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The team who delivered the work comprised Katrina Febry and Tracey Davies

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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 radiologists¹ 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 imagery 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. 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, for example '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, 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 stroke⁵, cancer⁶ and heart disease⁷. 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 whole⁹.

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 Cwm Taf University Health Board (the Health Board) between July and October 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 RADIS¹⁰ and PACS¹¹ across Wales. The findings from that work are due to be published in late spring 2017.

Contextual information

- 14 The Health Board's radiology service provides a range of imaging and interventional procedures across several sites. The main departments are based at Prince Charles Hospital (PCH) and Royal Glamorgan Hospital (RGH).

¹⁰ RADIS – Wales Radiology Information System

¹¹ PACS – Picture Archiving and Communications System

The radiology service is a separate Directorate which reports directly to the Chief Operating Officer and Director of Therapies and Health Science and the Medical Director.

Our main findings

- 15 Overall, we concluded that whilst operationally the service is well managed and strategically focused, there are risks to the current and future service delivery because of increasing demand, recruitment issues, reporting backlogs and waiting targets not being met.

Exhibit 1: our main findings

Table detailing our main findings.

Our main findings
<p>Generally, access to radiological services in-hours, and processes for monitoring clinical performance and learning are good. However, waiting times and reporting turnaround times need improvement:</p> <ul style="list-style-type: none"> • patients have good access to in hours radiology services, although access to some out-of-hours services is limited, and there is a robust system to ensure referrals are correctly prioritised; • waiting times targets are not being met, and while action is being taken to improve waiting times any reduction in waits need to be sustained; • despite increasing use of outsourced reporting, targets for reporting are not always met, and the Health Board is struggling to optimise reporting radiographer time; • clinical performance is regularly audited, discussed and fed back to staff, although report turnaround times and lost/late reports are not reviewed; and • processes are in place to monitor and learn from complaints and incidents, and the Health Board reviews patient satisfaction regularly.
<p>While referrals are well managed and the service is proactively optimising usage of its CT and MRI capacity, difficulty recruiting to vacant radiographer posts is having a negative impact on the service:</p> <ul style="list-style-type: none"> • demand for diagnostic radiology is increasing year on year; • referral guidance is in place and the service is taking positive steps to reduce inappropriate referrals, however, the absence of an e-referral system is a risk; • the service has a good system to manage appointment slots, although ICT systems are affecting the Health Board's ability to efficiently manage waiting lists; • difficulty recruiting to vacant radiographer posts is having a negative impact on the service; • the radiology workforce profile generally compares favourably with the rest of Wales, and staff carry out more radiology examinations than average; and • staffing constraints are hindering the Health Board's ability to train staff and maintain compliance with statutory and mandatory training; • the number of scanners per head of population is comparable to Wales and the Health Board is proactively optimising usage of its CT and MRI capacity.

Our main findings

Lines of accountability for the radiology service are clear, there is good Board and corporate oversight of the service, and funding for new equipment has been secured. However, ICT is having a negative impact on the service:

- the radiology service has a strategic plan and produces detailed demand and capacity forecasts, but does not have a detailed radiographer workforce plan;
- the management structure and lines of accountability are clear, and management meetings are strategically and operationally focused;
- the service is well represented on Board committees and sub-committee;
- in recent years, the service spend has been within budget, although savings targets have not been met;
- the radiology service has developed a comprehensive equipment replacement programme, and the Health Board has secured funding for both new and replacement equipment;
- generally, radiology ICT systems do not serve the Health Board's needs; and
- radiology performance is regularly reviewed at corporate and management level, however, whilst radiology reports comprehensively set out the service's strengths and weaknesses, little use is made of comparative performance information.

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 | Develop an action plan detailing how waiting times target will be achieved in the short term, and how the radiology service will sustain a reduction in waiting times going forwards. (Setting out how the use of locums, and outsourcing of examinations and other actions will help the Health Board achieve targets). |
| R2 | Develop an action plan detailing how reporting backlogs will be managed sustainably. (Setting out how extended practice radiographers, outsourcing of reporting and other actions will achieve reporting targets). |
| R3 | Develop and implement regular auditing of reporting turnaround times and lost/late reports. |
| R4 | Review the appraisal and PDP rates of non-clinical radiology staff. Ensure that all radiology staff have received an appraisal and PDP within the previous 12 months in line with the Health Board's target rate. |
| R5 | Review the number of radiology staff compliant with statutory and mandatory training, and set a target rate for compliance to be achieved in one and two years time. |

Demand and capacity issues affecting service performance

- R6 Develop a short term strategy to address staff shortages of radiographers.
- R7 Develop a plan/strategy with referring specialties to identify both major and minor changes that will impact on radiology demand (such as recruitment of new consultants, changes to patient pathways etc).

Extent to which radiology services are well managed

- R8 Develop a radiographer workforce plan alongside the radiology strategy, which identifies the baseline capacity needed to sustainably meet radiology demand in a timely and safe way.
- R9 By mid-2017 identify potential staffing requirements for the Diagnostic Hub, and develop a recruitment strategy.
- R10 Further develop the range of performance measures to support business reports by reviewing existing measures and identifying gaps. Measures should include equipment usage, the number of unreported images, average report turnaround times, longest report turnaround times and waiting times. Workforce measures such as planned versus actual staffing levels, vacancies, sickness rates, and appraisal and PDP rates along with compliance against training should also be reported.

Detailed report

Generally, access to radiological services in-hours, and processes for monitoring clinical performance and learning are good, however, waiting times and reporting turnaround times need improvement

Patients have good access to in-hours radiology services, although access to some out-of-hours services is limited, and there is a robust system to ensure referrals are correctly prioritised

- 17 Open-access services¹² are widely recognised as a means to reduce the time it takes for outpatients 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. The radiology service has an open access system for simple plain film x-rays. The service encourages GPs to provide patients with a request form which the patient can present at the radiology department to receive an x-ray without the need to arrange an appointment in advance. The Health Board told us they have sufficient capacity for plain x-rays to accommodate this practice, and told us that it reduces administrative work.
- 19 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) or routine priority (outpatient). This ensures that the patients with the most critical needs are seen first. Urgent referrals are seen as soon as they can be accommodated. All outpatients are added to the waiting list, with urgent referrals prioritised. The Health Board uses three referral categories: urgent,

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.

urgent suspected cancer and routine. The urgency is assigned by the referrer. Radiologists and, where appropriate, radiographers vet (review) the priority of the referral using the clinical information provided by referrers. The priority of the referral is amended according to the outcome of review. This system ensures waiting lists are based on clinical priority.

- 20 Patients with emergency health needs may need access to prompt radiology diagnostics and care outside standard radiology working hours. The Health Board provides CT imaging 24 hours a day, seven days a week, with radiographers on site at both PCH and RGH providing this service. MRI imaging is provided 12 hours a day, seven days a week. US imaging is provided eight hours a day on weekdays at both hospitals. Whilst there is no out-of-hours on-call service for MRI imaging, there is an on call service for US at both hospitals. The Health Board employs only one interventional radiologist, as a result, out-of-hours interventional procedures can only be provided on an ad hoc basis.

Waiting times targets are not being met, and while action is being taken to improve waiting times any reduction in waits need to be sustained

- 21 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.
- 22 Since 2009 waiting times for radiological tests have also formed part of the referral to treatment target¹³. Health boards in Wales are required to ensure that 95% of all patients waiting for elective treatment, receive their treatment within 26 weeks from the point at which the referral was received. For many of these patients, diagnostic tests help decide which treatment is the best option.
- 23 The all-Wales radiology waiting times¹⁴ for consultant and GP referrals shows that for August 2016 there were 6,984 patients waiting for radiology diagnostic imaging at the Health Board: 60% for US; 23% for MRI; 15% for CT; 2% for barium enema, and 1% for nuclear medicine.

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**

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

24 In August 2016, 1,586 patients were waiting for an MRI scan at the Health Board, of which 203 (13%) were waiting over eight weeks (**Exhibit 3**).

Exhibit 3: MRI waiting times for August 2016

Table showing that the Health Board has a higher percentage of patients waiting more than eight weeks for an MRI examination compared to the all-Wales figures.

	Total number of patients waiting for an MRI scan				Total waiting	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		
Prince Charles Hospital	689	123	0	0	812	15%
Royal Glamorgan Hospital	694	77	3	0	774	10%
Cwm Taf University Health Board	1,383	200	3	0	1,586	13%
All Wales¹	11,662	913	66	163	12,804	9%

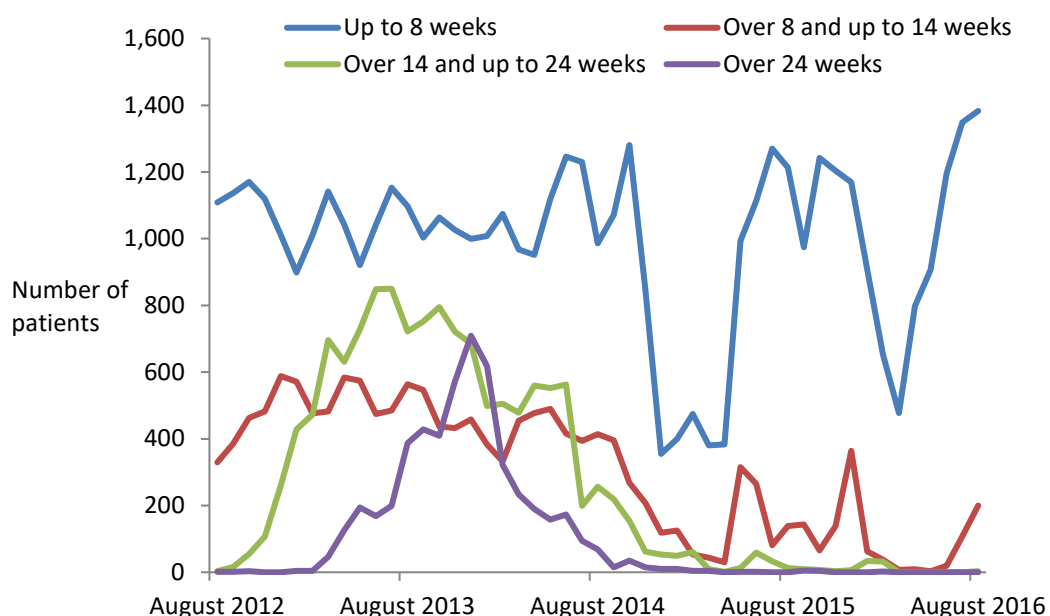
¹ All-Wales figures include all patients waiting for a diagnostic scan at Welsh health boards

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

25 The total number of patients on the waiting list for an MRI scan at the Health Board increased by 9% between August 2012 and August 2016, but the percentage waiting more than eight weeks decreased from 23% to 13% in the same period (Exhibit 4). Exhibit 4 shows variation in the number of patients on the MRI waiting list, with two large dips in the numbers waiting at the end of 2014 and spring 2015 a smaller dip in autumn 2015. These reductions in the waiting list coincide with the Health Board securing additional MRI capacity by outsourcing to mobile vans.

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

Chart showing fluctuating MRI waiting times over the last five years, since August 2012 there has been a reduction in the percentage of patients waiting more than eight weeks.



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

26 In August 2016, the percentage of patients waiting more than eight weeks for MRI imaging at the Health Board was higher than the Welsh average, with a slightly higher percentage of patients waiting more than eight weeks at PCH than RGH. The waiting times for November 2016 show that the total number of patients waiting for an MRI examination at the Health Board had reduced from 1,586 in August 2016, to 1,207. In November 2016, the percentage of patients waiting more than eight weeks for an MRI examination was 2% (down from 13% in August 2012).

27 In August 2016, 1,021 patients were waiting for a CT scan at the Health Board, of which 154 (8%) were waiting more than eight weeks ([Exhibit 5](#)).

Exhibit 5: CT waiting times for August 2016

Table showing that the Health Board has a higher percentage of patients waiting over eight weeks for a CT scan compared to the all-Wales figures.

	Total number of patients waiting for a CT scan				Total waiting	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		
Prince Charles Hospital	537	38	30	0	605	11%
Royal Glamorgan Hospital	407	3	6	0	416	2%
Cwm Taf University Health Board	944	41	36	0	1,021	8%
All Wales¹	7,293	63	51	11	7,418	2%

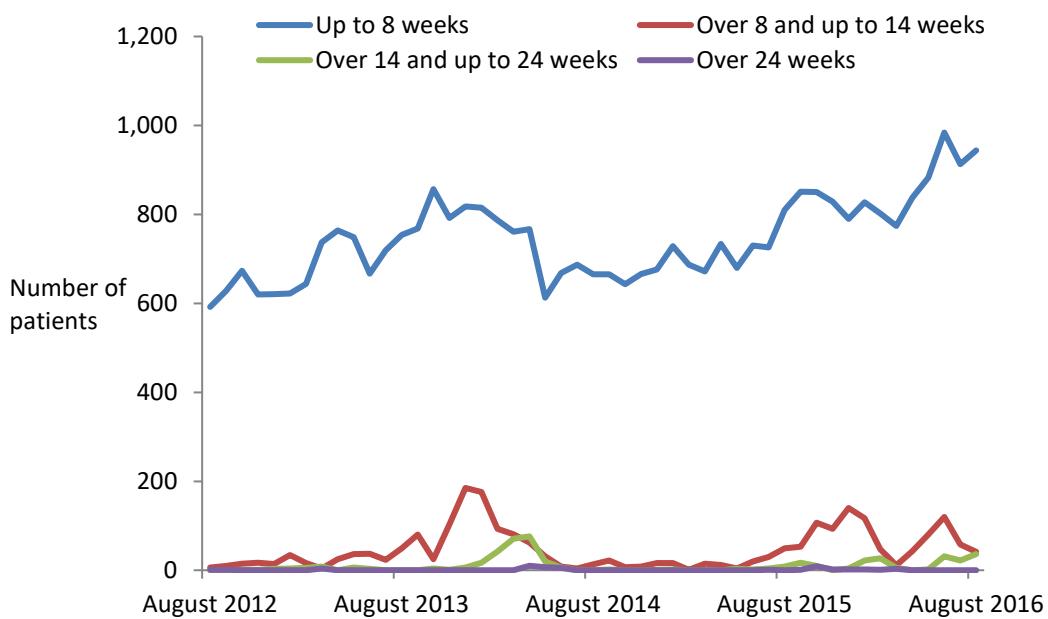
¹ All-Wales figures include all patients waiting for a diagnostic scan at Welsh health boards

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

28 The total number of patients on the waiting list for a CT scan at the Health Board increased by 41% between August 2012 and August 2016, and the percentage of patients waiting more than eight weeks increased from 1% to 8% in the same period (Exhibit 6). The increase in the number of patients waiting for CT imaging is a result of increasing demand in this modality.

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

Chart showing a growth in the numbers of patients waiting for a CT scan.



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

29 The percentage of patients waiting more than eight weeks for CT imaging at the Health Board is higher than the Welsh average, with a higher percentage of patients waiting more than eight weeks at PCH than RGH. The waiting times for November 2016 show that the number of patients waiting for a CT examination at the Health Board had increased to 1,230 from 1,021 in August 2016. Between August 2016 and November 2016, the percentage of patients waiting more than eight weeks showed a slight reduction from 8% to 7%.

30 In August 2016, 4,191 patients were waiting for a non-obstetric US scan at the Health Board, of which 1,346 (32%) were waiting over eight weeks (**Exhibit 7**). Further analysis shows that 19% of the total number of patients waiting for a US scan across Wales can be attributed to the Health Board.

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

Table showing that the Health Board has a significantly higher percentage of patients waiting over eight weeks for non-obstetric US scan compared to the all-Wales figures.

	Total number of patients waiting for a non-obstetric US scan				Total waiting	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		
Prince Charles Hospital	1,160	205	132	15	1512	23%
Royal Glamorgan Hospital	1,447	463	364	115	2,389	39%
Ysbyty Cwm Rhondda	238	36	16	0	290	18%
Cwm Taf University Health Board	2,845	704	512	130	4,191	32%
All Wales¹	18,944	1,999	626	133	21,702	13%

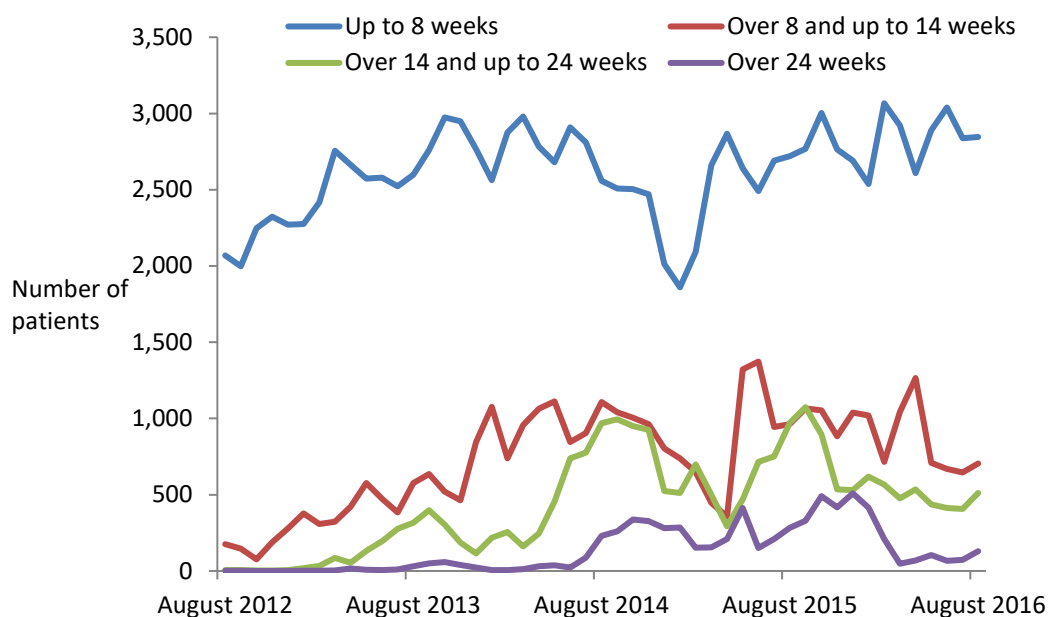
¹ All-Wales figures include all patients waiting for a diagnostic scan at Welsh health boards

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 46% between August 2012 and August 2016, and the percentage of patients waiting more than eight weeks increased from 8% to 46% in the same period (**Exhibit 8**). The Health Board told us that demand for non-obstetric US, particularly musculoskeletal US, increased at a rate that was above the Health Board’s capacity to undertake US examinations. This led to the increase in the number of patients on the waiting list.

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

Chart showing demand for non-obstetric US examinations increased between 2012 and 2016, and whilst fluctuations are evident, a significant number of patients are waiting more than eight weeks for a US examination. Between August 2014 and August 2016, a significant number of patients waited more than 24 weeks.



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

32 The percentage of patients waiting more than eight weeks for a non-obstetric US examination at the Health Board is higher than the Welsh average, with a higher percentage of patients waiting more than eight weeks at RGH than PCH. Some patients are waiting more than 24 weeks for their non-obstetric US examination; in August 2016, 4% of patients (130) had been on the waiting list for more than 24 weeks. In November 2016, the number of patients waiting for a non-obstetric US examination at the Health Board had reduced to 3,785 from 4,191 in August 2016. Whilst in the same period of time, the number of patients waiting more than eight weeks decreased from 32% (August 2016) to 22% (November 2016), 4% of

patients had been on the waiting list for more than 24 weeks. The Health Board told us that whilst some patients are waiting more than 24 weeks for their examination, these patients would have been assessed as non-urgent at the time of referral. If a patient's condition deteriorates, then the referral can be escalated by the referrer.

- 33 To help reduce waiting times, the Health Board has made the following changes:
- increased both the number of days and hours that CT and MRI examinations are undertaken for patients on the waiting list; and
 - secured additional capacity of CT and MRI examinations by outsourcing imaging to mobile vans (both commenced January 2017).
- 34 In addition, the Health Board is planning the following:
- revising CT and MRI booking schedules to reduce equipment downtime and thus increase the number of examinations;
 - trying to identify health boards with unused US capacity to outsource examinations to; and
 - in the medium term, increase the capacity in CT and MRI by increasing the number of scanners.

Despite increasing use of outsourced reporting, targets for reporting are not always met, and the Health Board is struggling to optimise reporting radiographer time

- 35 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.
- 36 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 Reporting Standards) were produced in order to clarify previous guidance and regulations. The Reporting 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
- 37 The Health Board assigns one radiologist to report images each week at each hospital. Reporting of images is prioritised with urgent referral images reported first, and then routine referrals.
- 38 In 2015-16, the average report turnaround time was generally quicker at RGH than PCH, with the exception of US reporting ([Exhibit 9](#)).

Exhibit 9: average report turnaround time between 1 April 2015 and 31 March 2016

Table showing average report turnaround time, the report turnaround time is generally quicker at RGH than PCH.

	Average report turnaround time (days)			
	CT	MRI	Plain x-ray	US
Prince Charles Hospital	2	8	10	0 ¹
Royal Glamorgan Hospital	0	0 ²	8	6

¹ 96 minutes

² 144 minutes

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

39 We asked the Health Board to provide the longest report turnaround time experienced by patients receiving imaging in 2015-2016, excluding any obvious outliers. **Exhibit 10** shows that some examinations were not reported for many months after the examination, for example, a plain x-ray took more than one year and two months to be reported.

Exhibit 10: longest report turnaround time between 1 April 2015 and 31 March 2016

Table showing the longest report turnaround time, showing some reports were not reported for many months after the examination.

	Longest report turnaround time ¹ (days)			
	CT	MRI	Plain x-ray	US
Prince Charles Hospital	286	187	438	209
Royal Glamorgan Hospital	0	188	236	106

¹ Longest report times exclude any obvious outliers

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

40 The Health Board reported in the Radiology Performance Report (June 2016) that a shortfall in reporting capacity, as a result of number of radiologists retiring in the last few years, and radiologist and radiographer vacancy levels, had led to a backlog of images awaiting reporting. In addition, radiology staff also told us that the system used to record dictated reports, does not enable efficient reporting as it runs slow and frequently cuts out, resulting in the loss of all reports dictated in the session.

41 To help address the backlog of examinations, the Health Board has authorised waiting list initiative payments for additional radiologist sessions to report

examinations¹⁵. The Health Board also increased the number of outsourced reports to improve reporting turnaround times.

- 42 We asked the Health Board to provide us with the number of examinations that had not been reported on the 31 March 2016 (**Exhibit 11**). Clearly, a proportion of the examinations identified in **Exhibit 11** will have subsequently been reported, albeit more than 10 days after the examination date.

Exhibit 11: number of examinations not reported as at 31 March 2016

Table showing the examination reporting backlog at the Health Board, a significant number of examinations were not been reported within 10 days on the 31 March 201.

	Number of examinations not reported ¹ (days)			
	CT	MRI	Plain x-ray	US
Prince Charles Hospital	36	139	1,209	19
Royal Glamorgan Hospital	124	111	1,948	21

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

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

- 43 The Health Board aims to report all images within the Reporting Standards timescales, and reporting turnaround times and lost/late reports are monitored. However, the Health Board told us that the radiology ICT systems do not easily facilitate the audit of reporting turnaround times and lost/late reports, meaning that time consuming manual checks are required.
- 44 Consultant views on reporting times were mixed. Two consultants told us that they generally receive reports within the Welsh Standard Reporting times. However, two consultants told us that whilst they may receive a copy of the image immediately, there can be a delay in receiving the report on the image. One consultant told us that sometimes there are delays receiving reports of images taken of patients attending the Accident and Emergency Department. On occasions, the patient may be sent home, only to be called back a day or two later when the report is received.
- 45 All of the consultants we spoke to told us that the radiology team are helpful and, within normal working hours there are always radiologists available to provide guidance if required.
- 46 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

¹⁵ Waiting list initiative payments are enhanced payments for staff to work additional hours, specifically for the purpose of reducing waiting lists.

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 with no formal radiology training. The use of extended practice radiographers can help to reduce the number of patient recalls caused by initial incorrect x-ray interpretation.

- 47 We asked the Health Board to tell us how many radiographers and ultrasonographers are trained and regularly report images:
- at PCH – three radiographer is trained to report plain x-ray film images and seven ultrasonographers are trained to report US images, and
 - at RGH – one radiographers are trained to report plain x-ray film and seven ultrasonographers trained to report US images.
- 48 In addition, the Health Board has trained radiographers to report barium enemas and CT head scan examinations. **Exhibit 12** shows that between April 2015 and March 2016 Health Board radiographers/ultrasonographers reported a higher percentage of MRI and US examination than the Welsh average, but a lower percentage of plain x-ray examinations than the Welsh average.

Exhibit 12: percentage of scans reported by radiologists, radiographers and other staff between 1 April 2015 and 31 March 2016

Table showing that between April 2015 and March 2016 the majority of CT and MRI scans were reported by radiologists. The percentage of radiographers reporting MRI and US examinations at the Health Board is higher than the all Wales percentage.

		% of scans reported by		
		Radiologist	Radiographer ¹	Others ²
CT	Prince Charles Hospital	100%	0%	0%
	Royal Glamorgan Hospital	100%	0%	0%
	Cwm Taf University Health Board	100%	0%	0%
	All Wales	98%	0%	2%
MRI	Prince Charles Hospital	96%	4%	0%
	Royal Glamorgan Hospital	96%	4%	0%
	Cwm Taf University Health Board	96%	4%	0%
	All Wales	98%	1%	1%
Plain x-ray	Prince Charles Hospital	61%	25%	14%
	Royal Glamorgan Hospital	65%	22%	13%
	Cwm Taf University Health Board	63%	23%	14%
	All Wales	63%	23%	14%
US	Prince Charles Hospital	14%	86%	0%
	Royal Glamorgan Hospital	19%	81%	0%
	Cwm Taf University Health Board	17%	83%	0%
	All 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**

49 Typically radiographers and ultrasonographers trained to report examinations make use of the skills. However, the June 2016 Risk Register reported that radiographers trained to report plain film x-rays were being diverted from reporting to undertake examinations due to the high level of radiographer vacancies. The Health Board reported in the Radiology Performance Report June 2016 that it was planning to outsource 1,000 plain x-ray reports to reduce the reporting backlog caused by radiographer vacancies.

- 50 The Clinical Director of Radiology told us that he would like to create a sustainable, trained team of extended practice radiographers to undertake reporting of images. The team needs to be of sufficient size to sustainably provide an agreed volume of reporting of plain x-rays and less complex CT and MRI examinations.
- 51 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 (RRO), 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.
- 52 The Health Board outsourced reporting to RRO prior to the introduction of the national contract. The Health Board uses RRO mainly to report out-of-hours CT examinations, but also to report some examinations undertaken in normal working hours. Outsourcing out-of-hours reporting enables all of the Health Board's radiologists to work a typical NHS working week (9:00-17:00), and to provide guidance to GPs and referring consultants as required.
- 53 The Health Board has outsourced more reporting in 2016-17 than anticipated, In September 2016, expenditure on outsourced reported was £50,000 greater than budgeted for. The Finance Report discussed at the Finance, Performance & Workforce Committee in November 2016 noted that urgent work is needed to address the significant increase in CT out-of-hours reporting costs over the past three years.
- 54 The Health Board monitors the quality of outsourced reporting alongside reports produced in-house. RRO has internal quality assurance processes, and share performance information and discrepancy information with the Health Board on a monthly basis. The Health Board is an active participant in contract review meetings attended by RRO, NHS Shared Services and all health boards.

Clinical performance is regularly audited, discussed and fed back to staff, although report turnaround times and lost/late reports are not reviewed

- 55 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.
- 56 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.

- 57 The Health Board told us that they undertake regular reviews in the following areas:
- appropriateness of referrals
 - quality of written referrals
 - appropriateness of urgent and/or out-of-hours referrals
 - demand levels by time of day/day of week
 - demand levels by GP/consultant
 - accuracy of reporting
- 58 However, there is scope to introduce the audit of reporting turnaround times and lost/late reports, neither are currently audited. The Health Board has set up a group to look into lost/late reports, and identify areas for improvements and the required remedy.
- 59 The Health Board's Radiology Annual Quality and Safety Report 2015-16 sets out a programme of additional audits for 2016-17, including;
- practitioner request form audit;
 - child protection pathway audit; and
 - audit of panoramic radiography image quality.
- 60 Issues identified in audits are raised with the radiology service's Directorate Manager and Clinical Director, and other appropriate staff.

Processes are in place to monitor and learn from complaints and incidents, and the Health Board reviews patient satisfaction regularly

- 61 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.
- 62 A superintendent radiographer lead has responsibility for health and safety, radiation safety and quality assurance. There are a number of radiology service groups in which clinical governance issues are discussed, including:
- the Governance Group – responsible for reviewing operational and governance issues, including quality and health and safety issues, which meets on a quarterly basis;

- the Modality Groups – a group for each modality responsible for reviewing specific issues for the modality which is attended by consultants and modality superintendents, and meets at least biannually;
 - the Clinical Discrepancy Group – monthly meetings attended by consultant radiologists at each site with the purpose of peer reviewing reporting discrepancies; and
 - the Clinical Audit Group – held every two months, all types of staff represented.
- 63 The Health Board has well developed processes in place to monitor and learn from incidents and errors, and the reporting of incidents is encouraged. In the first instance, the radiology service's Governance Group reviews incidents, and lessons learned are disseminated to all staff employed by the service. Clinical concerns are reported to the Clinical Discrepancy Group. Serious incidents and any incident trends are outlined in the Radiology Directorate Annual Report, which is presented to the Quality, Safety and Risk Board Committee
- 64 The Radiology Directorate Annual Report 2015-16, set out that there were four serious incidents reported in 2015-2016, all of which were radiation incidents (where a patient receives a higher than necessary radiation dose).
- 65 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, provide 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 IR(ME)R.
- 66 HIW undertook IR(ME)R compliance inspections at PCH and RGH in 2014 and reported that the Health Board had not fully implemented recommendations from a previous review in 2012. The recommendations were to implement a record of training undertaken by staff at PCH and to establish Local Diagnostic Reference Levels¹⁶. The Health Board's Radiology Directorate Annual Report 2015-16 set out that Health Board has revised its documentation, improved training records and practices for examinations. A HIW follow-up inspection at RGH in 2016 concluded that the Health Board had taken appropriate actions to address the areas for improvements previously identified.
- 67 The Health Board has a Radiation Protection Committee which covers the whole Health Board and is required under IR(ME)R. The Radiation Protection Committee is chaired by the Chief Operating Officer and meets annually.
- 68 Feedback from patients is a vital source of information for radiology services to understand and improve patient experience. Patient experience is captured by the Health Board by running a patient questionnaire at least once a year.

¹⁶ A Diagnostic Reference Level (DRL) is a recommended maximum radiation dose for a particular examination. The specific issue at the Health Board was that national DRLs were in use rather than local levels which should be adapted to be more appropriate to the patient population.

The questionnaire is issued to 20 patients per modality at each hospital site. The most recent survey, undertaken in March 2015, was generally positive, although the main issues highlighted included waiting times for US and some patients felt they had not received adequate information explaining how they would receive their results.

- 69 The Health Board told us that patient experience is an important part of monitoring the quality of the service and service development and the patient experience results and comments are considered by the Governance Group. The radiographers we spoke to told us the Health Board previously used a patient group to highlight patient experience of the service. However, as patients' encounters with the service are so fleeting the patient group seemed excessive.
- 70 During the period 1 April 2015 to 31 March 2016, the Health Board told us they received 7 complaints and 5 compliments across PCH and RGH. The Health Board said that generally complaints relate to waiting times for radiology examinations. Complaints are reviewed by the Governance Group, and clinical concerns are reported at the Clinical Discrepancy Group.
- 71 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.
- 72 The Health Board set out in the Radiology Directorate 2016-17 to 2018-19 Integrated Medium Term Plan that it intends to achieve ISAS accreditation by 2021, but that it requires 1.5 FTE of band 7 radiographer staff to undertake the work. Due to the absence of funding for the additional staff required, the Health Board anticipated it would not be able to start working on ISAS accreditation until at least 2017.

While referrals are well managed and the service is proactively optimising usage of its CT and MRI capacity, difficulty recruiting to vacant radiographer posts is having a negative impact on the service

Demand for diagnostic radiology is increasing year on year

- 73 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)¹⁷. The Royal College of Radiologists has predicted that by 2022 the number of radiological examinations carried out in England will be around 62 million¹⁸ per year driven by further innovation and demographic growth.
- 74 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)¹⁹. MRI and CT scans are complex data examinations, which generally include multiple images, and therefore, per patient examination, are more labour-intensive for radiologists interpreting images than less-complex scan types, such as plain x-ray scans.
- 75 The Health Board set out in the Radiology Directorate 2016-17 to 2018-19 Integrated Medium Term Plan that it is anticipated that CT and MRI imaging will increase by at least seven percent every year. Whilst the main reasons for increasing demand are same as those faced by all radiology services, particular initiatives that will contribute to the increase in demand include:
- replacing barium enemas with CT colon imaging due to proven higher detection rates, is projected to require an additional 875 hours CT scanning time across the Health Board annually; and

¹⁷ [Annual Imaging and Radiodiagnostics Data](#), NHS England, 2014

¹⁸ Royal College of Radiologists, [Information submitted to Health Education England workforce planning and education commission round 2015-16](#)

¹⁹ Royal College of Radiologists, [Information submitted to Health Education England workforce planning and education commission round 2015-16](#)

- early diagnosis of possible cancer being rolled out, meaning patients that do not have clear symptoms of a specific cancer being offered diagnostic tests, for example all potential prostate cancer patients are to be imaged with MRI.

Referral guidance is in place and the service is taking positive steps to reduce inappropriate referrals. However, the absence of an e-referral system is a risk

- 76 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' iRefer²⁰ 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.
- 77 The Health Board has local referral guidance available for clinicians who request radiology examinations. Clinicians are referred to the iRefer website for further guidance. However, the consultants we interviewed were not aware of any guidance produced by the radiology department, and the Health Board did not involve referring clinicians in the development of the referral guidance.
- 78 The Health Board does not have an electronic referral system, and so all referrals are paper based. Paper based referrals can be problematic for the following reasons:
- creating more administration because all referral forms have to be scanned;
 - difficulty in reading handwriting;
 - difficulty in understanding who the referrer is in the case of GPs that do not provide a full surgery address;
 - the paper forms have little space to provide a rationale for the reason for the referral; and
 - a potential risk that patients may tamper with forms in the cases where patients take the forms to the service.
- 79 The Health Board has a duty radiologist working 10 sessions during week days, and the referring clinicians told us that this means that they can easily seek guidance if required. However, one consultant expressed concerns that there was no duty radiologist available for two hours each day around midday. Although, other consultants told us they were happy with the guidance received from the duty radiologist and told us that the radiologists in general were all approachable and they could also easily speak with any of the specialist radiologists for help with referrals if required.

²⁰ iRefer is a radiological investigation guidelines tool from The Royal College of Radiologists.

- 80 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.
- 81 All referrals are justified to check appropriateness and patient urgency. Currently, there are different justification protocols for each modality. Generally the justification of referrals is undertaken by radiologists. However, extended practice radiographers vet some CT, plain x-ray, and US referrals.
- 82 The consultants we interviewed told us that where issues are identified with a referral, the radiology staff will always contact the referrer to request more information or highlight any issues with the referral, and inform the referrer of any amendments made as a consequence of the review.
- 83 The Health Board regularly audits the appropriateness of referrals, quality of written referrals appropriateness of urgent and/or out-of-hours referrals to identify any trends, so that they speak to the referee to prevent further occurrences.

The service has a good system to manage appointment slots, although ICT systems are affecting the Health Board's ability to efficiently manage waiting lists

- 84 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. Services offering partial-booked appointments typically see lower DNAs.
- 85 At the Health Board, patients with urgent referrals will be contacted with a specific appointment time for the earliest available appointment time. Patients with routine referrals are entered as partial bookings, and the patient is written to and invited to call back to make an appointment time to suit the patient. The Health Board told us that the DNA rates across the Health Board are less than 5%.
- 86 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.
- 87 The Health Board sets aside a small number of appointment slots in equipment timetables to be able to accommodate emergency and inpatient referrals. The time set aside is based on historic demand and forecast data. However, demand can be unpredictable which means, sometimes, too much or too little time is allowed in the timetable. The Health Board told us that emergency or urgent inpatient CT imaging

is easier to accommodate than MRI imaging because generally CT examinations take less time.

- 88 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.
- 89 Patients cannot chose the hospital site to attend for their radiology appointment, this is because the Health Board operates separate waiting lists for PCH and RGH.
- 90 The Health Board aligns clerical staff to modalities, so that each clerical staff member deals with one modality only, this is so that they have an understanding of the length of scan required, the consultant availability and the imaging equipment to ensure that they allocate an appropriate appointment in terms of timing, equipment and length of appointment.
- 91 The Health Board told us that waiting list held on the ICT systems are not accurate, and as a result the service relies on a paper waiting list to identify the patients waiting the longest. In addition, due to ICT limitations, there is a separate waiting list for each hospital, therefore, the identification of the longest waiters is a time consuming manual task. Consultant staff meet on a weekly basis with the Service Manager to discuss the waiting lists and identify the patients waiting longest to expedite urgent cases and the longest waiters.

Difficulty recruiting to vacant radiographer posts is having a negative impact on the service

- 92 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.
- 93 Our review found that the full-time equivalent (FTE) establishment²¹ staffing level of radiologists at the Health Board increased by 6% between 2012 and 2016 (Exhibit 13), compared with 5.9% across Wales²². However, the Health Board was unable to provide the FTE establishment staffing level radiographers at the Health Board in 2012 and 2016. Across Wales, the FTE establishment staffing level radiographers increased by 10.2% between 2012 and 2016.

Exhibit 13: Health Board FTE establishment of radiologists trend between 2012–2016

Table showing there has been little growth in the number of radiologists between 2012 and 2016.

	2012	2013	2014	2015	2016	Percentage change 2012–2016
Radiologists	18.2	18.2	19.1	19.1	19.3	6%

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

- 94 The continued increase in demand for complex imaging (CT and MRI) 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 radiographers and 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 UK²³. Across Wales, there is a shortfall of consultant radiologists in interventional, breast, paediatric and

²¹ 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.

²² 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.

²³ NHS Wales, **NHS Wales Health Collaborative Diagnostic Services Modernisation Programme**, December 2015

nuclear radiology. Across the UK, the number of unfilled consultant radiologist posts in 2015 was 9%, with 7% in Wales²⁴.

- 95 We asked the Health Board to provide us with the number of vacancies as at March 2016, but the health Board did not provide the data. However, in May 2016, the radiology service's risk register highlighted that the number of radiographer vacancies is the highest risk facing the service, with the number of vacancies being the highest the Health Board has experienced. The Business Update 2015-16 reported that in January 2016 there were 14 radiographer vacancies.
- 96 The level of vacancies has led to:
- increased waiting times, in particular for CT examinations;
 - increased reporting turnaround times for plain x-rays;
 - theatre lists being cancelled;
 - increased turnaround times for outpatients and accident and emergency referrals;
 - reduced rates of staff receiving training, appraisal and personal development plans; and
 - concerns that the level of staff vacancies is impacting on the wellbeing of staff.
- 97 In summer 2016, the Health Board had vacancies at band 5, 6 and 7 for radiographers and ultrasonographers, and there were vacancies for staff trained in undertaking CT, MRI, US and plain x-ray examinations. Of particular concern to the radiology service was the band 5 radiographer vacancies as the Health Board has historically struggled to appoint at this grade. An advert for band 5 vacancies in autumn 2016 received little interest. The Health Board told us that vacancy levels were high in part because lower than normal levels of radiographers graduated in summer 2016. The service believes that radiographers are seeking out jobs in community hospitals as these are less intensive than radiographer roles in acute hospitals and do not involve shift or on-call work. Also, the Health Board believes that some radiographers may find roles at other health boards more attractive, where there is less or no evening and/or weekend shift work. The vacancy situation was compounded by higher than normal maternity leave at the time of our review.
- 98 The Health Board employs specialist consultant radiologists. The level of specialist consultant radiologists to support some specialist areas is vulnerable. Of particular concern is interventional radiology for which the Health Board employs one consultant radiologist, and has been unable to fill a second vacancy due to a shortage of interventional radiologists UK-wide. On-call interventional radiology is ad hoc with the single interventional radiologist covering as and when possible, and as a result of the vacancy, there has been a reduction in the range of interventional procedures offered. This has resulted in some intervention radiology being transferred to University Hospital Wales in Cardiff. The Health Board is

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

working with other Health Boards to establish a network of interventional radiologist to provide cover across South Wales.

- 99 Nurses act as escorts for inpatients and Emergency Department patients. At the time of the review, due to nurse vacancies (in other directorates), the service expressed concern that there is a risk of patients being unattended, particularly during out-of-hours where patients waiting for imaging are not in the line of sight of radiography staff. The service has raised the issue with the Assistant Director of Nursing.
- 100 Across Wales, radiology services are 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 over²⁵. To provide a future sustainable consultant radiologist 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.

²⁵ NHS Wales Workforce, Education and Development Services, **NHS workforce census data for June 2016, 2016**

101 At the Health Board, 27% of the consultant radiologists and 33% of radiographers are aged 50 and over, and potentially within five years of retirement (Exhibit 14). The Health Board expressed concerns that the number of radiologist trainees does not match the number of radiologists nearing retirement age both within Wales and the UK.

Exhibit 14: 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 slightly lower percentage of radiologists and radiographers aged 50 and over.

		Age					
		Under 39	40–44	45–49	50–54	55–59	60+
Consultant radiologists ¹	Cwm Taf University Health Board	5 (28%)	3 (17%)	4 (22%)	1 (6%)	3 (17%)	2 (11%)
	All Wales	29 (18%)	43 (27%)	28 (17%)	20 (12%)	20 (12%)	21 (13%)
	Radiographers ²	Cwm Taf University Health Board	54 (56%)	7 (7%)	10 (10%)	13 (13%)	11 (11%)
	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

102 The Health Board told us that in the short term they were relying on locum radiographers and ultrasonographers to cover the vacancies. The average locum use in 2015-2016 was 11.8 FTE. The Health Board has not used locum radiographers or ultrasonographers in previous years. However, two ultrasonographers were due to complete their training in December 2016.

103 Further, the Health Board is reviewing the skill mix of staff and is seeking opportunities to recruit non-professional grades, such as assistant practitioners, to help provide additional capacity for imaging, working under supervision.

The radiology workforce profile generally compares favourably with the rest of Wales and staff carry out more radiology examinations than average

- 104 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.
- 105 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)²⁶. **Exhibit 15** shows that the number of radiologists and radiographers relative to population and workload is larger than the all-Wales average, suggesting a more generous staffing establishment when compared to All-Wales. However, the Health Board serves the most deprived communities in Wales, with, on average, poorer health than residents living elsewhere in Wales. Life expectancy for both males and females in the area is the lowest of any of the Health Boards in Wales. Health risk behaviour indicators in Cwm Taf are generally worse than, or at best, similar to the Wales average. This means that it is likely that the number of radiology examinations required per head of population is higher in the Health Board than in other areas in Wales. In addition, the Health Board covers out-of-hours examinations with radiographer shift work, rather than on-call. Other health boards mainly cover out-of-hours examinations with on call, although all health boards, except Powys, provide some shift cover on weekends.

Exhibit 15: 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
Cwm Taf University Health Board	5.7	30.5
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.

²⁶ The Royal College of Radiologists, **Clinical radiology UK workforce census 2015 report, 2016**

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

- 106 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. There is no standardised activity measurement in use in radiology in Wales or the UK.
- 107 In the absence of standard activity count, the medical classification system – the Systematised Nomenclature of Medicine Clinical Terms (SNOMEDCT) – has enabled some activity measurement. SNOMEDCT 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 SNOMEDCT 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 SNOMEDCT consistently. Currently in Wales radiology activity is not consistently recorded which makes it difficult to provide a true comparison of activity.
- 108 The Health Board measures imagining activity by 'investigation', which means each part of the body scanned counts as one investigation. However, the Health Board expressed concerns that whilst SNOMED is used across Wales, the way activity is coded into systems varies within and between health boards; for instance a broken hip could be recorded as either a pelvis code or a hip code, or both.

109 **Exhibit 16** and **Exhibit 17** highlights that the number of examinations per FTE in-post radiologist and radiographer/ultrasonographer is higher than for other parts of Wales, this is likely to be due to the vacancy levels and higher health needs at the Health Board.

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

Table showing that compared to the all Wales average, radiologists at the Health Board undertake more examinations per full time equivalent radiologist.

	Number of examinations per in-post FTE radiologist		
	All examinations	CT	MRI
Cwm Taf University Health Board	17,276	2,217	922
All Wales¹	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**

Exhibit 17: number of examinations per full-time equivalent in-post radiographer/ultrasonographers 2015–16

Table showing that compared to the all Wales average, radiographers at the Health Board undertake more examinations per full time equivalent radiographers.

	Number of examinations per in-post FTE radiographer/ultrasonographer			
	All examinations	CT	MRI	US
Cwm Taf University Health Board	3,401	436	182	696
All Wales¹	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**

110 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.

Staffing constraints are hindering the Health Board's ability to train staff and maintain compliance with statutory and mandatory training

- 111 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.
- 112 All radiologists and four-fifths of radiographers received an annual appraisal of their performance or received a personal development plan in 2015-2016²⁷. The June 2016 Radiology Performance Report, set out that the rate of radiographers receiving an appraisal and a professional development plan had fallen in 2016 due to the high number of radiographer vacancies resulting in difficulty releasing radiographers from clinical work. The radiographer superintendents were asked to compile an action plan to complete continuing professional development reviews when staffing levels increase. The Health Board was unable to tell us the percentage of other staff working in the radiology department that received an appraisal or personal development plan in the same year.
- 113 The Health Board keeps 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. The Health Board maintains entitlement documents for referrers, practitioners and operators as required by IRMER. For referrers, the register sets out which staff have appropriate qualifications and/or training to refer patients and for which modalities the entitlement extends to. For operators and practitioners, the register sets out the qualifications and/or training of operators and practitioners, and the work they are qualified to undertake as a result.
- 114 The Health Board was unable to provide us with the percentage of staff in the service that attended each statutory and mandatory training module in 2015-2016²⁸. However, the Health Board reported in the June 2016 Radiology

²⁷ 100% of radiologists and 80% of radiographers received an appraisal of their performance and a personal development plan in 2015-16.

²⁸ The statutory and mandatory training modules are set out in the UK Core Skills and Training Framework, they are; Equality, Diversity and Human Rights; Health, Safety and Welfare; Fire Safety; Infection Prevention and Control; Moving and Handling; Safeguarding Adults; Safeguarding Children; Resuscitation; and Information Governance

Performance Report that radiographer compliance with statutory and mandatory training had reduced in 2016 due to the Health Board being unable to release staff to attend training, due to high vacancy levels. The service was particularly concerned that staff had been unable to attend manual handling training. This omission in training is potentially putting staff and patients at risk if staff are not trained in the appropriate methods of manoeuvring patients. The issue is noted in the risk register.

- 115 The Health Board told us that it was struggling to provide modality specific training to skill radiographers to undertake CT and MRI examinations. To train someone on a modality, the Health Board schedules the staff member to work almost exclusively on that modality for a few weeks under supervision. However, staffing levels at the time of the review did were not high enough to provide cover to supervise staff. The consequence of this is that the Health Board may become reliant on locums to provide imaging on the more complex imaging (CT and MRI).

The number of scanners per head of population is comparable to Wales and the Health Board is proactively optimising usage of its CT and MRI capacity

- 116 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 population²⁹. Data is not available for the separate countries of the UK.

²⁹ Organisation for Economic Cooperation and Development, **OECD Health Statistics 2014 – Frequently Requested Data**, 2014

117 **Exhibit 18** shows the number of scanners per million population for Wales in 2016. The Health Board has the same number of CT scanners per million population, but less MRI scanners per million population than Wales and UK. The number of CT and MRI scanners at the Health Board does not compare favourably with other countries in Europe.

Exhibit 18: number of CT, MRI and US scanners per million¹ population as at September 2016

Table showing the number of scanners per million population in the Health Board compared to the Welsh average.

	CT	MRI	US
Cwm Taf University Health Board	10.1	6.7	50.6
All Wales²	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

118 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.

119 In 2014, the Health Board was operating CT scanners for nine hours a day and US scanners for eight hours a day both on weekdays only. MRI scanners were operated for 13 hours a day on weekdays and 13 hours a day on Sundays at PCH. The planned usage of Health Board CT, MRI and US scanners in 2014, as a percentage of potential operating hours, was higher than the Welsh average (Exhibit 19).

Exhibit 19: percentage usage of CT, MRI and US scanners, 2014

Table showing that in 2014, the Health Board had a higher percentage usage for CT, MRI and US scanners, than compared to the Welsh average.

Type of scanner	Average number of operating hours per scanner on each day		Percentage usage of equipment ¹	
	Monday to Friday	Saturday to Sunday	Cwm Taf University Health Board	All Wales average
CT	9.0	0.0	54	52
MRI	13.0	3.3	85	66
US	8.0	0.0	48	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.

120 In 2014, if CT, MRI and US scanners at the Health Board had been operating 12 hours a day and seven days a week, we estimate that it may be possible to undertake at least an extra 100 CT scans, an extra 15 MRI scans and an extra 660 US scans a week³⁰.

121 Since 2014, the Health Board has increased the operating hours of CT and MRI scanners, with radiographers working shifts to provide CT scans 24 hours a day, seven days a week at both PCH and RGH. MRI imaging is provided 12 hours a day, seven days a week. The operating hours of US scanners is now 8 hours a day Monday to Friday at both sites. Whilst not all modalities are covered 24 hours a day and 7 days a week, the Health Board is the only health board providing around the clock cover for some modalities.

³⁰ 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 estimation is based on a CT scan length of 45 minutes, a MRI scan of 90 minutes, and a US scan of 30 minutes.

- 122 The Radiology Directorate Report 2015-16 set out that there was insufficient capacity in MRI imaging and to a lesser extent in US and CT. The Health Board plans to revise MRI and CT bookings to assist capacity and provide maximum usage of scanning equipment in operating hours.
- 123 The radiology service has periodically increased MRI capacity by outsourcing MRI examinations to a mobile MRI van. In January 2017, the Health Board financed the use of both a CT and an MRI mobile van for a three month period. The purpose of outsourcing the CT and MRI work is to reduce the waiting lists. The Health Board is exploring opportunities to outsource US scanning to other Health Boards that have unused capacity. In the medium term the Health Board will increase the number of CT and MRI scanners in the Health Board to create more capacity.

Lines of accountability for the radiology service are clear, there is good Board and corporate oversight of the service, and funding for new equipment has been secured, however, ICT is having a negative impact on the service

The radiology service has a strategic plan and produces detailed demand and capacity forecasts, but does not have a detailed radiographer workforce plan

- 124 The Health Board should have a clear strategic plan. The plan should set out how the Health Board will meet current and future demand for radiology services.
- 125 The Radiology Directorate 2016-17 to 2018-19 Integrated Medium Term Plan (Radiology IMTP) provides detail about the strategic approach and intent of the service and the challenges faced by the service and actions to mitigate them. The Radiology IMTP sets out the service's strategic objectives for 2016-2019 they are:
- to provide a high quality, sustainable, timely radiology imaging service to patients;
 - to meet eight week waiting targets for all examinations; and
 - to achieve Welsh standard reporting turnaround times and monitor progress regularly.
- 126 The Radiology IMTP sets out that radiology service aims to deliver on Health Board objectives, and has considered the principles in the Social Services and Well-being (Wales) Act 2014 and Well-being of Future Generations (Wales) Act 2015. Whilst the Radiology IMTP sets out the Health Board's aim to shift care from the secondary sector to the primary sector, it does not outline how the radiology service will play its part.

- 127 The Health Board told us that the radiology service met with referring specialties, the Local Medical Committee, Directors of Primary Care, specialty leads and key stakeholders to engage them with the development of the strategy. However, there were mixed views from consultants that we interviewed; some felt that their specialty was consulted on the development of the Radiology IMTP, whilst others did not. Senior members of the radiology team are engaged in the development of the Radiology IMTP, but the radiology service does not consult all team members.
- 128 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. 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.
- 129 The radiology service reviews the integrated medium term plans of other directorates and meets with key staff to understand developments occurring elsewhere in the Health Board, but will impact on the radiology service. The Radiology IMTP summarises the service changes occurring in other directorates, and the degree to which they will impact on the radiology service.
- 130 There was agreement by the radiology team members and consultants that the radiology service is informed of major service changes, such as changes to patient pathways. However, radiology team members told us that they were not always informed of decisions that would have a lesser effect on the service, for example the appointment of new consultants. The radiographers we spoke to told us that while such changes on their own may not have much impact on the radiology service, the accumulative impact of many such changes can have a significant effect.
- 131 Each radiology service should have an agreed documented annual operational delivery plan. The operational plan(s) 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,
- 132 The Health Board produces detailed demand and capacity calculations covering CT, MRI and US imaging. The spreadsheets set out the core scanning capacity, and uses historic demand and forecasted future demand to provide monthly analysis of the number of examinations that will be undertaken, and the impact on waiting lists. The calculations show the impact on waiting lists when possible scenarios that can reduce the waiting times are factored in, such as the use of additional private scanning capacity or staff overtime.

- 133 The Health Board set out plans in April 2016 to adopt some aspects of the Danish diagnostic service³¹ for early diagnosis of possible cancer. The main purpose is to provide patients who have some symptoms, but not clear symptoms of a specific cancer, with early diagnostic tests. Other changes the Health Board would like to introduce is one-stop diagnostic clinics, for patients requiring more than one diagnostic test. The Health Board has not set out how the radiology department will respond to the increase in workload for the radiology department.
- 134 The Radiology IMTP, as well as setting out the strategy, also includes the operational plans for delivering the strategy. The Radiology IMTP includes a workforce plan (the Plan) for radiologists. The plan includes the historical FTE of radiologists for each year since 2008, and the anticipated FTE up to 2019. The Plan sets out the aim to increase the number of radiologists employed by two FTE. Also set out, is the need to replace any existing radiologist posts if they become vacant, the need to increase the radiologist FTE if demand increased by more than expected, for example, in response to currently unknown service developments. The Plan sets out the challenges posed by the ageing consultant population and difficulties in recruiting radiologists.
- 135 However, the plan does not set out any specific areas where recruitment or training of existing staff is required. Whilst the plan sets out the intention to reduce radiologist workloads to ten sessions a week, there is no indication of how this will be achieved, or account for time required for radiologists to comply with standards, or attend multi-disciplinary team meetings.
- 136 There is no equivalent workforce plan for radiographers or other staff working in the radiology service.

The management structure and lines of accountability are clear, and management meetings are both strategically and operationally focused

- 137 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.

³¹ In Denmark a system operates where patients who do not have clear symptoms of a specific cancer are offered diagnostic tests within a few days, or sometimes hours of a GP making a referral. Special 'one stop shop' diagnostic centres have been set up for those with more vague symptoms, while other open access centres are able to provide quick 'yes/no' tests and to report back quickly to GPs. Clinicians in Denmark say the tests do not cost more money as they would need to be done anyway, but that early diagnosis for those with unclear symptoms means better outcomes for patients.

- 138 The Radiology Directorate is managed by the Clinical Director and Directorate Manager. The Clinical Director is the budget holder for the service and responsible for the operational development of radiology services and workforce development. The Clinical Director reports operationally to the Executive Lead for the Radiology Directorate who is the Chief Operating Officer and Director of Therapies and Health Science. The Clinical Director also reports directly to the Medical Director in respect of clinical governance. The Directorate Manager is accountable managerially and operationally to the Clinical Director, and in terms of radiography governance standards, to the Chief Operating Officer and Director of Therapies and Health Science.
- 139 The current structure had been in place for approximately five years and is well established. The radiology staff we interviewed felt the structure worked well and that there are clear lines of accountability. The Clinical Director and Directorate Manager said that they felt it was beneficial that there were few management layers and that it was easy for them to speak directly to the Medical Director and the Chief Operating Officer and Director of Therapies and Health Science.
- 140 The key forum for the service is the monthly Clinical Business Meeting, which is attended by the Chief Operating Officer and Director of Therapies and Health Science, the Clinical Director, the Directorate Manager, the Director of Finance and any other staff members that are relevant to the discussion. Staff from other specialties are only invited when pertinent to the discussion. There is a set list of topics for discussion and updates, including each modality, staffing, IT, equipment, finance, patient safety, outsourcing and forward plans. After each meeting a report summarising the discussion and identified risks is produced.

The service is well represented on Board committees and sub-committees

- 141 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 quality and safety, workforce and organisation development and risk management committees. Radiology should feature sufficiently often on committee agendas to help ensure wider awareness of the service and its issues.
- 142 Across Wales, we found variation in the degree of radiology team representation on key board committees. We found that the radiology service at the Health Board is represented on key Board Committees by the Executive Lead for radiology, the Chief Operating Officer and Director of Therapies and Health Science. The Executive Lead is a Board member and also a member of both the Quality, Safety and Risk Committee and the Finance, Performance & Workforce Committee. Radiology is a standing agenda item on both committees. At the May 2016 Quality, Safety and Risk Committee the Radiology Directorate annual report was presented.

In recent financial years, the service spend has been within budget, although savings targets have not been met

- 143 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.
- 144 The radiology service does not have a specific strategic financial plan, but the radiology service prepares a financial update for the Finance, Performance & Workforce Committee (the Committee). The Committee meets every three months. The financial report clearly sets out the financial position for the radiology service and the reasons for any over or underspend. The Committee also monitors in-year financial spend on a rolling basis. In 2014-15 the service underspent by £85,000 and in 2015-16 by £338,000 (**Exhibit 20**).

Exhibit 20: radiology service budget comparison with expenditure (£ million) 2014-15 and 2015-16

Table showing the variance between the radiology service budget and actual expenditure.

		2014-15	2015-16
Health Board	Budget (£ million)	9.7	10.0
	Expenditure (£ million)	9.6	9.7
	Variance	-0.9%	-3.4%

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

- 145 The November 2016 Finance, Performance & Workforce Committee minutes highlight that the month six spend for 2016-2017 was £74,000 over budget, this mainly attributed to increased spend on outsourced out-of-hours CT examinations reporting. The minutes note that urgent work is needed to address the significant increase in CT reporting costs over the last three years.
- 146 Over the last three years the services cost improvement programme has become more ambitious. Over these years the radiology service has achieved cost saving through measures such as cost reductions, role redesign and looking for efficiencies. During the three years between 2013-14 and 2015-16, the service missed its savings targets by:
- £47,000 in 2013-14, the target was £142,000,
 - £33,000 in 2014-15, the target was £205,000, and
 - £24,000 in 2015-16, the target was £255,000.
- 147 The November 2016 Finance, Performance & Workforce Committee minutes highlight that in month six of 2016-17 the radiology service was below the target to achieve a saving of £233,000.

The radiology service has developed a comprehensive equipment replacement programme, and the Health Board has secured funding for both new and replacement equipment

- 148 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.
- 149 The European Society of Radiology³² 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.
- 150 In November 2015, NHS Wales anticipated that 87% of imaging department scanners would require replacement by 2017³³. **Exhibit 21** shows the age of CT, MRI and US scanning equipment at the Health Board.

³² European Society of Radiology, **Renewal of Radiological Equipment**, September 2014

³³ Diagnostic Service Programme NHS Wales, **All Wales Gantry (MRI, CT, Gamma Camera and Ultrasound) Usage/Capacity**, November 2015

Exhibit 21: age of CT, MRI and US equipment at the Health Board as at September 2016

Table showing the age of CT, MRI and US equipment at the Health Board, and that many scanners have either beyond or reaching average device expectancy

		CT	MRI	US
Age of scanners at the Health Board (years) ¹	Prince Charles Hospital	9	8	4 (average of 6 scanners)
	Royal Glamorgan Hospital	10	5	4 (average of 6 scanners)
	Ysbyty Cwm Rhondda	Not applicable	Not applicable	4, 5, 6
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)

- 151 There is a register of all radiology equipment and the age of each item in the Radiology Directorate Capital Plan 2016-18 (the Capital Plan). Whilst the intensity of use is not provided, for key items needing replacement, the limitations of the equipment, such as image quality and maintenance needs are included. The Capital Plan sets out the cost of the key equipment required, and for each item there is a Business Case.
- 152 The Capital Plan sets out that the highest clinical risk posed by radiology equipment at the Health Board is the CT scanner at PCH. At the time of our review, the scanner was breaking down approximately every eight weeks. When the equipment breaks down, it directly affects the care of critically ill emergency and stroke patients (stroke care is centralised to PCH). Both CT scanners at the Health Board are in excess of nine years old.
- 153 The Capital Plan sets out the other key equipment requiring replacement including fluoroscopy equipment, the MRI scanner and three US scanners, all at PCH. There are concerns about the adequacy of the resolution of images produced by the MRI scanner at PCH meaning that some types of MRI examinations are transferred to RGH.
- 154 Whilst other radiology equipment is beyond its replacement due date, the Health Board is happy that they are still satisfying their function and not posing a clinical risk to patients. However, older items and equipment are more likely to break down and there is a risk that parts may be difficult to replace.

- 155 The Capital Plan sets out that a replacement CT scanner is required at PCH, and an additional CT and MRI scanner is required at RGH to accommodate increasing demand in the Health Board.
- 156 Radiographers at the Health Board told us of the need of a planned approach to equipment replacement. In previous years, at the end of the financial year, money has been identified for replacement of radiology equipment, however, the money was usually only enough for less expensive equipment, such as US scanners, rather than more expensive equipment, such as CT and MRI scanners. A CT scanner can cost upwards of £800,000 and there are also additional installation costs. In 2014, the Health Board secured Welsh Government funding to replace the CT scanner at RGH. However, due to the installation costs and the difficulties of installing a new CT scanner without decommissioning the existing scanner, more than two years later the CT scanner is still in storage.
- 157 The Capital Plan acknowledges that in previous years there was no planned approach to equipment replacement. The production of the Capital Plan provides a three year plan to highlight the financial implications for each year. The Health Board has also developed on the shelf business cases for equipment, which could help them take advantage of short notice capital opportunities.
- 158 The clinical space within the radiology department at RGH is currently being expanded as part of a £1million capital investment by the Health Board, which will also be the foundation of a future 'Diagnostic Hub' at Royal Glamorgan Hospital with two MRI and two CT scanners. The Diagnostic Hub is intended to;
- meet all of the Health Board's current imaging needs to the relevant standards; and
 - meet the Health Board's future demand, including those resulting from service developments, such as the one stop clinics (for example, the Danish Model); and
 - provide additional examination capacity for all neighbouring health boards.
- Given the difficulties the Health Board has had recruiting radiographers, the Health Board will need to ensure that the required staffing level is achieved.
- 159 In November 2016, it was announced that the Welsh Government will provide the Health Board with £6million to purchase and install both a new CT scanner, an MRI scanner and other medical equipment for the Diagnostic Hub. The new scanners will provide capacity for an additional 7,232 MRI scans and 6,599 CT scans per year. The existing CT scanner at RGH will be replaced with the CT scanner currently in storage. When the funding was announced by the Welsh Government, the Health Board was unable to confirm when the Diagnostic Hub would be functional.
- 160 In December 2016, it was also announced that the Welsh Government would provide an additional £1.7million to replace the CT scanner at PCH.

Generally, radiology ICT systems do not serve the Health Board's needs

- 161 Having effective ICT 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.
- 162 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.
- 163 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.
- 164 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 professionals³⁴. 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.
- 165 The Health Board does not have an electronic referral system, and so paper referrals are manually typed into RADIS. The Health Board has two separate instances of RADIS, one covering the RGH area, and the other covering the PCH area. The IMTP sets out the highest priority for the service is for one merged instance of RADIS covering the whole Health Board. The merger was planned to be undertaken by NWIS in March 2016, however, the Health Board's October Quality and Safety Board Committee minutes reported that the merger had still not taken place.
- 166 Having two separate instances of RADIS means there are two separate waiting lists. If the Health Board wants to review a combined waiting list to identify the longest waiting patients, the two lists must be extracted from RADIS and merged. If

³⁴ 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.

a patient is transferred from one waiting list to the other, the patient details must be re-entered onto RADIS, and the Health Board has to ensure that both instances of the patient record are updated manually. Clinicians at RGH cannot view the patient details and procedure details of examinations held on the PCH instance of PCH and vice versa.

- 167 The Health Board told us that they do not rely on the performance reports generated by RADIS, as they are aware that there are duplicate entries of patients in some reports. Also, the Health Board is only able to generate separate reports for the two instances of RADIS. To generate combined reports, the Health Board must extract the data from both systems, and as a consequence, is reviewing third party software to generate the performance reports they require.
- 168 Generally, the Health Board is satisfied with the PACS system. However, some staff at the Health Board told us that PACS cannot provide 3D images, such as where other information is overlaid over a CT scan. PACS has embedded links to a 3D visualisation tool which provides a comprehensive set of 3D tools that launch in context from the PACS, it is possible that some of the difficulties that the Health Board has with producing 3D images is a result of bandwidth issues or that there is a training requirement for staff.
- 169 All radiologists can access the PACS system out-of-hours from home. Medical staff that work within hospital sites in the Health Board can view images held on PACS. However, GPs and NHS staff working outside of the Health Board are unable to access images on the PACS system.
- 170 The Health Board uses G2 Speech software to enable dictation of reports. The Health Board told us that IT issues, believed to be a network bandwidth issue, result in the G2 system frequently freezing and timing out. The consequence of the system freezing, is the loss of all reports being dictated in the session. This is impacting on the efficiency of reporting of images, as it frequently means that reports need to be dictated a second time.
- 171 The Health Board told us that radiologists and radiographers responsible for reporting images are unable to easily identify examinations that have not yet been reported, meaning manual checks are required.

Radiology performance is regularly reviewed at corporate and management level. However, whilst radiology reports comprehensively set out the service's strengths and weaknesses, little use is made of comparative performance information

- 172 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.

- 173 Benchmarking enables health organisations to improve performance through comparison with other similar organisations. One source of comparative data that health 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 data collection. While the Health Board participates in the NHSBN radiology data collection, there is little evidence in the radiology service's reports that the data is used to benchmark the Health Board's performance with other health boards.
- 174 The minutes of the monthly clinical business include a traffic light scorecard, recording whether the Health Board is on target to achieve the following objectives:
- provide and develop healthcare services which meet the current and future healthcare needs of the population we serve;
 - all healthcare services provided are clinically effective, safe and of a high quality;
 - work collaboratively with patients and other stakeholders to promote effective engagement at all levels;
 - make the best use of financial resources and maintain financial sustainability
 - attract, retain and enhance the skilled workforce we need to deliver services and successfully respond to change;
 - establish a regulatory framework and ensure compliance;
 - make the best use of information and knowledge to support the effective planning, delivery and management of performance; and
 - develop a culture of leadership and learning within the LHB to enable continuous improvement, drive innovation, realize benefits and promote personal development
- 175 The Health Board is investing in the development of QlikSense, an analytical software package, to help produce reports and further analysis of radiology data. However, progress is slow, due to difficulties with interfacing QlikSense with RADIS.
- 176 It is not clear what factors are considered in coming to a judgement on each objective, nor what constitutes achieving the target. The report identifies and summarises service strengths and weaknesses. Whilst the report includes detailed explanations of the issues facing the service, there is little data or performance information provided, and there is no comparative data comparing performance with other health boards.
- 177 For the quarterly Quality & Safety Committee meetings, each Directorate, including the Radiology Directorate provides a report on quality and safety issues, including waiting times, staffing levels, staff training compliance, incidents and equipment

age and safety. Radiology reports include actions to mitigate any concerns. The radiology service also produced an annual Quality and Safety Report, which includes detail of the challenges facing the service during the year, but little performance data other than the number of serious incidents.

- 178 Radiology financial performance is reported to the Finance, Workforce and Performance Committee, however in the September and November 2016 meeting minutes, there is little evidence of discussion about workforce issues in the minutes.

Appendix 1

Audit approach

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

Exhibit 22: audit approach

Table outlining audit approach used for this review.

Method	Detail
Information and data collection	<p>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.</p> <p>We also utilised data and information from a number of other sources, including:</p> <ul style="list-style-type: none">• 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.
Document request	<p>We requested and reviewed documents from the Health Board including:</p> <ul style="list-style-type: none">• 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;

Method	Detail
	<ul style="list-style-type: none"> • 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	<p>We interviewed a number of staff including:</p> <ul style="list-style-type: none"> • Radiology Directorate Manager • Radiology Clinical Director • A sample of consultants selected by the Health Board: Surgery, Medicine, Accident and Emergency and Anaesthetics
Focus groups	<p>We carried out focus groups as follows:</p> <ul style="list-style-type: none"> • Radiographer Senior Leads at PCH and RGH • GP Locality Leads

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 23: The Health Board's management response to the recommendations:

Ref	Recommendation	Intended outcome/ benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R1	Develop an action plan detailing how waiting-time targets will be achieved in the short term, and how the radiology service will sustain a reduction in waiting times going forwards. (Setting out how the use of locums, and outsourcing of examinations and other actions will help the Health Board achieve targets).	Reduce waiting times for patients.	Yes	Yes	<p>Waiting Times Targets achieved for 2016/17, with no over 8 weeks waiting @ 31 March 2017.</p> <p>Action Plan developed to sustain improved waiting times position which includes:</p> <ul style="list-style-type: none"> • Additional capacity to be continued • CT & MRI commissioned for 7 day working • Continued use of Locum staff (13) (long and short term locums) whilst continuing to recruit substantive staff, across both DGH sites to support CT, USS and General Radiology work. 	31 March 2017	<p>Clinical Director (CD) Radiology</p> <p>Directorate Manager (DM) Pathology and Radiology</p>

Ref	Recommendation	Intended outcome/benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R2	Develop an action plan detailing how reporting backlogs will be managed sustainably. (Setting out how extended practice radiographers, outsourcing of reporting and other actions will achieve reporting targets).	Reduce reporting backlog, leading to quicker reporting turnaround times, and reduce excessive long waits experienced by some patients.	Yes	Yes	Plan in place to develop UHB Action plan, which includes; <ul style="list-style-type: none"> Reporting radiographer (lead post) currently being recruited to – this post will coordinate and oversee development of radiographer reporting capacity including identification of areas of development, sourcing appropriate training and planning capacity. Expansion of radiographer reporting capacity in the area of GP plain film underway, including better use of current Advance Practice Radiographers. In the process of appointing to General Reporting Radiographer post, which will provide additional capacity to support further developments into GP/Chest and Abdomen reporting. 	30 June 2017	Clinical Director (CD) Radiology Directorate Manager (DM) Pathology and Radiology

Ref	Recommendation	Intended outcome/benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R3	Develop and implement regular auditing of reporting turnaround times and lost/late reports.	Reduce reporting times, and reduce excessive long waits experienced by some patients. Identify and eliminate lost/late reports.	Yes	Yes	Working with Information department to develop an effective audit tool using QlikSense to; <ul style="list-style-type: none"> • Report turnaround times; and • Lost/Late reports 	31 August 2017	Directorate Manager (DM) Pathology and Radiology Superintendent Radiographer Information Manager
R4	Review the appraisal and PDP rates of non-clinical radiology staff. Ensure that all radiology staff have received an appraisal and PDP within the previous 12 months in line with the Health Board's target rate.	Well supported staff, encouraged to reach their full potential. Better understanding of individual and team training needs	Yes	Yes	There is a general improvement in PDP rates and a commitment to achieve agreed targets which are routinely monitored at monthly Clinical Business Meetings (CBMs). A forward plan of PDP dates is in place.	31 December 2017	Directorate Manager (DM) Pathology and Radiology Superintendent Radiographers
R5	Routinely review the number of radiology staff compliant with statutory and mandatory training, and set a target rate for compliance to be achieved in one and two years' time.	Staff compliant with statutory and mandatory training and reduced risk to staff and patients.	Yes	Yes	For Mandatory training, the target is 100% for level 1 (Core Skills Training Framework) over a 2 year period. Mandatory training compliance continues to improve and there is routine monitoring of performance at the monthly CBM.	31 August 2017	Directorate Manager (DM) Pathology and Radiology Superintendent Radiographers

Ref	Recommendation	Intended outcome/benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R6	Develop a short-term strategy to address staff shortages of radiographers.	Clarity on how the Radiology Directorate's plans to address radiographer vacancies in the short term.	Yes	Yes	<p>The Directorate has a refreshed 3 year Integrated Medium Term Plan (IMTP) for this coming year, which includes workforce planning.</p> <p>The Directorate is engaged fully with the workforce modernisation lead in order to take forward its recruitment strategy, which includes maintaining Locum staff (short and long term locums), whilst it continues to recruit graduates and its recruitment strategy is being taken forward.</p> <p>Radiology specific modernisation workshop held and the related actions that help in identifying new opportunities are being taken forward.</p> <p>Similar to our Nurse and Medical recruitment campaigns, the UHB has commissioned an external marketing organisation to work with us on our recruitment and information campaign for Radiology.</p>	<p>30 March 2017</p> <p>Summer 2017</p>	<p>Clinical Director (CD) Radiology</p> <p>Directorate Manager (DM) Pathology and Radiology</p> <p>Head of Communications</p>

Ref	Recommendation	Intended outcome/benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R7	Develop a plan/strategy with referring specialties to identify both major and minor changes that will impact on radiology demand (such as recruitment of new consultants, changes to patient pathways, etc).	To enable the radiology service to understand the totality of potential extra demand. To enable the service to consider and put in place, where required measures to address additional demand.		In Part	The Directorate has developed a Demand & Capacity Plan, referenced within the Directorate IMTP, which includes: <ul style="list-style-type: none"> • Ensuring demand assumptions are based on a combination of national benchmarking and local monitoring of demand rises. • Engaging with referring directorates – e.g. cardiac services, primary care clusters. • Working with information department on demand and capacity modelling. • Ensuring Radiology directly involved with pathway changes such as Early Cancer pathway/vague symptom clinics. • Radiology to work with planning to formalise change planning approach in regard to Radiology. 	30 June 2017	Directorate Manager (DM) Pathology and Radiology Planning Business partners

Ref	Recommendation	Intended outcome/benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R8	Develop a radiographer workforce plan alongside the radiology strategy, which identifies the baseline capacity needed to sustainably meet radiology demand in a timely and safe way.	Clarity on the Directorate's radiographer/sonographer current and one-to-two year workforce requirements. Having a plan will help to enable the Health Board to proactively address gaps in capacity.		In Part	<p>The Directorate's IMTP which links to its workforce plan and related recruitment Strategy (linking with the Radiology Strategy), includes;</p> <ul style="list-style-type: none"> • Demand & Capacity Plans; <ul style="list-style-type: none"> – Additional Sonographers – Additional Radiographers <p>Further related work is being progressed to consider the most appropriate skill mix (including options for grade and skills) of staff required for scanning.</p> <p>The workforce plan (within the Directorate IMTP, will be revised in line with business partner input and support.</p>	31 August 2017	<p>Clinical Director (CD) Radiology</p> <p>Directorate Manager (DM) Pathology and Radiology</p> <p>Workforce Business partners</p>
R9	By mid-2017 identify potential staffing requirements for the Diagnostic Hub, and develop a recruitment strategy.	Clarity on the Directorate's future workforce requirements, to enable the Health Board to plan a recruitment strategy, particularly given current recruitment difficulties.	Yes	Yes	<p>Project for diagnostic hub staffing underway including assessment of requirements of staffing and skill mix to enable hub commissioning.</p> <p>Strategies for recruitment and retention of graduates are also included within the plan.</p>	31 August 2017	<p>Clinical Director (CD) Radiology</p> <p>Directorate Manager (DM) Pathology and Radiology</p>

Ref	Recommendation	Intended outcome/benefit	High priority (yes/no)	Accepted (yes/no)	Management response Actions identified:	Completion date	Responsible officer
R10	<p>Further develop the range of performance measures to support business reports by reviewing existing measures and identifying gaps.</p> <p>Measures should include equipment usage, the number of unreported images, average report turnaround times, longest report turnaround times and waiting times.</p> <p>Workforce measures such as planned versus actual staffing levels, vacancies, sickness rates, and appraisal and PDP rates along with compliance against training should also be reported.</p>	Better understanding of service performance to inform and support continuous improvement.	Yes	In Part	<p>A suite of performance measures is already in place and been developed during the year as a consequence of strengthened business intelligence systems, including QlikSense. This includes;</p> <ul style="list-style-type: none"> • Waiting times are reported to CBM currently – including numbers over 8 weeks – currently 0. • PDP and Appraisal rates, along with Core Skills Training Framework compliance are reported to CBM, currently – these are not included in the Directorate report submitted to WAO and form a separate element of the CBM agenda. • Vacancies and recruitment positions/plans are reported to CBM currently. • Sickness rates are reported to CBM currently. • Compliance against training is reported to CBM currently. <p>Further measures including reporting indicators will be agreed and developed and factored into directorate reporting, aligned with established automatic reports via QlikSense software.</p>	31 October 2017	<p>Clinical Director (CD) Radiology</p> <p>Directorate Manager (DM) Pathology and Radiology</p>

Wales Audit Office
24 Cathedral Road
Cardiff CF11 9LJ

Tel: 029 2032 0500

Fax: 029 2032 0600

Textphone : 029 2032 0660

E-mail: info@audit.wales

Website: www.audit.wales

Swyddfa Archwilio Cymru
24 Heol y Gadeirlan
Caerdydd CF11 9LJ

Ffôn: 029 2032 0500

Ffacs: 029 2032 0600

Ffôn testun: 029 2032 0660

E-bost: post@archwilio.cymru

Gwefan: www.archwilio.cymru