

Scottish Radiology Transformation Programme

**Radiology Current
Operating Model (COM)
Package**

**11th of
February
2021**

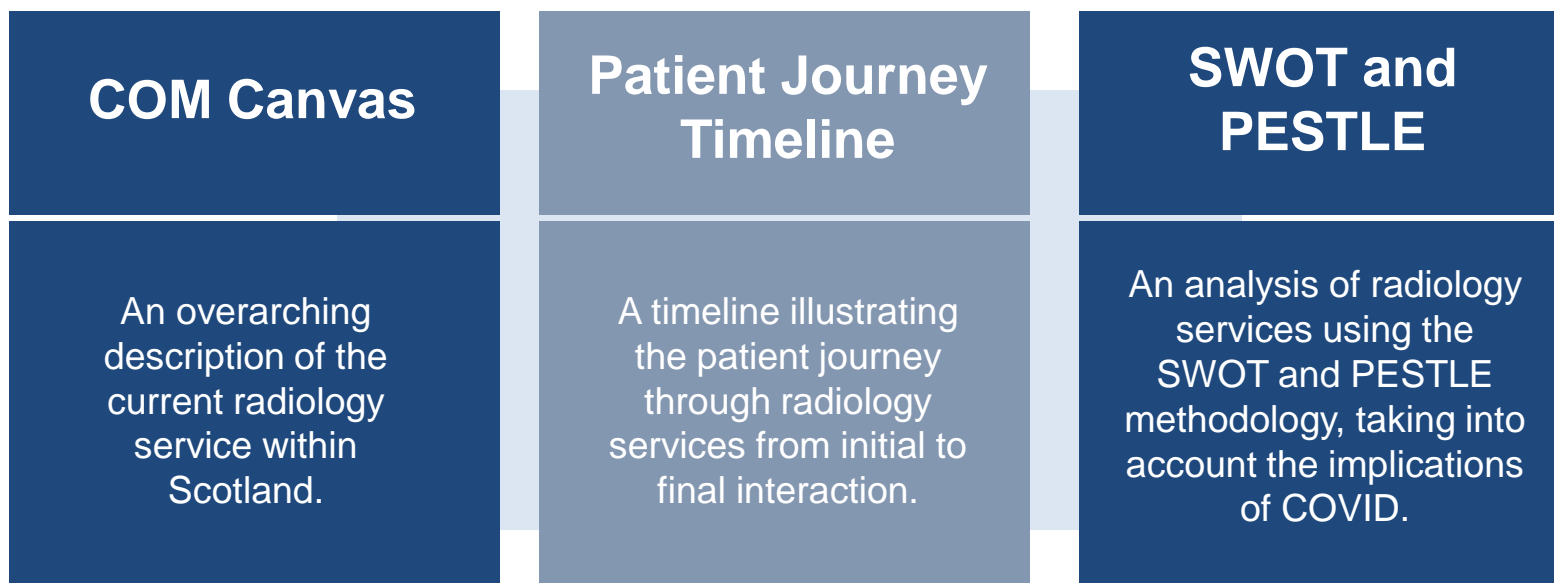
Contents

➤ Current Operating Model (COM) Overview	
➤ <u>COM Canvas Structure</u>	4
➤ Current Operating Model (COM) Canvas	
➤ <u>Capabilities and Culture</u>	5
➤ <u>Digital Technology</u>	12
➤ <u>Organisation of Radiology Services</u>	17
➤ <u>Business Information and Data</u>	23
➤ <u>Education and Training</u>	30
➤ <u>Processes</u>	34
➤ Appendices	40

Current Operating Model (COM) Overview

The purpose of defining the Current Operating Model (COM) is to understand and set a baseline for how radiology services within Scotland currently operate and to help inform decision making in building the future Target Operating Model (TOM).

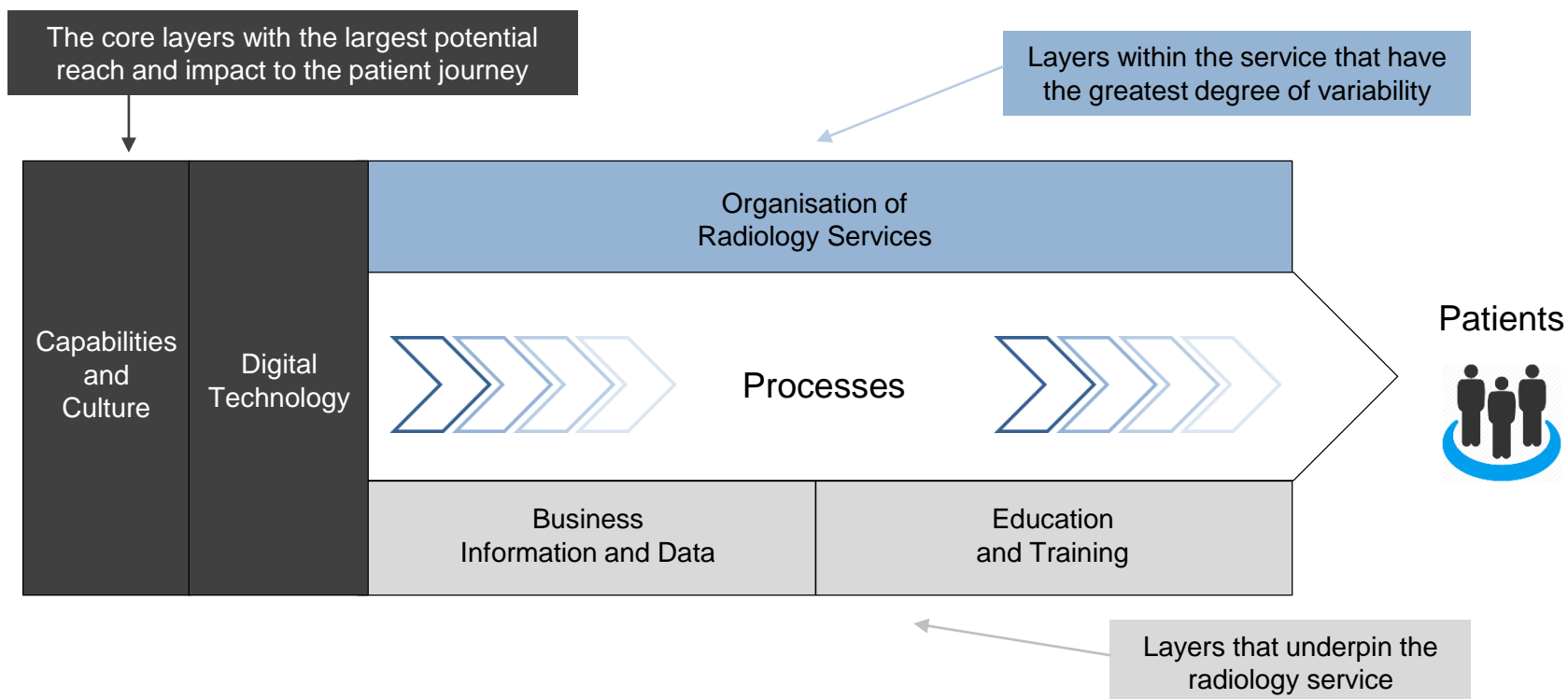
The COM will outline what the current service looks like through three core components:



COM Canvas Structure

The Current Operating Model Canvas provides an overarching description of the current radiology service within Scotland. Through deconstructing the radiology services into constituent layers, the current framework can be systematically mapped and analysed to provide a greater understanding of how the current radiology service works.

The framework structure below details the key layers in relation to their position in the canvas.



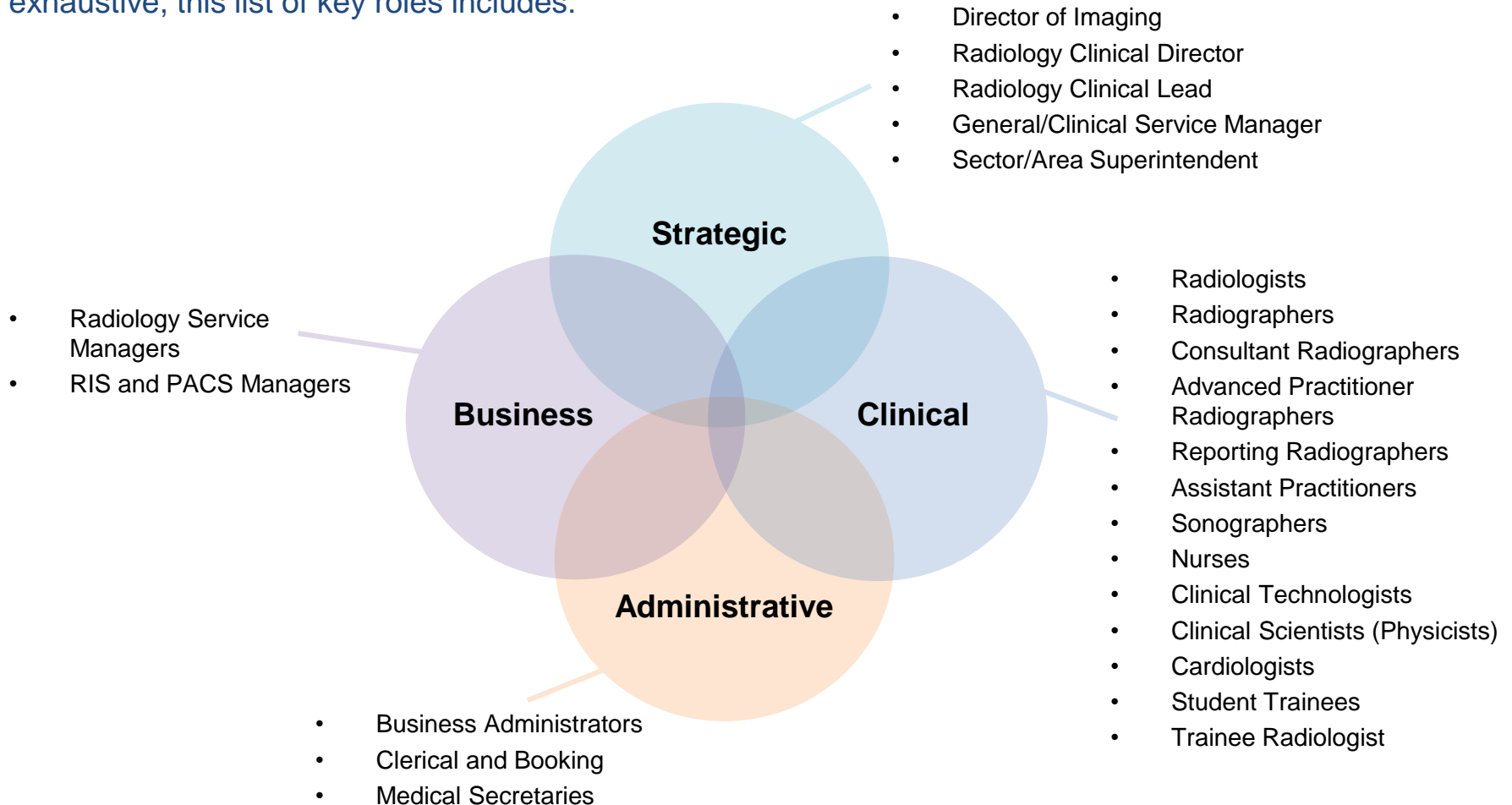
Capabilities and Culture



***The mix of skills,
roles, people and
vacancies in the
current radiology
service***

Skills and Roles within the Radiology Team

There are a number of strategic, clinical, business and administrative roles that provide a unique set of skills which will be involved in the delivery of radiology in Scotland. Although not exhaustive, this list of key roles includes:



Clinical Workforce - Radiologist

The RCR (the Royal College of Radiologists) census 2019 reports that there is a severe shortage of consultant radiologists across Scotland. Please note the North East Region area included below contains the following health boards: NHS Highland, NHS Grampian, NHS Tayside and NHS Western Isles (excluding NHS Orkney and NHS Shetland).

Headcount

Despite Consultant Radiology numbers growing by 5% from 2018-19 (**five times higher than the average year on year growth rate over the last five years**), the additional posts will only match the forecasted number of retirements.

	North East Scotland	South East Scotland	South West Scotland	Scotland total
Consultant-grade	67	85	195	347
Speciality trainee	21	58	79	158
SAS-grade	2	1	1	4
Total	90	144	275	509

Capacity

As of 2019 there was a shortfall (gap between capacity and activity) of **141 WTE Consultant Clinical Radiologists in Scotland**. Capacity of Clinical Radiologists, in contrast with demand, is forecasted to continue to decrease unless action is taken.

	North East Scotland	South East Scotland	South West Scotland	Scotland total
Imaging examinations (financial year (2018-2019))				
CT examinations	119,397	138,714	394,909	653,020
MRI examinations	53,818	61,872	131,685	247,375
X-rays	476,125	661,655	1,288,505	2,426,285

Largest Disparities

- Provision of interventional radiology services in Scotland is estimated to have a **shortage of 45%** (32 WTE)
- The shortage of breast radiologists in Scotland is likely to increase rapidly over the next five years, as many specialists are approaching retirement age and only a small number of newly qualified Consultant Clinical Radiologists are choosing to specialise in this area. Currently in some health boards, this is now being supported by consultant radiographer led services
- The shortage of Consultant Clinical Radiologists in the **North region (43%)** of Scotland is **higher than any other area nationally (31%)**

Workforce Trends

- The 2019 RCR census report outlined that Radiologists are currently feeling overworked and undervalued. **1/3 report feeling stressed and burnt-out**, with an estimated impact of attrition of 1% per year over the next five years (n=18 WTE)
- In order to maintain a greater work life balance there has been an increase in demand for less than full-time working (LTFT). Since 2014, **the workforce capacity loss due to LTFT working has resulted in a loss of nine WTE**

Clinical Workforce - Radiographer

Managing the increase in demand of radiology services will also require an increase in capacity for strategic, business, administrative and clinical roles, especially radiographers. Although there is no comparable census for radiographers throughout Scotland as there is for radiologists, the SCoR (The Society & College of Radiographers) undertakes an annual UK wide workforce census that outlines radiographer workforce data (this process is currently voluntary).

The 2019 SCoR Diagnostic Radiographer census outlines the current shortfall (number of vacancies as a percentage of establishment WTE) as **6.3%** in Diagnostic Radiographers throughout Scotland, the second highest vacancy rate in the UK (**Appendix 1.1**). Currently most health boards have a high number of vacancies which has been worsened due to the impact of COVID-19. The information below outlines some of the SCoR census's findings.

By headcount **3.7%** of diagnostic radiographers in the UK are due to retire in the next two years (largest % of retirements stemming from Bands 8B and 8C). Significant numbers of radiographers are employed on locum and through private provision for acquisition.

The main reasons diagnostic radiographers in the UK give for leaving their posts are:

- promotion in other centre – 71%
- retirement – 59%
- personal reasons – 53%

- 5.6% of diagnostic radiographers are in postgraduate education (majority in either reporting or ultrasound)
- 11.4% of diagnostic radiographers, sonographers and nuclear technologists working at advanced practice and 0.8% as consultant grades
- 72% of respondents to the UK census indicated they used either diagnostic radiography or sonography agency staff (or both)

Recruitment

Board level recruitment is in many ways a competitive process whereby applicants can negotiate with individual boards around the structure of the role they are applying for (this has in turn resulted in an internal competitive market throughout Scotland). The ability of individual boards to construct an attractive enough job plan, in what is essentially a buyer's market, may be compromised by factors such as the ability to satisfy applicants' subspecialty interests within a board.

The RCR census 2019 reported that the Consultant Radiologist **vacancy rate is continuing to increase** (10% in 2019 – **Appendix 1.2**). The Scottish Government has committed to 10 additional training places per year for the next five years (2019-2024). The RCR census 2019 suggests **further expansion in training numbers** from 32 to 47 per year, with the need to reduce annual attrition from 10% to 5%.

Based upon the UK average age of retirement of 60 years, an estimated 65 WTE consultants in Scotland – **equivalent to 20% of the current consultant workforce** – are expected to retire over the next five years. This level of attrition will put additional strain on the current radiology workforce (**Appendix 1.2**).

Vacancies are not spread evenly across health boards and in recent years there has been significant migration of established consultant radiologists from smaller and more remote health boards to the larger teaching centres. Recruitment to Consultant Radiologist posts is currently carried out at individual board level, with a recent test of change carried out using a single international recruitment process, with candidates interviewed for specific board posts.

Radiographer recruitment is largely impacted via geography. Students who have studied or lived within a health board are more likely to stay and work locally after their studies. Health boards where training centres are situated tend to find it easier to recruit radiographers when compared to rural health boards, but are limited to the number of students universities can produce.

Advanced Practice

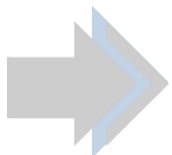
Adequate Radiographer workforce continues to be a challenge with a lack of Advanced Practice (AP) roles and graduate supply. This compounds overall workforce supply issues and reduces the flexibility to accommodate demand. In order to counteract this, the Advanced Practice project, being managed by the SRTP team, will test increasing the use of advanced practice to increase overall capacity.



Radiographers have expanded their role over the years to encompass some aspects of image reporting. However, there is a wide variation in employment practices for APs across the country, including their scope of practice and ability to dedicate time to AP roles. The net effect of this variation is that this workforce resource is not being utilised to capacity and the transferability of skills across NHS Boards is limited.



As with undergraduate training, clinical placements pose a similar problem. Larger NHS Boards find it easier to support training due to higher levels of activity in particular areas of AP and a larger multi-disciplinary staff group who can support those trainees. Co-ordination of placements across a wider geography and linked to a national workforce plan would be of benefit. This could potentially be achieved through an academy model linked to universities who provide specialist modules as part of the education profile.



Backfill arrangements are cited as a major issue in terms of their ability to release staff to train, and therefore engage in a structured Advanced Practice (AP) programme. Again, this is a function of a lack of fundamental capacity, with insufficient numbers of graduate Radiographers and Assistant Practitioners.

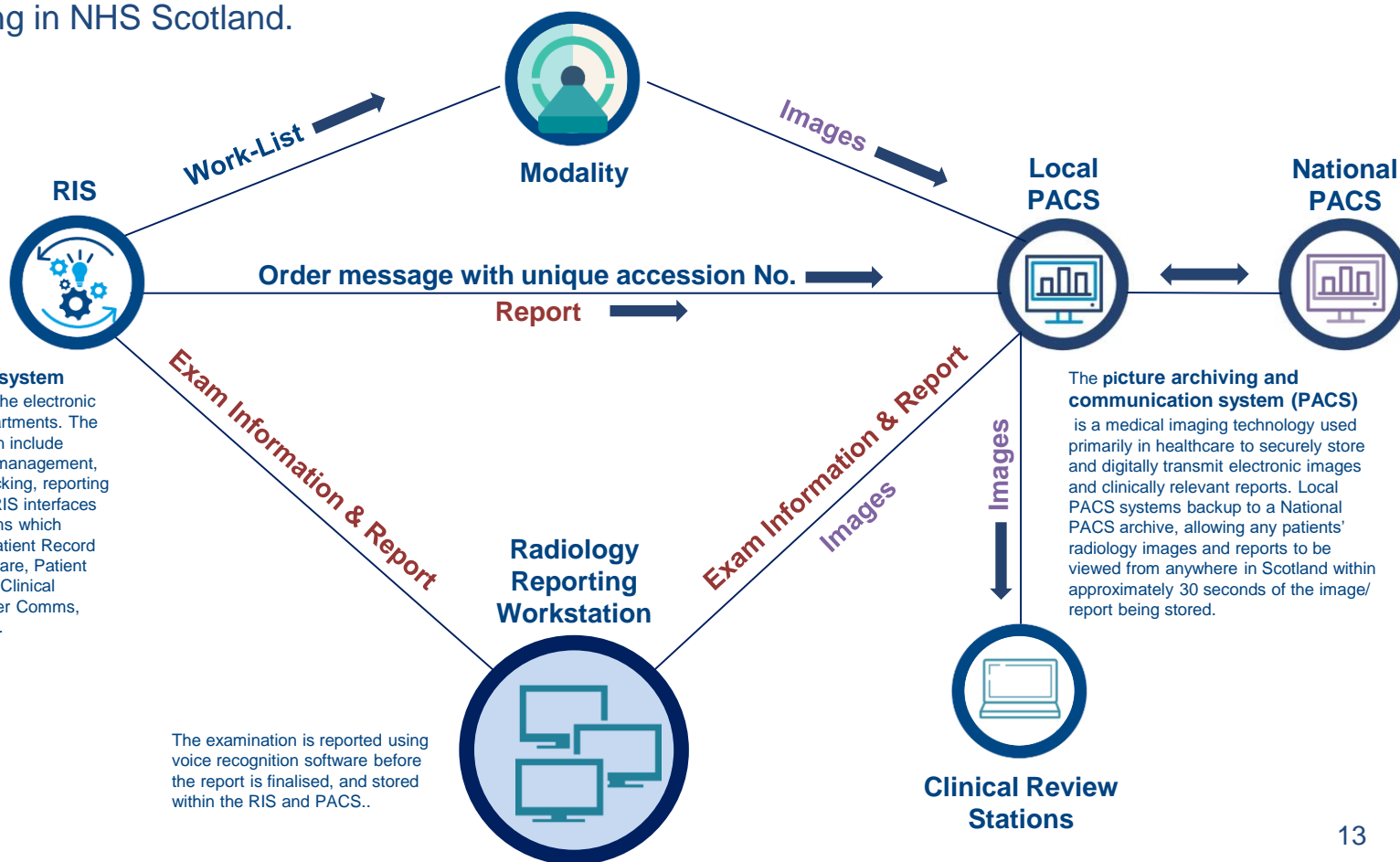
Digital Technology



The key digital technology (systems, tools and structures) that underpin the delivery of radiology services within Scotland.

IT Architecture

The current radiology IT architecture in Scotland comprises a national PACS (Picture Archiving and Communication System) which captures radiological images and reports, with disparate RIS (Radiology Information Systems), which manages waiting lists, requests, bookings and order communications and radiology image reporting as well as holding data such as waiting lists. The flowchart below shows a high level overview of the typical IT pathway for radiology patient imaging in NHS Scotland.



IT Infrastructure – Support

Passing information between IT systems across different health boards is currently a challenge due to the variation in which IT systems have been implemented (i.e. RIS). In health boards, procedural decisions are largely made on factors including cost and clinical governance. As a result, differing systems are developed, which do not allow patient information to be shared easily.

Key impacts stemming from this include:

IT system support arrangements vary at a local level, resulting in health boards paying different rates and receiving varying levels of service. Consequently, support to services such as OOH can be affected, limiting the amount of interoperability that can be delivered between health boards.

The implementation of RIS varying from health board to health board creates greater workarounds for regional and national systems. Variations in RIS reference data between health boards also leads to inconsistency when trying to compare data nationally.

There is a continuing need for investment within IT infrastructure. Having different RIS systems does not support the streamlining of communication services from a pan-Scotland perspective.

IT Connectivity

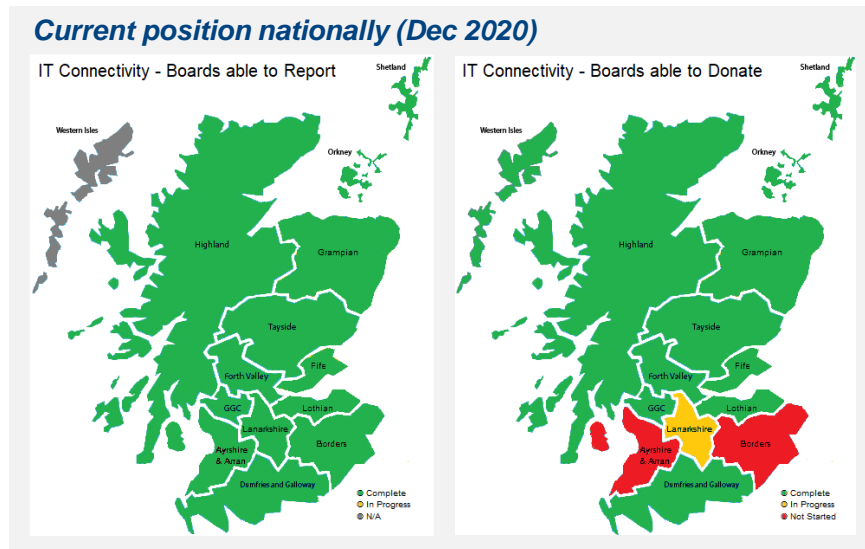
Image reporting is delivered by a variety of methods depending on each individual health board, including; RIS based reporting, PACS based reporting and reporting through a stand alone reporting platform. Each individual health board has an independent RIS where the image report is created and stored (**Appendix 2.1**). The Scottish Radiology Transformation Programme (S RTP) IT Connectivity project enables the RIS systems to interface with the national Soliton Share+ platform and allows reporting of images across health board boundaries.

➡ National IT connectivity is managed through the Soliton Share+ platform. This allows images to be reported from sites distant from acquisition (**Appendix 2.2**). It allows load balancing across Board and Regional boundaries as well as supporting the process of on-call reporting at a regional or national level using existing staff on existing equipment. This is a process being developed as part of the SNRRS pilot by the Scottish National Radiology Reporting Service (SNRRS) Workflow Managers

➡ Images are shared across traditional NHS Board boundaries to be accessed, reported upon and returned to the host NHS Board RIS via the identified solution. Implementing IT connectivity in this manner has enabled the workforce to work across NHS Board boundaries on a virtual basis

➡ National IT connectivity currently doesn't support any on call reporting, only standard non urgent work

➡ This national connectivity will underpin future regional or national radiology networks which will be required for speciality areas



Technological Innovation in Radiology

There is currently no standard established process for assessing new technologies and their applicability to the local/regional needs. Although local assessments are made prior to purchase, often the procurement exercise is influenced significantly by short term cost constraints and by agreements with manufacturers that may then prevent ideally assessed products from being purchased.

Current innovation in technology within the radiology service in Scotland is being explored through a number of initiatives and projects throughout Scotland.

Clinical Decision Support (CDS iRefer)



Clinical Decision Support software has the potential to moderate demand, automate request justification and improve the quality of radiology requests. This innovative solution supports clinicians in their decision-making to request the most appropriate radiology imaging for patients, based on guidelines from the Royal College of Radiologists. As well as streamlining internal processes, it has the potential to improve patient safety through avoiding unnecessary procedures and radiation exposure. A CDS pilot is currently being undertaken within 2 local health boards (NHS Tayside and NHS Greater Glasgow & Clyde) to assess and understand the variation in demand between the actual referral and what the CDS system would have requested.

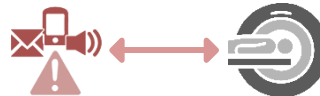
Artificial Intelligence (AI)



Artificial Intelligence is on the horizon as a support to radiology service capacity. Current clinical views indicate that AI may have a significant impact on the service in the near future, however more ambitious AI software is likely to be delivered in the future. The SRTP team has set-up a project to understand the national position and direction of AI and develop a national roadmap for its implementation.

The project will take into account how AI can play a wider role within radiology services through coordination with other areas such as procurement and equipment.

Clinical Alert Systems



There are clinical alert systems currently available to automatically pass information to the requestor once the scan is complete. Clinical alert systems are intended to safely and accurately highlight abnormal scans (including examples of incidental or unexpected pathology) to clinicians at the time of the report. There are currently no national projects to deliver clinical alert systems throughout Scotland.

Organisation of Radiology Services



The framework by which services are located, coordinated and managed nationally, regionally and locally with Scotland

Location of Radiology Services

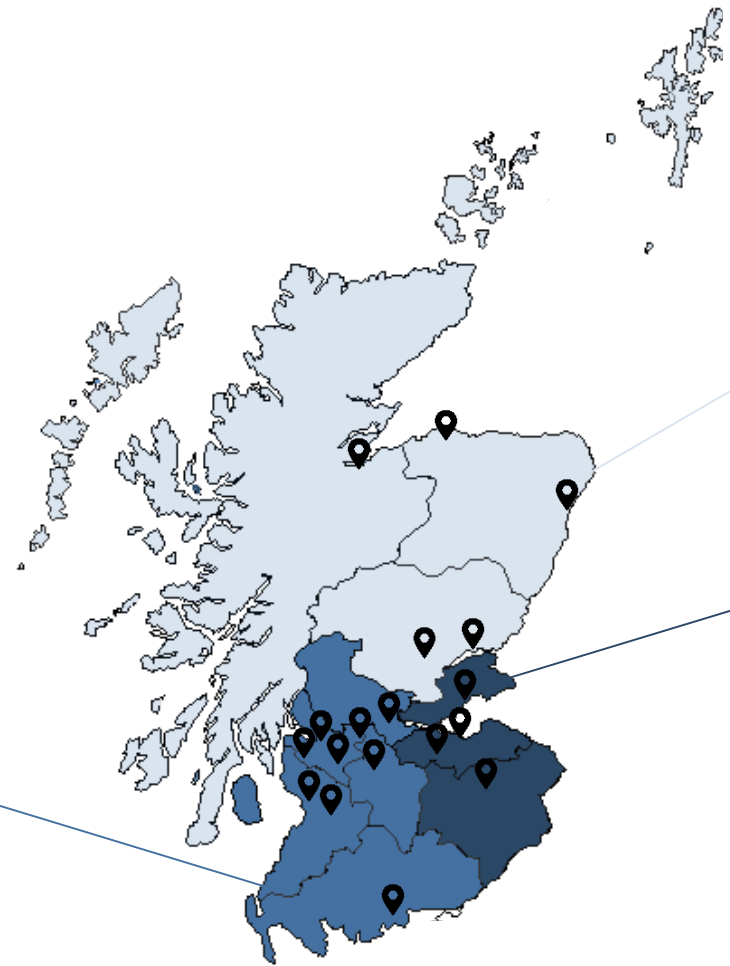
All health boards in Scotland currently offer radiology imaging (fourteen geographical health boards plus the Golden Jubilee Hospital). The list of principal radiology departments throughout the three key regions within Scotland are outlined below. A map detailing all radiology services throughout Scotland is detailed in **Appendix 3.1** (continual updates are in progress).

West

Population
2,670,000

WTE radiologist per 100,000 population
6.9

Radiology departments
 Monklands Hospital - Airdrie,
 University Hospital Ayr,
 Dumfries & Galloway Royal Infirmary
 Hairmyres Hospital - East Kilbride,
 Gartnavel General - Glasgow,
 Glasgow Royal Infirmary,
 Golden Jubilee National Hospital,
 The Royal Hospital for Children Glasgow,
 The Queen Elizabeth University Hospital - Glasgow ,
 Inverclyde Royal Hospital
 Stobhill Hospital - Glasgow,
 New Victoria Hospital - Glasgow,
 Institute of Neurological Sciences - Glasgow,
 University Hospital Crosshouse - Kilmarnock,
 Forth Valley Royal Hospital - Larbert,
 Royal Alexandra Hospital - Paisley,
 West Glasgow Ambulatory Care Hospital - Glasgow
 Wishaw General Hospital - Wishaw



North

Population
1,352,000

WTE radiologist per 100,000 population
4.4

Radiology departments
 Royal Infirmary - Aberdeen
 Royal Aberdeen Children's Hospital
 Woodend Hospital - Aberdeen
 Dental Hospital - Aberdeen
 Dr Grays Hospital - Elgin
 Ninewells Hospital - Dundee
 Dental Hospital - Dundee
 Raigmore Hospital - Inverness
 Perth Royal Infirmary - Perth

East

Population
1,397,000

WTE radiologist per 100,000 population
5.4

Radiology departments
 Queen Margaret Hospital – Dunfermline
 Royal Hospital for Sick Children - Edinburgh
 Royal Infirmary of Edinburgh
 Western General Hospital - Edinburgh
 Victoria Hospital - Kirkcaldy
 St Johns Hospital - Livingston
 Borders General Hospital - Melrose

*North Region information excludes NHS Shetland and NHS Orkney
 Data taken from RCR 'Clinical radiology Scotland workforce 2019 summary report'

Organisation of Radiology

Accountability for finance, human resources and workforce, performance and service delivery arrangements **remains local within individual health boards.**

Cross-boundary working does occur both regionally and nationally, but as '[Coordination of Services](#)' details, the decision making responsibility for radiology service provision sits at a local health board level.

Regional Collaboration

Emergent regional approaches have provided opportunities for local cross-boundary working to effectively meet increases in demand. Examples of these approaches include regional planning groups, SERRIS (the South East Regional Reporting Insourcing Solution) and through the delivery of radiology support for cancer services.

However, collaborative approaches have had difficulties in fully delivering due to local health board arrangements (financial, delivery, planning) and the need to deliver sustainable services.

National Collaboration

Although decision making primarily sits locally, there are a number of national groups that help to coordinate and strategically influence radiology services in Scotland.

As part of the Diagnostics strategic governance structure that reports to the NHS Board of Chief Executives, the Imaging Executive Board (IEB) nationally aligns and focuses the strategic direction of radiology services. A number of national and regional groups connect and report to the IEB (**Appendix 3.2**).

Coordination of Services

Services are coordinated and delivered either locally (managed within a health board), regionally (services within one of the three regions – north, east, west), nationally or through a combination of any of the aforementioned tiers.

National	Regional	Local	Multi-tier
<ul style="list-style-type: none"> IT Connectivity (RIS) NRIP (Data Mart) Soliton Share + Standardised Clinical and quality Governance Assurance processes for Cross Boundary Working (e.g. Radiation Protection) Reporting Radiographer resource Radiology training schemes (Aberdeen, Edinburgh, Dundee and Glasgow) National clinical services (e.g. screening services) National Imaging Equipment Board - National outsourcing framework agreement (with agreed national rate) 	<ul style="list-style-type: none"> Communities of Practice - subspecialty radiologists in paediatrics Imaging sequences/ protocols Radiology Planning Cancer multi-disciplinary team networks SERRIS IR Imaging to support thrombectomy pathways Informal communities of practise 	<ul style="list-style-type: none"> 15 local instances of RIS across Scotland provided by three different suppliers: Philips, Wellbeing and Intersystems IT Standard Operating procedures IT functionality and implementation Board level performance targets Maintaining local service delivery is a board level responsibility Decision making on insourcing and outsourcing arrangements Board specific clinical pathways and prioritisation for Radiology CDS (Clinical Decision Support) software pilot - Tayside and Greater Glasgow and Clyde Technological innovation Governance arrangements Financial arrangements Workforce arrangements Human resource arrangements 	<ul style="list-style-type: none"> Realistic medicine – national principles with regional/local delivery There is a national PACS as well as local PACS Virtual multi-disciplinary teams have been utilised both locally and regionally Stroke services and neuro imaging and interventional radiology – National Services being provided by NHS Lothian

Modalities

Access to the majority of imaging modalities are available within every health board. Modalities such as PET CT, Interventional and Cardiac catheterisation are available at major hospitals or within a geographical region.

Modality	Brief Description	Includes radiation	Preparation required
X-ray (Plain Film)	X-rays, or plain films / plain radiographs, is a medical imaging modality in which x-rays are used to visualise the internal structures of the body.	Yes	
CT (Computed Tomography)	A CT scan is a specialised x-ray test that can give clear pictures of the inside of the body. A computer then processes the results and displays the scan on a monitor as a two or three-dimensional image.	Yes	Hydration (low eGFR)
MRI (Magnetic Resonance Imaging)	An MRI scan is a test that uses magnetic and radio waves to give detailed pictures of organs and other structures inside the body. The scanner picks up these signals and a computer turns them into an image.	No	Detailed screening questionnaire, Remove piercings
Ultrasound	An ultrasound scan is a common test that uses sound waves to create images of organs and structures inside the body.	No	Full bladder (gynae scans)
Nuclear Medicine	Nuclear Medicine is a specialised area of radiology that uses very small amounts of radioactive materials to examine organ function and structure.	Yes	
Fluoroscopy	Fluoroscopic Procedures are studies of moving body structures. A continuous x-ray beam is passed through the body part being examined so that the body part and its motion can be seen in detail (it might be part of an examination prior to MRI).	Yes	NBM/Bowel prep If a need for IV contrast then Hydration checks
Mammography	A specialised imaging modality that utilizes low energy x-rays to obtain very detailed images of breast tissue.	Yes	
DEXA (Dual Energy X-ray absorptiometry/ Bone densitometry)	An imaging technique in which x-rays are used to acquire the images that are particularly used to measure the density of bones.	Yes	
PET CT	Combination of PET (positive emissions tomography) and a CT (computerised tomography) scan.	Yes	Hydration (low eGFR)
Interventional	Minimally invasive image-guided procedures, i.e. emergency treatment of patients with bleeding, sepsis and stroke. Might also be planned for an alternative to surgical treatment.	Yes	
Cardiac catheterisation*	Cardiac catheterisation is an invasive diagnostic procedure that provides important information about the structure and function of the heart.	Yes	Hydration (low eGFR)

* Cardiac catheterisation is provided within radiology departments and primarily utilises Radiographers

Specialist Services Provision

Nationally, radiology has a number of highly sub-specialised services it provides. Diagnostic services are provided in all health boards with slight variations, whereas interventional services are not provided in all health boards.

General radiology and services such as gastrointestinal (GI) radiology, diagnostic neuroradiology, genito-urinary radiology (GU) and musculoskeletal (MSK) imaging are provided by the majority of health boards within Scotland, where as other specialties such as interventional radiology, PET scanning, IMRT specialist cancer intervention, interventional neuroradiology, stroke thrombectomy service, cardiothoracic radiology and specialist paediatric radiology are only available at some health boards or at specific sites. Facilities providing these specialised services are limited due to the greater cost and complexity in their delivery.

Sub-Speciality	Brief Description
Interventional radiology	Body intervention except neuro intervention. Available in Edinburgh, Glasgow (multiple sites), Dundee, Aberdeen, Inverness, Fife and Forth Valley
Interventional neuroradiology	Treatment of certain neurological conditions such as aneurysms and AVMs Edinburgh and Glasgow
Stroke thrombectomy service	Provided in Dundee but will be available in Edinburgh and Glasgow in the near future
Paediatric radiology	Diagnostic aspects are provided across different health boards to a variable extent. The interventional services are primarily limited to Edinburgh and Glasgow.
Cardiothoracic radiology (i.e. CTCA)	Diagnostic aspects are provided across most health boards to a variable extent.

National specialist healthcare is also supported through collaboration with radiology services to varying degrees (**Appendix 4.1**). An example of this is the work radiology plays with liver transplants, where although it is not a radiology sub-speciality there is a knock-on imaging service provision to support the service.

Business Information and Data



The information and data that reflects the demand, activity, finance and performance of radiology services in Scotland

Managing Demand

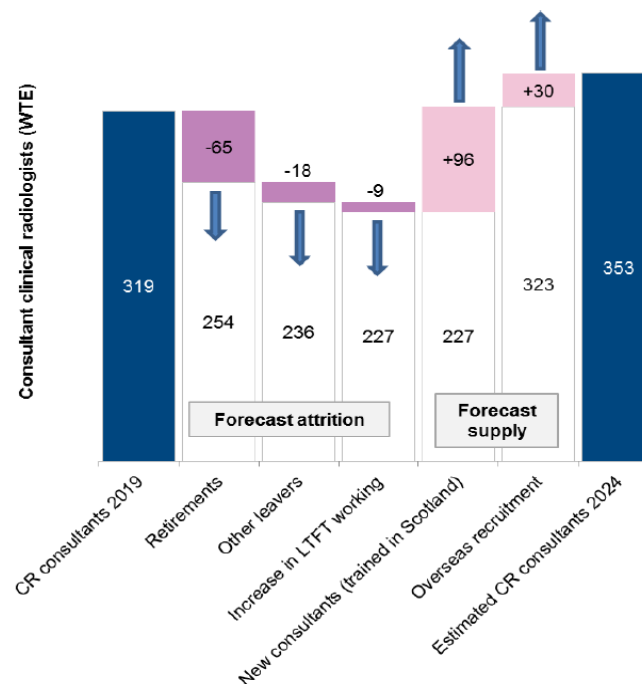
Demand for imaging has been growing over a number of years within Scotland, driven by an ageing population, increased demand due to changing clinical pathways, new clinical guidelines and increased screening to support early diagnosis. The average annual growth in demand between 2012 and 2018 has been 3.4%.

Demand for complex imaging has grown particularly quickly: CT and MRI examinations carried out on patients in Scotland have increased by 30% from 2014-2019. In contrast, Consultant Radiologist workforce capacity has only increased 11% over the same period.

The RCR reported that demand for radiology services in Scotland is likely to **grow further over the next five years** given the increasing demand for diagnostic imaging, the greater complexity and diversity of imaging studies and the rising demand for interventional radiology

As a result of COVID-19, the radiographer workforce may need to expand to meet the required demand, this is needed in part due to appointments taking longer and the requirements of social distancing per examination.

Figure 1. Estimated supply of consultant clinical radiologists (WTE) – Scotland, next five years (2019–2024)

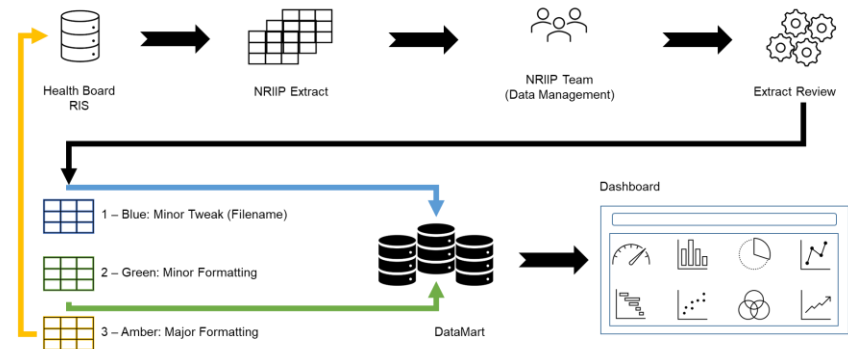


With health boards hosting local RIS systems in order to meet local needs, multiple configurations of data are held throughout Scotland. The National Radiology Information Intelligence Platform (NRIIP) has been developed to store a nationally defined dataset to facilitate the ability to collate, analyse and share national, regional and local radiology data through the national radiology dashboards.

IMPACT

- ➡ National Radiology Dashboard can visualise data to allow National, Regional and Local service management, service planning, service improvement and benchmarking
- ➡ There is the opportunity to do wider analysis by expanding the indicators within the dashboards to include workforce, acquisition capacity and other relevant indicators (e.g. imaging data analysis as part of detailed cancer pathway work)

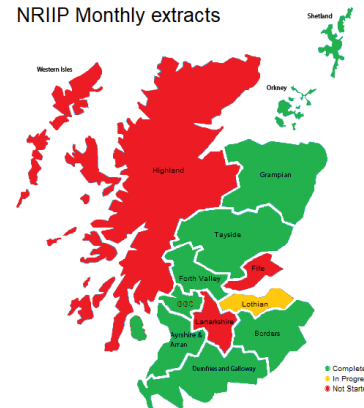
NRIIP Basic Workflow



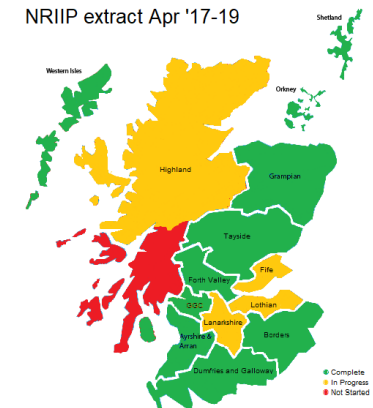
CHALLENGES

- ➡ The NRIIP is not being fully utilised by all health boards providing an unreliable national perspective of radiology activity
- ➡ Different RIS versions and different configurations within the same RIS versions across NHS Scotland
- ➡ Delays in delivery of data extracts coupling with competing priorities has caused slowed progress in a nationally integrated NRIIP

NRIIP Monthly extracts



NRIIP extract Apr '17-19



Performance

Health boards report performance against access targets (such as waiting times) on a regular basis and the figures are published by Public Health Scotland. Other performance measures covering quality, process improvements and satisfaction measures vary from health board to health board.

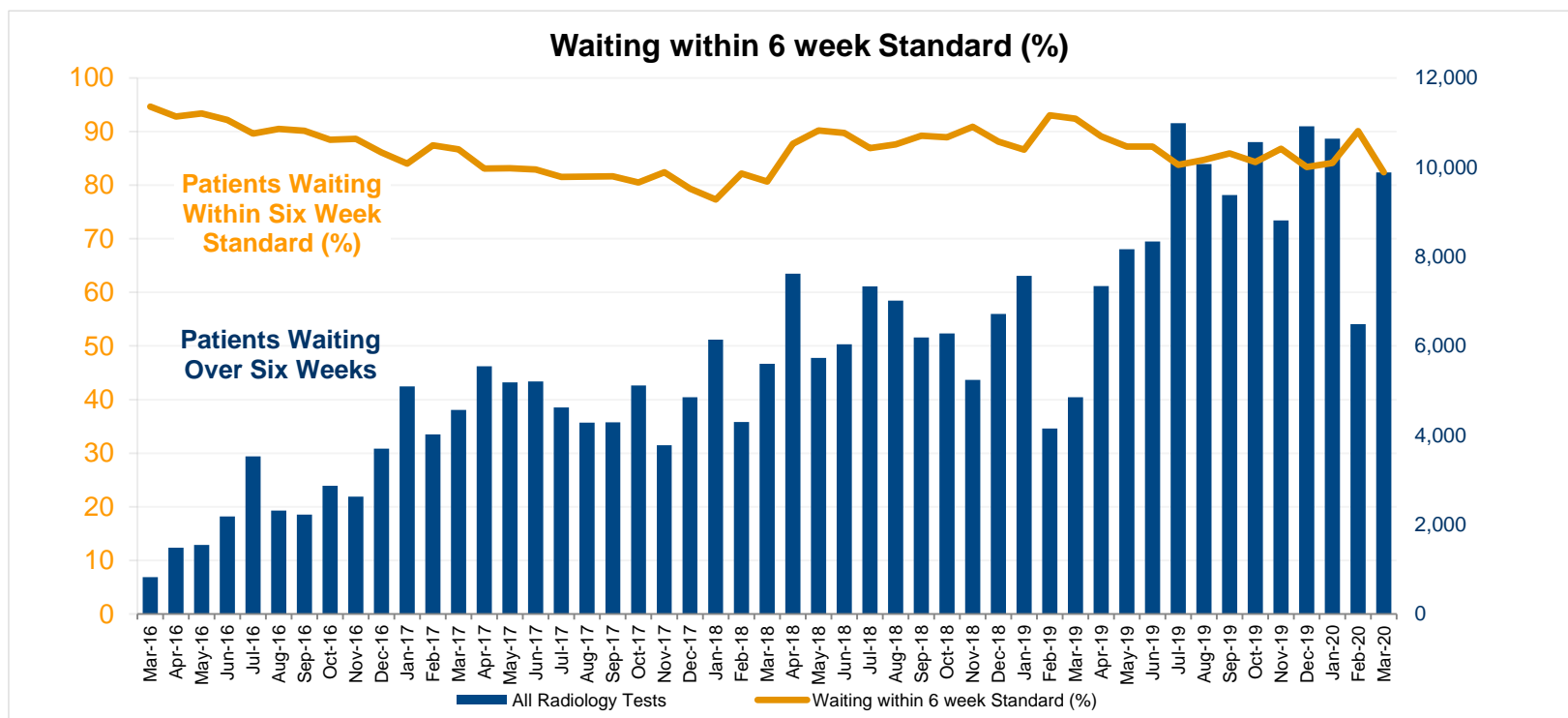
There is currently no national framework for measuring quality indicators of radiology services in Scotland. The Scottish Clinical Imaging Network (SCIN) has set out a quality measurement process to help consistently track a number of indicators on the quality of the service i.e. levels of satisfaction (SISAT – Scottish Imaging Self Assessment Tool), continuous improvements indicators (such as learning from adverse events). Although some health boards in Scotland are using the quality measurement process it has been implemented and used in different ways from varying health boards.



Despite the variations in which health boards implement and manage performance, there is a high level of similarity in the operating model that is used to measure and track performance indicators throughout Scotland.

Performance – Waiting Times

Reflecting the increase in demand for radiology services, there has been a continual increase in the number of patients waiting in excess of six weeks over the last four years. The graph below (Public Health Scotland) highlights that the number of patients in Scotland waiting over six weeks in March 2020 was 9,883 **over 10 times** the number of patients in comparison to four years earlier. This trend is likely to continue to rise due to increasing demand for imaging services coupled with the shortages in clinical radiology workforce. **Appendix 5.1** details the impact COVID-19 has had on waiting times from March 2020.

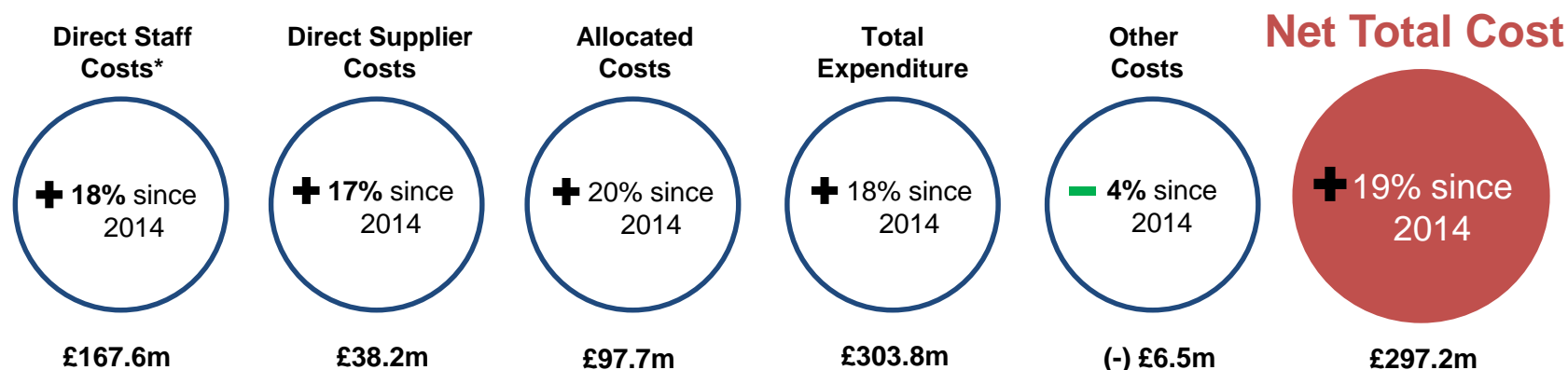


Finance

Finance costs for radiology services in Scotland are growing annually at a high rate. There has been continuous growth in the total net cost of radiology services per year; from **£249.8m** in 2013/14 to **£297.2m** in 2018/19: A **19% increase** over a five year period. It is anticipated that costs will continue to escalate due to continuing increase in demand. There is an additional cost due to the requirement to outsource reporting.

Radiology services have annual savings targets, which continue to be a challenge as demand rises. The financial challenges that each health board faces vary due to different local circumstances. Each health board manages these challenges differently according to their local needs.

The information below demonstrates the five year growth (2014-2019) in radiology service costs and activity gathered by PHI and available within the Cost Book.



* Direct staffing costs do not include costs for trainees and those who have funded training sessions for trainees
 Data taken from Scottish Health Service Costs, year ended 31st March 2019 SFR5.1 2014 and 2019 Cost book

Finance - Outsourcing

Increasing demand has led to increasing report turnaround times. Lack of capacity to deal with this increase in demand from all health boards leads to a greater outsourcing of image reporting to the private sector, the payment of additional sessions at enhanced rates to existing Radiologist Consultants and also the employment of agency and locum staff. Outsourced Radiographer reporting tends to be utilised to address delayed reporting that has created a backlog.

The RCR census 2019 reported that expenditure on outsourcing and additional payments had increased from an estimated **£3.5m** for 2013/14 to **£14.5m** for 2018/19: costs **quadrupled** over a five year period.

There is significant variability of outsourcing costs relative to population size across Scotland. Costs were much higher (£2.17 per head) within the North region in comparison with the rest of Scotland. This reflects a radiology workforce shortage within the region. Other variables that impact outsourcing costs include lack of standardisation of imaging pathways, varying demand and general population health and well-being. Further breakdown of outsourcing and insourcing costs for 2018/19 are detailed in **Appendix 5.2**.

Outsourcing expenditure reporting, per head of population - 2019



Education and Training



Understanding the training and recruitment links to higher education and how patients are educated and communicated with when experiencing radiology services

Links with Tertiary Education

The syllabus and training schemes for radiologists and radiographers are determined by the different regulatory authorities. Radiologists and Radiographers have different training systems with different links to Higher Education Institutions (HEI).

Radiologists

The curriculum for Radiology trainees is set by the Royal College of Radiologists and approved by the General Medical Council. The four statutory education bodies of the UK (e.g. NHS Education for Scotland (NES)) are responsible for recruitment and quality management of the training environment provided by clinical Boards such that it meets standards of the GMC. There are no formal link between HEIs and radiologist training. However, radiology staff will often teach medical students and in doing so some students will ultimately decide to apply for radiology training. This informal influencing and commitment to teaching is very important.

Radiographers

The HCPC (Health Care Professions Council) is the Regulatory Body for registered Radiographers validating pre-registration education to fit with the HCPC Radiography Standards of Proficiency. The College of Radiographers (CoR) approve educational programmes in line with their Standards identified within the CoR Education and Career Framework. Some elements of radiographer training/education are also inputted to through Nursing, Midwifery and Allied health Professionals (NMHAP) in NES. The CoR also approve post-registration education programmes supporting advancing practice – this is the present case and must continue to support high standards of practice within the radiography workforce.

Strategically moving forward, an understanding on how the Radiologist and Radiographer workforce is being utilised (such as Assistant Practitioners and Advanced Practice Radiographers) will have a large impact on the development of radiographer trainees. The devolved nature of health care delivery may lead to some variations in expression, however the HCPC ensures a national expected proficiency/standards of care are met for registration. Development of Radiographers has multiple levels, creating multiple areas of speciality to choose from (**Appendix 6.1**).

Training

Training schemes for radiologists are currently designed around a UK based recruitment process, that is then distributed across four rotations in Scotland (Aberdeen, Edinburgh, Dundee and Glasgow). Training for Radiographers occurs through three centres in Aberdeen, Edinburgh and Glasgow, with some clinical placements occurring throughout Scotland. These training schemes are primarily based around larger centres where there is a comprehensive range of skills available and training can be sustained due to a critical mass of Radiologists and Radiographers to support those trainees within the clinical setting.

Notwithstanding the overall capacity gap across Scotland, recruitment of qualified staff to these major centres is generally less problematic than in rural sites. This pattern is well recognised in terms of the link between training site and recruitment to Consultant Radiologist and Radiographer roles post training.

For both Radiologists and Radiographers, trainee rotations to rural settings can be difficult to support especially for small hospital sites that do not have the case mix or facilities required to meet training site approval. It seems likely that capacity gaps in rural sites will remain for the foreseeable future, therefore opportunities to place trainees in sites at a distance from the central belt remain difficult.

For both radiology and radiography trainees, the **impact of the COVID-19 pandemic** on service provision, educational capacity and learner progression has been **significant**.

Many radiology departments have **significant space constraints** that can preclude effective social distancing, thus further **hampering the learning capacity for current trainees**.

Radiographer placements can be very difficult to deliver. Previously students were able to work weekends in order to get placements, however this has now become location dependent. Employers highlight that students (particularly Radiographers) who have had opportunities to train in both rural sites and major centres benefit in the longer term.

Patient Education and Communication

Communicating and educating patients is continually developing. A number of mediums (physical and online) are available for patients to access to understand more information around the current radiology services available within Scotland. Current trends in demand reflect the societal change in expectations around patients requiring radiology services throughout Scotland.



The most common information a patient seeks is what the purpose for the scan is for, the details on how to prepare for the scan and what happens on the day. Pre-COVID this information would have been largely communicated on a face to face basis



Applications such as NHS inform and new COVID applications have recently shown that when no other option is given, **patients will self-refer to information online** and from other sources



As current demand over the last four years is reflecting, **there is growing societal assumption** from patients that unless you get a scan or a test, significant pathology could be missed



Realigning patient expectations on when a scan or test may and may not be necessary **would be key when educating patients in the demand for radiology services**, but the collective view is that this would be extremely difficult



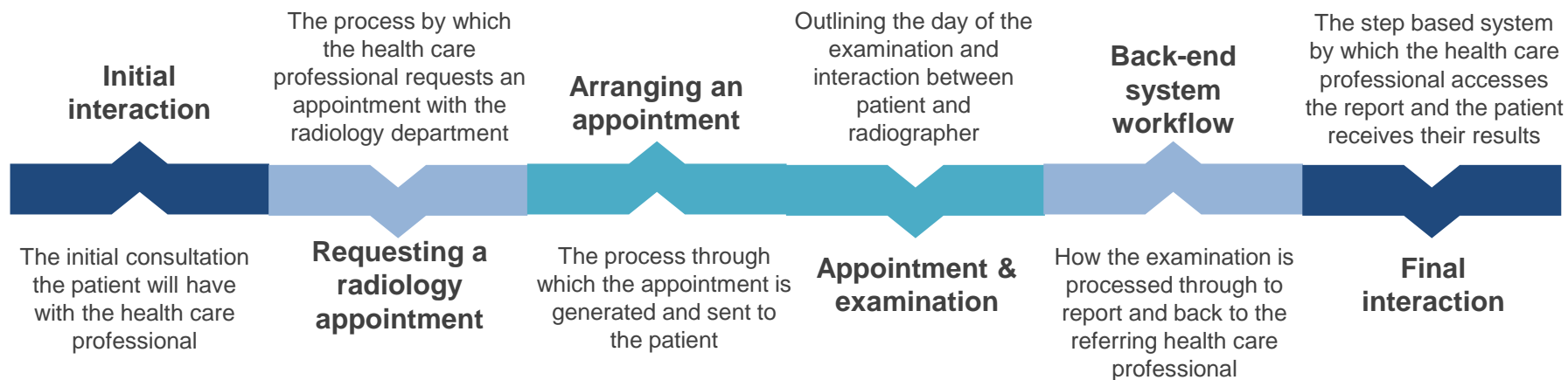


***The processes behind
the key stages within
a patient's journey in
radiology***

Patient Journey Timeline

The patient journey in the diagram below has been defined by a timeline of events. The patient journey timeline outlines the key contacts within the journey and details each point the patient is in contact with the service from referral and examination to recipe of results.

The timeline has been outlined below:

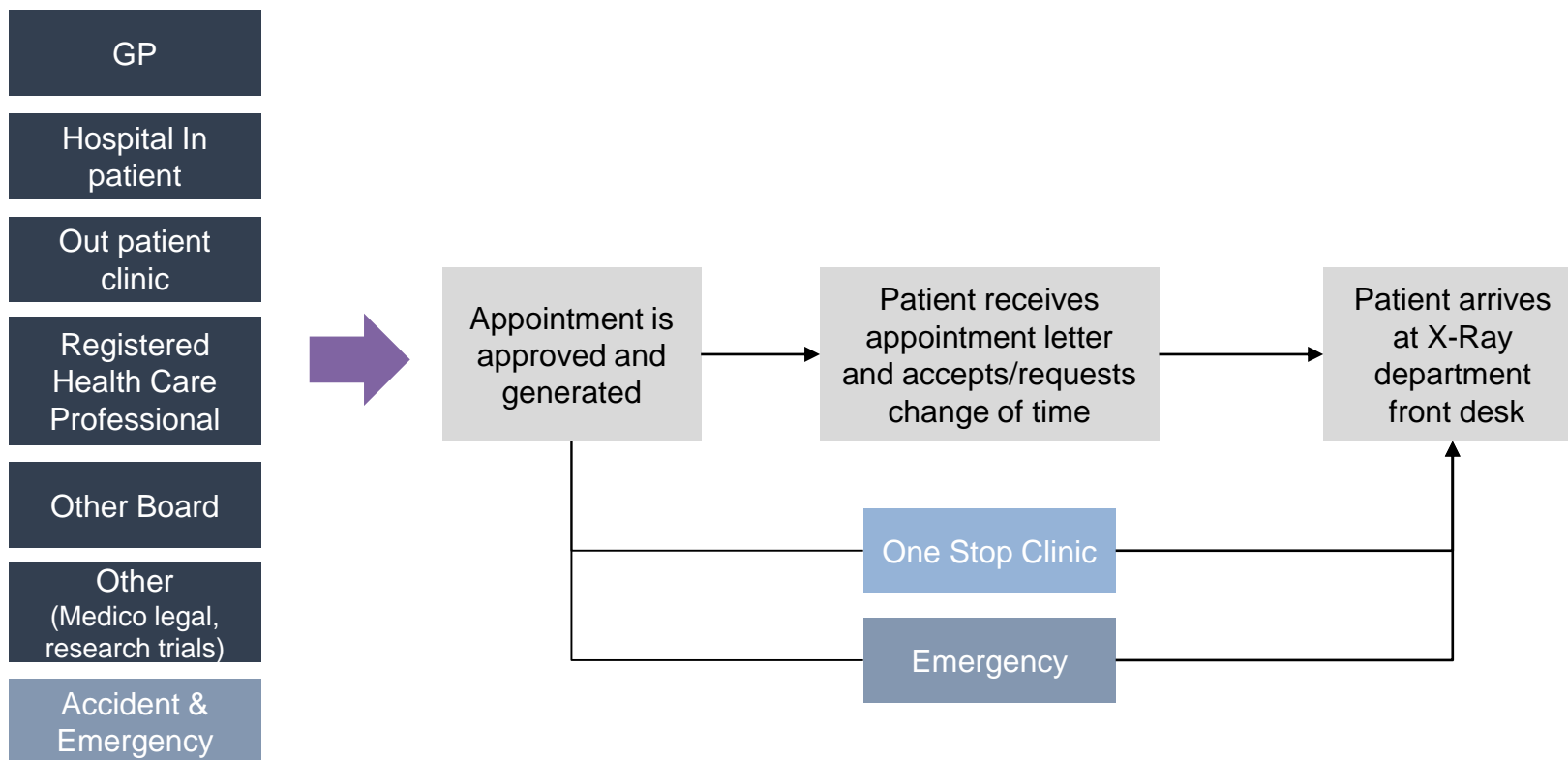


The patient journey can vary greatly from health board to health board when being prioritised and implemented. The full patient journey timeline can be viewed within the accompanying **'Patient Journey Timeline'** within the COM package.

Patient Channels

Patients can be referred to a radiology department from a variety of routes as outlined below, the most common are through GP consultations, outpatient clinics, or via an emergency situation (A&E).

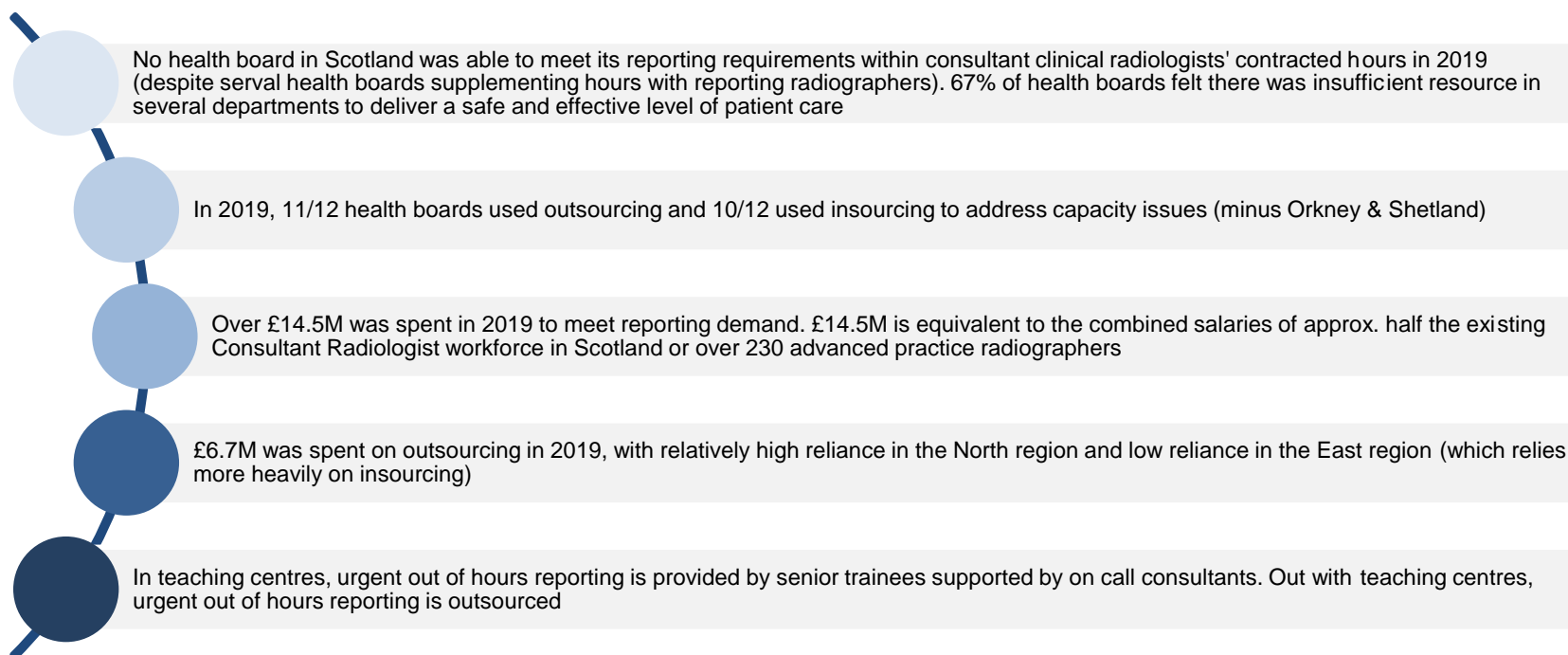
Depending on the nature of the visit being an emergency or not, the patient will follow one of the below channels through their journey.



Reporting

Currently twelve health boards (and GJH) offer radiology reporting (NHS Orkney & NHS Shetland do not have radiologists but do have reporting Radiographers and also receive reporting services from another health board). In order to provide/deliver additional reporting capacity there is a national framework agreement for outsourcing available, with an agreed national rate, which all health boards use. Decisions on outsourcing are made locally, with different health boards using different suppliers. Insourcing agreements are arranged individually between health boards and local radiologists.

In 2019, 11/12 health boards used outsourcing and 10/12 used insourcing to address capacity issues. In order to offset some of the outsourcing demands from health boards in Scotland the [Scottish National Radiology Reporting Service \(SNRRS\)](#) is being piloted.



The Scottish National Radiology Reporting Service (SNRRS) is a product of the Scottish Radiology Transformation Programme (SRTP). In response to the requirement for additional radiology reporting, a pilot radiology reporting bank has been established hosted at the Golden Jubilee National Hospital. This allows radiology examinations to be reported out with the health board of origin.



The aim of the SNRRS is to have all 14 health boards in Scotland connected to the National Reporting System with the ability to send their examinations to the SNRRS bank for reporting. Currently 11 out of 14 health boards are connected



Reporters have been able to report examinations sent to the SNRRS from July 2020



The SNRRS pilot has supported the use of a significant number of home-based workstations, with a small number of workstations in hospitals for reporters to work on site



Soliton Share+ Reporting system has been chosen to provide the IT Connectivity

Out of Hours (OOH) Cover

OOH imaging acquisition is provided locally by local radiographic staff working shifts or on-call rotas. This is supported by radiologists and their current out of hours model is **delivered in two different ways**, either by the local radiology staff (teaching centres located nationally throughout Scotland) or outsourced to the private sector (this is variable by local health board).

The need for OOH services is **continuing to grow in line with the demand for radiology services nationally** causing an impact on staffing availability for in-hours services.

Delivery of OOH cover

Radiology teaching centres (located in Aberdeen, Dundee, Edinburgh and Glasgow) provide OOH cover for their local areas utilising radiology trainees supported by consultant staff. In hospitals where radiology trainees are not based, OOH cover is largely outsourced through the workflow management and data capture system 'Night Hawk'. The 'Night Hawk' system allows consultants to deliver daytime and weekend services.

Radiographic OOH cover is done through shift patterns or on-call arrangements and varies between health boards, depending on the budget allocated to OOH cover, the size of hospital and what specialisms are being covered.

OOH Reporting

Outsourced reporting through workflow management and data capture systems such as 'Night Hawk' is generally seen to increase the demand for over night scanning.

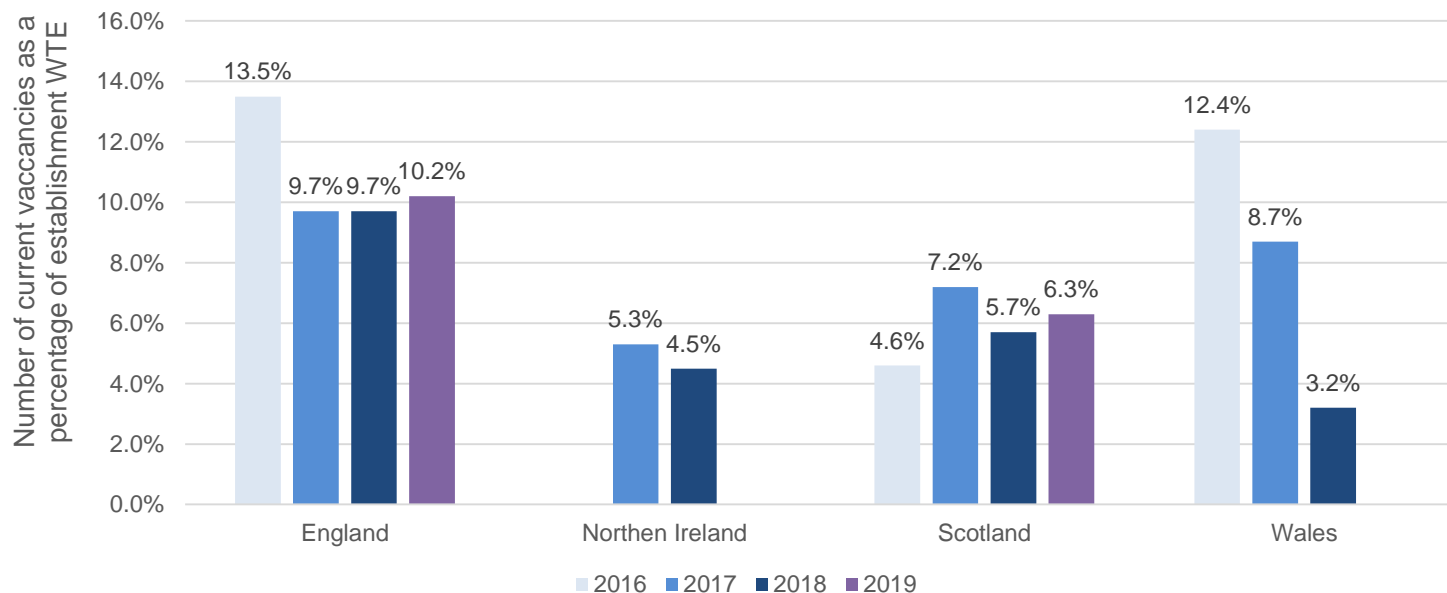
OOH reporting through using the SNRRS bank would be very difficult through the current model. There currently isn't the capacity of radiologists within the SNRRS to meet the growing demand on OOH imaging. Alongside this 24/7 cover in case of an emergency (i.e. instant support with a head scan) isn't available.

Appendices



Appendix 1.1: UK Diagnostic Radiographer vacancy rates (2016-2019)

Current vacancy rate by year and UK country



Appendix 1.2: Radiologist Workforce trends over the next five years

	North East Scotland	South East Scotland	South West Scotland	Scotland
Workforce trends				
Percentage of WTE workforce to retire within five years*	22%	18%	19%	20%
Consultant clinical radiologist annual workforce growth (average – past five years)	1%	2%	2%	2%
IR annual workforce growth (average – past five years)	-11%	0%	-2%	-4%
Vacancy rate	14%	10%	10%	10%
Percentage workforce loss due to LTFT working	10%	12%	6%	8%
Forecast Retirements				
Consultants (WTE)	14	14	37	65
Percentage of workforce	22%	18%	19%	20%

Appendix 1.3: Estimated Workforce Capacity over the Next Five Years

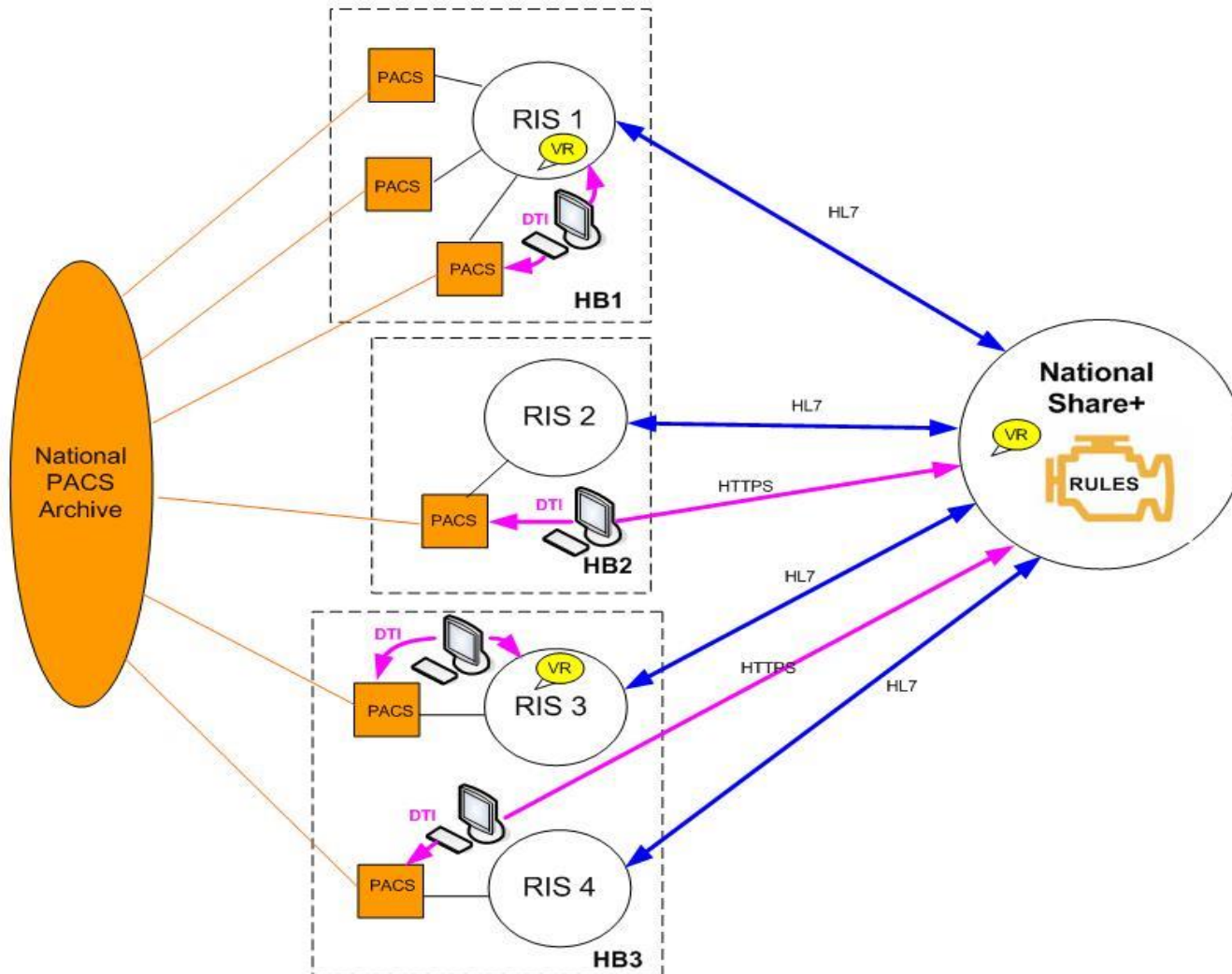
Scenario	Estimated increase in WTE consultants over five years	Proportion of 2019 workforce shortfall met
Training		
Increase annual training places from 32 to 47*	+55	39%
Reduce training attrition from 10% to 5%	+7	5%
Recruitment		
Increase overseas recruitment by 50%	+15	11%
Retention		
Incentivise consultants to retire at 65 (increase from 60)	+45	32%
Increase staff retention – halve attrition for reasons other than retirement	+9	6%
Total	+131	93%

Appendix 2.1: RIS Landscape

The current RIS landscape is complex and is changing. In 2020/21 there will be various RIS upgrade and RIS replacement projects taking place in most Health Boards with each of the four RIS suppliers

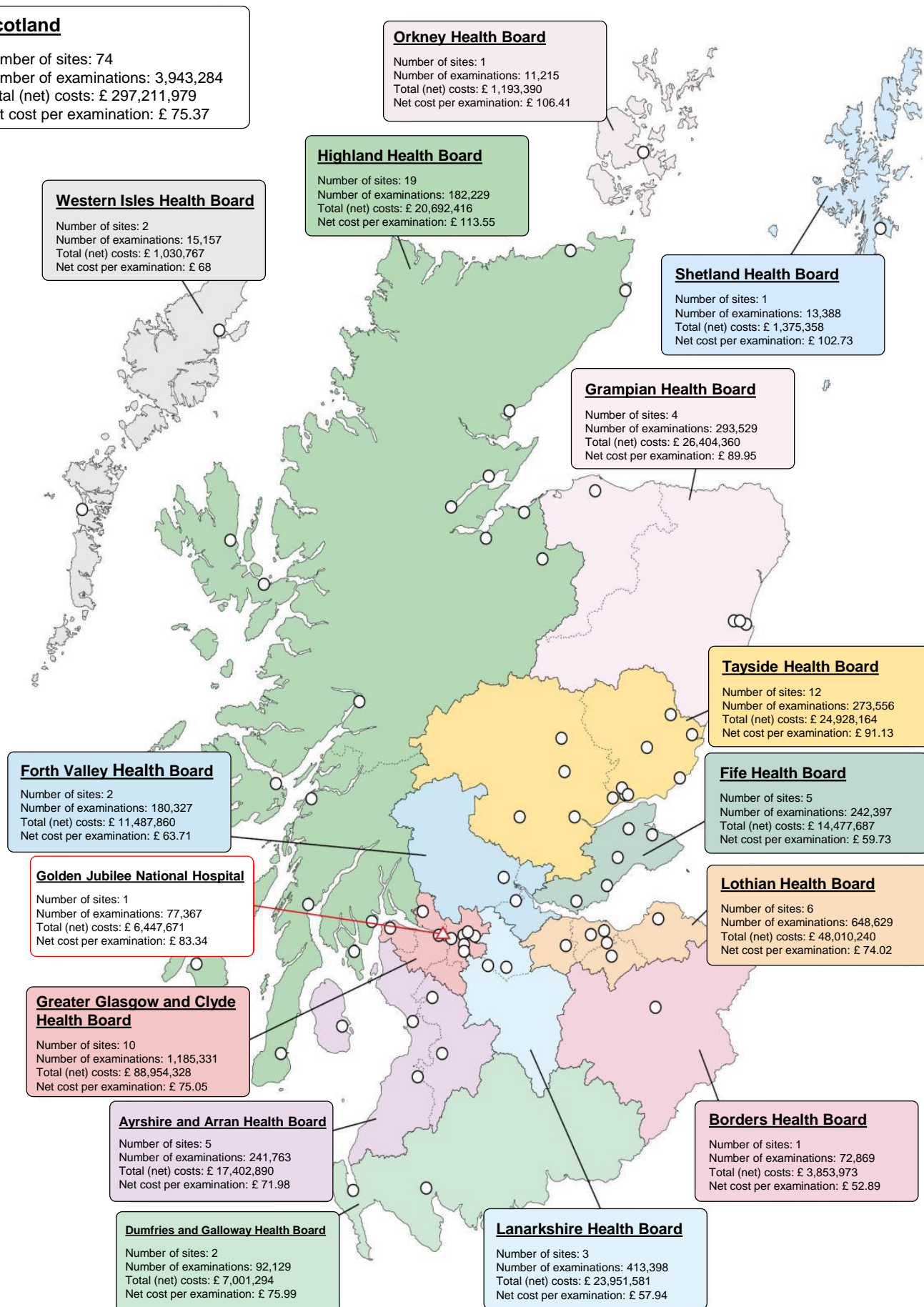
Health Board	RIS	Reporting Platform
Greater Glasgow & Clyde	HSS	HSS
Fife	HSS	Soliton Reporting+
Tayside	HSS	HSS
Highland (A&B)	HSS	HSS
Highland (Raigmore)	CSH 10.1 (+RIS Clinic)	CSH RIS moving to Vue PACS Reporting
Forth Valley	CSH 10.1	CSH RIS moving to Vue PACS Reporting
Dumfries	CSH 10.1	PACS Vue Reporting
Lanarkshire	CSH 10.1	PACS Vue Reporting
Ayrshire	CSH 10.1 moving to Soliton RIS	CSH 10.1 moving to Soliton Reporting+
Grampian/Orkney/ Shetland	CSH 10.1	Soliton Reporting+
Borders	CSH 10.1 moving to Soliton RIS	Soliton Reporting+
Golden Jubilee	CSH 11.1	PACS Vue Reporting
Western isles	CSH 11.1	CSH 11.1/PACS Vue Reporting
Lothian	TRAK	TRAK moving to Soliton Reporting+

Appendix 2.2: Soliton Share + Model



Appendix 3.1: Locations providing radiology services, Scotland, 2019

The map below details the location of radiology services throughout Scotland. Please note that this map is will have continual updates.

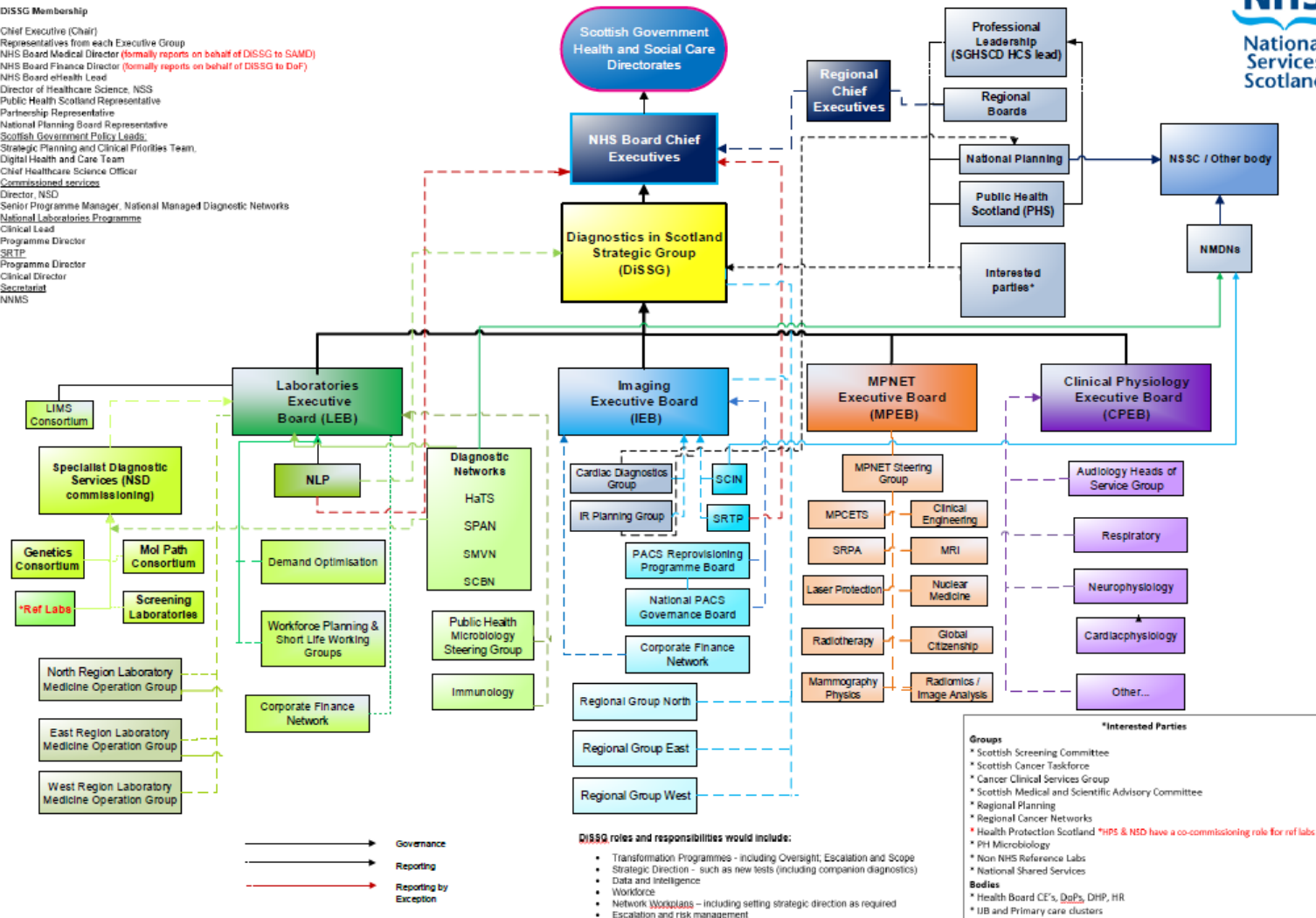


Appendix 3.2: Strategic Structure of Diagnostics in Scotland

Diagnostics in Scotland Strategic Group (DISSG)

DISSG Membership

Chief Executive (Chair)
 Representatives from each Executive Group
 NHS Board Medical Director (formally reports on behalf of DISSG to SAMD)
 NHS Board Finance Director (formally reports on behalf of DISSG to DoF)
 NHS Board eHealth Lead
 Director of Healthcare Science, NSS
 Public Health Scotland Representative
 Partnership Representative
 National Planning Board Representative
 Scottish Government Policy Leads
 Strategic Planning and Clinical Priorities Team
 Digital Health and Care Team
 Chief Healthcare Science Officer
Commissioned services
 Director, NSD
 Senior Programme Manager, National Managed Diagnostic Networks
 National Laboratories Programme
 Clinical Lead
 Programme Director
 SRTIP
 Programme Director
 Clinical Director
 Secretariat
 NNMS

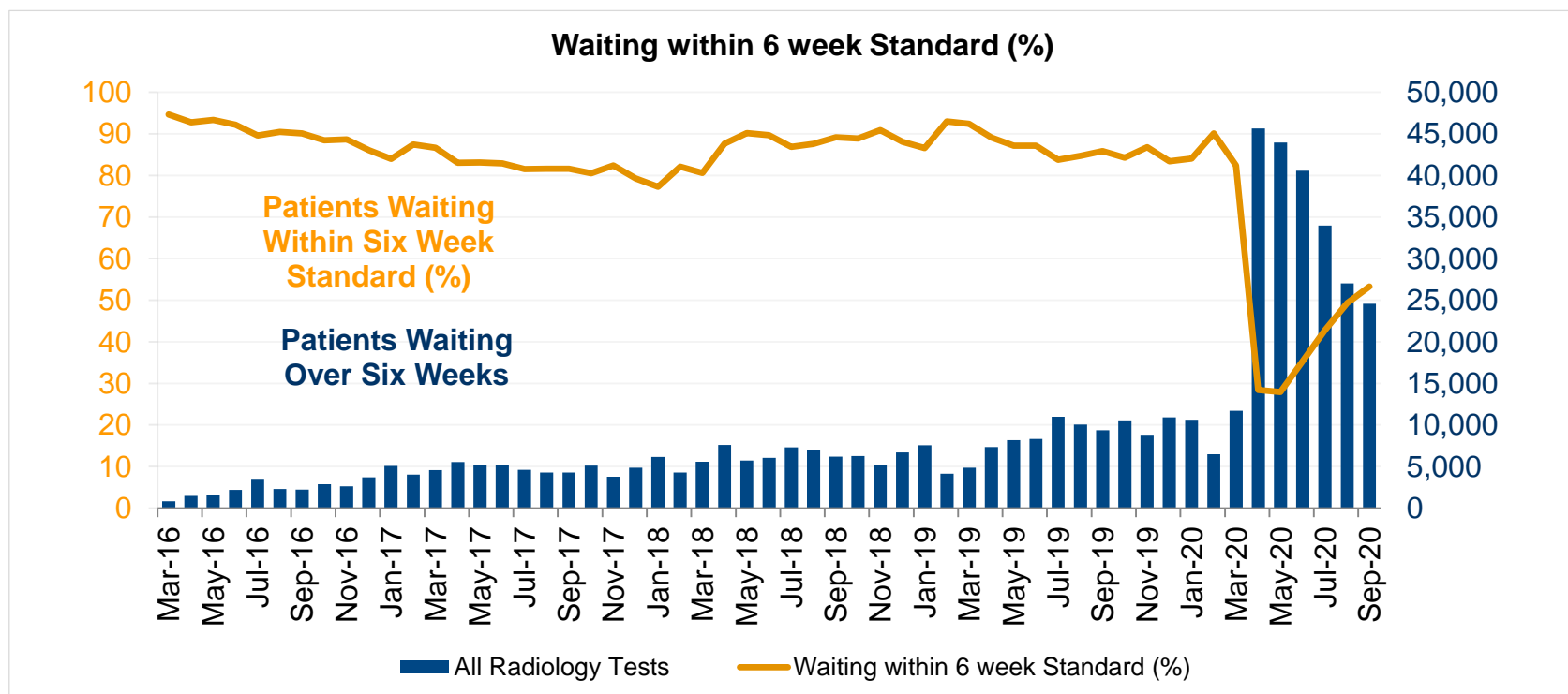


Appendix 4.1: Radiology Input Into Specialist Services

Radiology input can vary from simple plain radiography to highly complex diagnostic and/or interventional procedures.

Contains Radiology Input			Doesn't Contain Radiology Input
Brachial Plexus Injury - Adult	Down's syndrome screening laboratory	Percutaneous mitral valve and related interventions	Advanced Interventions
Brachial Plexus Injury - Paediatric	Ear and atresia reconstruction: adult & paediatric	Proton beam therapy	Cervical Cytology Training School
CAR-T Therapy Service	Epidermolysis bullosa	Pulmonary vascular hypertension	Child Inpatient Psychiatry
Chest wall deformity: paediatric	Epilepsy surgery: paediatric	Solid organ transplantation	Genetic and molecular pathology laboratories
Chronic pain management	Extra-corporeal life support	Specialist prosthetics	Histopathology external quality assessment scheme
Cleft lip and palate	Hydatidiform mole	Specialist services UK	Mental health service for deaf people
Cochlear implantation: adult and paediatrics	Hyperbaric medicine	Spinal injuries	Microbiology reference and specialist laboratories
Complex Airways Disorder - paediatric	Inherited metabolic disorders: adult and paediatric	Spine deformity	Photobiology
Complex Mesh Service	Intensive care: paediatric	Stem cell transplantation: adult	Retroperitoneal lymph node dissection
Congenital Heart Disease - Adult	Interventional fetal therapy	Stem cell transplantation: paediatric	The Scottish Newborn Screening Laboratory
Congenital Heart Disease - paediatric	Lutathera for neuroendocrine tumours	Stereotactic radiotherapy	Trace element and micronutrient diagnostic and research laboratory
Craniofacial service: paediatric	National Advanced heart Disease Service (heart transplant)	Supra-renal and thoraco-abdominal aortic aneurysm	
Cystic fibrosis: adult	Ophthalmic oncology	Transcranial Doppler and MRI scanning	
Deep brain stimulation			

Appendix 5.1: Radiology waiting times including COVID-19 impact



Appendix 5.2: Outsourcing/Insourcing Reporting Costs (FY 2018-19)

RCR estimates adjusted to take account of health boards unable to supply financial data.

	North East Scotland	South East Scotland	South West Scotland	Scotland
Outsourcing/insourcing costs (FY 2018-2019)				
Outsourcing to teleradiology companies	£3,337,304	£409,939	£2,965,196	£6,712,439
Additional payments to contracted radiologists (insourcing)	£785,523	£2,371,414	£1,834,634	£4,991,571
Ad hoc locums (for excess reporting)	£1,474,783	£75,000	£1,288,776	£2,838,559
Total insourcing/outsourcing costs	£5,597,610	£2,856,353	£6,088,606	£14,542,569
Outsourcing expenditure per head of population	£2.47	£0.29	£1.11	£1.23
Insourcing expenditure per WTE consultant radiologist	£13,092	£31,619	£10,025	£15,561

Appendix 6.1: The College of Radiographers Career Framework

