongoing financial monitoring is necessary for radiology services to ensure that the service is operating within budget, to anticipate potential budget overspend, and to take remedial action where necessary.

129 As mentioned above, neither of the two radiology services have specific financial plans through which to inform operational plans. Nonetheless, radiology managers actively work with members of the Health Board's finance team to regularly monitor in-year spend. Total Health Board expenditure on radiology services was just below and just above the total budget in 2014-15 and 2015-16 respectively (Exhibit 23).

Exhibit 23: radiology service budget comparison with expenditure (£ million) 2014–15 and 2015-16

Table showing that expenditure was less than the allocated budget in 2014-15, and greater than the allocated budget in 2015-16.

		2014–15	2015–16
Health Board	Budget (£ million)	£19.4	£19.5
	Expenditure (£ million)	£19.0	£19.8
	Variance	-2.1%	1.5%

Source: Wales Audit Office, **Radiology Health Board Survey**

130 The Health Board was not able to achieve its radiology CIP plan in any of the last three financial years, and was substantially off each in-year target (Exhibit 24).

Exhibit 24: CIP target versus actual cost improvement, for the financial years 2013-14, 2014-15, and 2015-16.

Table showing that the cost improvements achieved in each of the three previous financial years was substantially less than the respective CIP target.

	2013-14	2014-15	2015-16
CIP target	£1,912,206	£327,875	£371,348
Actual cost improvement	£176,422	£28,000	£8,000

Source: Wales Audit Office, **Radiology Health Board Survey**

While there is no capital allocation budget, each radiology service produces an equipment replacement programme, and some older equipment poses significant risks to patient care and service continuity

131 NHS bodies need to have comprehensive arrangements in place for the maintenance and replacement of radiology imaging equipment. Older imaging equipment has a higher risk of failure and maintenance costs increase, and the image quality declines with age. Radiology equipment more than ten years old is typically considered to no longer be state of the art and technical advances will render the equipment obsolete. The lifespan of equipment shortens with increased use.

132 The capital allocation budget in the Health Board is nil. Each radiology service maintains an equipment replacement schedule, which serves as the basis for equipment replacement prioritisation. Managers of both radiology services met with Capital Planning colleagues early in 2016 to consider the equipment replacement

priority papers they had prepared. Most major replacements necessitate that the services work together to decide how to proceed and managers said that this does happen.

133 Some equipment has to be replaced following a breakdown which cannot be repaired, or as a result of a crisis in the functionality of imaging equipment. However, we saw limited evidence of contingency planning.

134 The European Society of Radiology[29] advocates that equipment aged:

- up to five years old reflects the current state of technology, and can be upgraded;
- between six and ten years old is fit to use if properly maintained, but require replacement strategies to be in place; and
- 11 or more years old requires replacement.

135 In November 2015, NHS Wales anticipated that 87% of imaging department scanners would require replacement by 2017[30]. Exhibit 25 shows that, depending on whether there has been high, medium or low use, some of the Health Board's CT scanners have reached, or are reaching, the end of their life expectancy.

Exhibit 25: age of CT, MRI and US equipment at the Health Board as at September 2016

Table showing that based on high and low usage, a number of the Health Board's CT scanners have or are reaching the end of equipment life expectancy.

		CT	MRI	US
Age of scanners at the Health Board (years)[1]	Morriston Hospital	5, 8	5	3 (average of 7 scanners)
	Neath Port Talbot Hospital	8	5	2 (average of 5 scanners)
	Princess of Wales Hospital	1, 8	5	2 (average of 6 scanners)
	Singleton Hospital	5	9	4 (average of 9 scanners)
Average device life expectancy based on utilisation (years)	High	8	8	7
	Mid	10	10	8
	Low	12	12	9

[1] Where there are more than five scanners, the average age has been provided.

Source: Wales Audit Office, **Radiology Equipment Age Survey**; and European Society of Radiology, **Renewal of Radiological Equipment**, September 2014 (average device life expectancy)

[29] European Society of Radiology, **Renewal of Radiological Equipment**, September 2014

[30] Diagnostic Service Programme NHS Wales, **All Wales Gantry (MRI, CT, Gamma Camera and Ultrasound) Usage/Capacity**, November 2015

136 At MHDU, the equipment replacement capital cost is £11,445,000 excluding VAT. In monetary terms, £5,165,000 of equipment currently exceeds the life span set out by the Royal College of Radiologists. The MHDU radiology service is only 55%compliant against these targets. Radiology equipment at POWHDU has a replacement capital cost of £10,500,000 excluding VAT. In monetary terms £6,390,000 of equipment exceeds the life span set out by the Royal College of Radiologists, which means the POWHDU radiology service is only 39% compliant against this target. There is an awareness that failure to comply with this target increases clinical risk caused by images of sub-standard diagnostic quality as well as increased potential for harm from high radiation doses. Radiology services have also identified that increased equipment failure will lead to significant risks to service resilience across the organisation. For example, there is only one fourteen year old digital subtraction angiography unit supporting vascular imaging at Morriston Hospital, which in turn supports the vascular network for Mid and West Wales.

137 An SBAR has been prepared for a mammography scanner in Singleton, and has been discussed with unit managers. The existing scanner is nine years old, and not as effective as the newer scanner in the NPTH. The difference in the effectiveness of the equipment, and the potential risk that arises with regard to accuracy of imaging, is logged as one of the highest service risks in the unit's radiology risk register. Consideration is being given as to whether or not to centralise the service in the NPTH. However, there are a number of significant challenges that would need to be addressed before that could be achieved.

The lack of a clear timeframe for a single core radiology system limits the development of more joined up radiology services

138 Having effective IT systems plays a central role in delivering efficient radiology services. In Wales, the Radiology Information System (RADIS) is a national system created and run by NHS Wales Informatics Service. It is used by all health boards. RADIS supports the scheduling of radiology investigations, provides a clinical record of scans received by patients and allows health boards to generate reports and statistics on performance. Other systems link to RADIS to provide additional functionality; these different systems must integrate well with each other to ensure that information easily transfers and updates between systems.

139 Our review found that across Wales, health boards have mixed views on RADIS. Some health boards told us they felt that RADIS is adequate in terms of patient scheduling, clinical reporting and management reporting. However, some health boards expressed concerns that RADIS does not integrate with other systems in use by health boards, and also about the quality of the management reporting, limitations of the clinical reporting and management reporting functions.

140 Electronic requesting systems can enable clinicians referring patients for diagnostic imaging to request and receive updates and the outcomes of radiology requests quickly. In Wales, the functionality of request software is generally limited to providing a template for a request which then has to be emailed to the radiology service.

141 All health boards use Picture Archiving and Communications Systems (PACS). PACS software acquires and archives radiology images electronically, and enables the safe distribution of the image with other health professionals[31]. The report of the image (stored on RADIS) and the scan image (stored on PACS) together comprise the clinical record of the image. When reporting on images, radiologists can choose to use voice-activated dictation systems to record their report.

142 Senior staff told us that the lack of a common core radiology system is a key issue. The Health Board operates two radiology IT systems. POWHDU operates RADIS, and MHDU operates Radcentre. Radiology staff we spoke to regard this situation as unhelpful as it reinforces the separation of services which might otherwise communicate with each other more effectively. In addition, promised developments to RADIS by NWIS are said to have been very slow to be introduced.

143 Both systems are functional for the provision of waiting list information, but less so with regard to supporting business planning. Generating reports can be time consuming as the information which is often needed is not part of a standard suite of reports. Whilst there is some scheduling functionality on both systems, neither system is used to manage scheduling as this is labour intensive. Both systems produce clinical reports which are considered fit for purpose and both allow for prescriptive design of reports. Radcentre can generate a range of reports including user specific ones. RADIS can be used to generate reports but greater input is required from NWIS team initially. Neither system is used for resource allocation.

144 RADIS highlights unreported images, and POWHDU runs a monthly unreported images report. There are also 'red star' reports which highlight unexpected abnormal serious results for fast tracking mechanisms. However, these reports have to be faxed as they are not available in a format which can be emailed. Radcentre does not highlight unreported images. MHDU use PACS to obtain reports on unreported images.

145 As mentioned above, the Health Board does not use an electronic requests system. Many radiology staff think that such a system would make a substantial difference to the way in which services can be provided.

146 The radiology teams are generally satisfied with Fujifilm PACS, and are able to access some images out-of-hours from home for a full range of modalities. However, the transition from Agfa PACS to Fujifilm PACS has been complex on Radcentre because of difficulties in achieving data migration. Radiologists supporting out of hours services in Morriston and Singleton have lap top access to PACS and Radcentre. This link can be used for image review and evaluation. Where out of hours work is outsourced the independent service provider has full access to the hospital PACS and Radcentre systems. Service users within the same hospital and in other Health Board hospitals can access images stored on PACS, whereas GPs cannot. NHS staff outside the Health Board are able to

[31] PACS is provided by a third party, Fujifilm. Fujifilm supplies hardware and software to health boards for the provision of PACS services, including voice recognition and full disaster recovery solutions. Each health board provides the necessary infrastructure to run those services, including networks and server space.

access some images on PACS. Access to images from other health boards is limited. There is widespread use of voice activated software within the core systems, and other software. The Health Board's aim is to migrate to single radiology information systems when the legacy systems are replaced. These will be Fujifilm PACS and RADIS, once available. The consolidation of PACS will be completed by the end of 2017 however there is no date for NHDU migrating to RADIS as yet.

Radiology performance is regularly reviewed at service level and through corporate performance team meetings, although there is more limited reporting of radiology performance at unit level

147 Effective monitoring and scrutiny of radiology service performance is important in assessing if the service is supporting delivery of the organisational goals and objectives, and identifying the need to take remedial action. Health boards should use performance data and audit results to monitor and evaluate outcomes delivery and the performance of the radiology departments. Performance monitoring and review should take place at all levels within the organisation, from the operational level up to board level. Performance should be analysed, assessed and monitored at an operational level and reported to and scrutinised by relevant health board committees and the board.

148 Benchmarking enables health organisations to improve performance through comparison with other similar organisations. One source of comparative data that heath boards have access to is NHSBN radiology data. The NHSBN collects and analyses radiology data from health organisations across the UK annually and publishes an analysis of its findings. All health boards and trusts in Wales are members of the NHSBN but not all participate in each audit.[32]

149 The Health Board routinely submits radiology data each year to the NHSBN for comparison with other Welsh and English radiology services. In addition to receiving the benchmarking data, the NHSBN is invited to present their radiology findings to the Health Board each year. Radiology service managers indicated that they use the data to inform planning.

150 Both radiology services are included in a performance dashboard for their respective delivery unit. This is routinely reported to the Board as part of assurance arrangements. It includes a range of standard indicators, including a number which have a traffic light status (i.e. red, yellow, green) attached. The main components which are relevant for radiology are reported as part of a combined figure for the delivery unit e.g. appraisals, absence, mandatory training, etc. Diagnostic waiting times are specified by service, and specific figures for radiology are listed. The radiology services produce similar service level dashboards.

151 Radiology performance is considered on a quarterly basis as part of performance team meeting arrangements, where accountability is to the Chief Operating Officer. Performance data is also shared with staff and reviewed during superintendent

[32] Hywel Dda University Health Board and Powys Teaching Health Board do not participate or provide data to the radiology module.

radiologist meetings on a routine basis. There is more limited reporting of performance data at unit level. MHDU holds monthly Clinical Support Services Directorate meetings and quarterly unit meetings, during which performance data is discussed. The services produce monthly exception reports which include issues that relate to performance.

Appendix 1

Audit approach

We carried out a number of audit activities between June and August 2016. Details of these are set out below.

Exhibit 26: audit approach

Table outlining audit approach used for this review.

Method	Detail
Information and data collection	We used health-board-level and hospital-site-level survey forms to capture data and information on radiology services, which were completed by the Health Board. We also utilised data and information from a number of other sources, including: • NHS Benchmarking Network radiology 2015 and 2016 data collection (data collection period 2 May to 8 July 2016); • The All Wales Equipment Capacity Report, NHS Wales Health Collaborative (December 2015); • Stats Wales: Radiology Diagnostic Waiting Times • National Reporting and Learning System (NRLS) data: Patient safety incidents; and • HIW IH(ME)R (Ionising Radiation (Medical Exposure) Regulations): diagnostic incidents by Health Board between 2010 and 2016

Method	Detail
Document request	We requested and reviewed documents from the Health Board including: • terms of reference and membership of the Health Board's main radiology group, together with a sample of minutes from the previous meetings; • examples of condition pathway documents (for stroke, cancer or heart disease) illustrating radiology service provision requirements; • relevant radiology papers to the board and committees along with operational papers including safety reports; • examples of the Health Board's main radiology service performance reports or performance scorecards from the past six months; • the most recent financial report showing progress towards the savings/cost improvement plan; • the radiology equipment replacement plan; • the radiology risk register; • guidance provided to hospital referrers and GPs on expectations when referring patients to the service; and • examples of any work carried out over the past two years to measure radiology patient experience.
Interviews	We interviewed a small number of staff including: • radiology service managers at Morriston Hospital Delivery Unit and Princess of Wales Hospital Delivery Unit; • radiology clinical directors at Morriston Hospital Delivery Unit and Princess of Wales Hospital Delivery Unit; • 3 emergency department consultants; • 2 consultant surgeons; • 2 consultant physicians; • 2 GP area cluster leads; • a group of superintendent radiographers at Morriston Hospital Delivery Unit; and • operational superintendent radiographer, Princess of Wales Hospital.

Appendix 2

The Health Board's management response to the recommendations

The following table sets out the recommendations from the report and the management response.

Exhibit 27: The Health Board's management response to the recommendations

Ref	Recommendation	Intended outcome/ benefit	High priority (✓)	Accepted	Management response	Completion date	Responsible officer
R1	The two radiology services should establish a joint action plan, by mid-2017, parts of which may need to be achieved as resources become available, to ensure that peer review of reporting quality is carried out in line with the requirements of professional standards.	**Increased frequency of, and individual compliance with, peer review of reporting quality, in line with the requirements of professional standards.**	✓	✓	Action plan developed to identify requirements to develop and expand peer review of reporting. 4 Phase approach for Radiologist, Sonographer and Radiographer reporting 1 Each site to nominate lead to develop action plan (June 17) 2 Each site to scope peer review and quantify current practise 3 Sites to agree level of review 4 Gap analysis to address shortfall/constraints to be presented to Executive	Phased approach 1. June 2017 2. Sept 2017 3. Oct 2017 4. Dec 2017	Radiology Clinical Leads

Ref	Recommendation	Intended outcome/ benefit	High priority (✓)	Accepted	Management response	Completion date	Responsible officer
R2	The two radiology services should set out a joint plan to identify ways in which they can reinforce the need for other services to communicate with them about initiatives and changes that will affect the provision of radiology services	**An ongoing focus on the importance of being informed of service developments and changes in other parts of the Health Board.**	✓	✓	Develop an action plan including communication plan to address short list of category of changes which will impact on radiology and how these can be addressed. Identification of 4 key categories. 5 New or replacement equipment. (Advice to assess impact now included in business case process – **complete**) 6 New services consultants and additional clinics across specialties 7 Policy and Guidance Changes 8 Workforce constraints within radiology	October 2017	Radiology Service Managers
R3	The two radiology services should record radiology outpatient appointment DNA rates and include them in radiology service performance reports.	**Routine demonstration of the effectiveness of radiology service performance on DNA rates.**		✓	DNA rates are being recorded and reported as KPIs via Radiology Dashboard to Directorate meeting	Complete June 2017	Radiology Service Managers

Ref	Recommendation	Intended outcome/ benefit	High priority (✓)	Accepted	Management response	Completion date	Responsible officer
R4	The two radiology services should jointly review and address the coordination of radiology appointments within specialties and across sites, to help distribute demand effectively and to reduce variations in waiting times.	**A more consistent approach to managing appointments and demand across the Health Board's radiology service as a whole.**		✓	It is impossible to have a single booking system with 2 different Radiology Information Systems in HB. Both sites are currently meeting diagnostic targets. Successful recruitment of staff will allow extending working day for MRI at PWH. If successful will be in place October 2017 9 A single Radiology Information system to be used across the Health Board. RadIS was scheduled to be installed and working in Swansea by 1st April 2018. This has been delayed. Assess possibility of Central booking when compatible systems in place. This will need careful consideration, consultation and planning as could involve increased patient travel. 10 Extend the working day in MRI at PWH if recruitment is successful. Staff the two CT scanners at PWH (dependent on recruitment).	 October 2018 October 2017	Radiology Service Managers
R5	The Health Board should set out capital replacement plans, and contingency plans, for equipment which poses a particular risk to service continuity and patient care.	**Greater clarity about, and mitigation of the risks arising from aging equipment.**		✓	Equipment List updated to include expected replacement dates and shared with Planning team. Risks to be updated on departmental and organisational Risk Registers Contingency plans to be developed	Complete June 2017 August 2017 October 2017	Service Managers Director of Therapies and Health Science

Ref	Recommendation	Intended outcome/ benefit	High priority (✓)	Accepted	Management response	Completion date	Responsible officer
R6	The two radiology services should jointly examine the costs and benefits of increased scanning hours during the week and at weekends, and if appropriate, develop a business case for an increase in scanning hours.	**A clear understanding of the costs and benefits of extending scanning hours. If beneficial, the provision of a clear case as to how that should be done.**		✓	Capacity and Demand scoping paper and analysis developed including costs. Further work scheduled into work plan 11 Review of need for additional sessions based on capacity demand modelling and adherence to performance targets. Develop workforce plan/business case 12 Commence strategic planning for additional machine capacity which will have lead in time of a number of years	Complete June 2017 October 2017 Include in Strategic Plan R7	Service Managers
R7	The two radiology services should establish a joint radiology strategic plan, by mid-2017, to: • show where they are now in terms of demand, capacity and available resources; • set out a collective view of where they need to be; • establish how they will work together to achieve their collective aims; and • inform the development of annual operational plans.	**A planning framework which focuses on the management of radiology services for the Health Board as a whole, as well as on the two separate services.**	✓	✓	13 Initial Discussion meeting held within Radiology 14 Capacity, demand and resources separately assessed as part of meeting R1-7 15 Arranged wider discussions including with Unit Directors to set out collective view and develop a joint action plan draft to be included in IMTP/Annual plan for 2018	April 2017 Meeting Sept/October 2017 Contribution to IMTP by October - December 2017	Director of Therapies and Health Science
R8	The two radiology services should set clear financial plans to inform their annual operational plans.	**Clear financial plans which inform other elements of radiology planning.**	✓	✓	Budgets have been realigned to reflect the current out turn. Financial Plans to be developed in line with annual operational plan	June 2017 December 2017	Service Managers

Ref	Recommendation	Intended outcome/ benefit	High priority (✓)	Accepted	Management response	Completion date	Responsible officer
R9	The Health Board should, by mid-2017, establish arrangements to help ensure director oversight of a Health Board-wide strategic focus on radiology, which should be in addition to that currently given to the separate radiology services.	**Director oversight which helps ensure management of radiology services for the benefit of the Health Board as a whole, as well as for the two separate radiology services.**	✓	✓	Director of Therapies and Health Science established as Director overseeing strategic direction.	June 2017	Director of Therapies and Health Science
R10	The Health Board should ensure clear representation of radiology services on its key committees and groups, by mid-2017.	**Increased visibility of radiology services at key Health Board committees and groups.**	✓	✓	Exec Director representation/Deputy at key Health Board Committees to ensure appropriate strategic planning meetings.	June 2017	Director of Therapies and Health Science

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