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Clinical Radiology
The Royal College of Radiologists

Radiology reporting figures for service planning
2022

November 2022

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Foreword

As demand for imaging grows year on year, services are under increased pressure to ensure sufficient reporting capacity within their departments. Crucial to this is the need for guidance and tools to assist services with resource planning and to establish methods for calculating service capacity. By publishing this guidance, the RCR aims to support services by exploring the factors that can affect reporting capacity and by providing two models of calculating reporting capacity that can be adapted by departments depending on their requirements.

The focus of this guidance is solely on departmental planning rather than the individuals, and it should not be used for individual performance management or medico-legally.

The RCR would like to thank the working party, in particular Dr James Thomas, and all those who contributed to the development of the guidance through the consultation feedback process.

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1 Summary

- A measure of the reporting capacity is vital to support managers and directors in planning the provision of services within their units.
- Individual reporting outputs are extremely variable and are affected by numerous factors, and these figures cannot be used for individual job planning or performance management.
- It should be recognised that all systems for reporting figures will be imperfect.
- It should be recognised that reporters rarely report continuously for four-hour blocks.
- The working environment plays an important role in efficient and safe reporting, including a good IT infrastructure.
- Time should be factored in for other necessary activities, reflecting real-world working practices, such as interruptions, vetting, teaching/mentoring and rest periods. Real-world data should be used as it incorporates such factors.
- Reporting of plain films has changed, with an increasing contribution from other staff groups (principally radiographers), and radiologists are often reporting a higher proportion of more complex patients.

2 Introduction

The NHS long-term plan (2019) recognised the crucial role of diagnostic services and NHS England commissioned the Richards report,[1] which recommended rapid and urgent expansion of imaging services. This investment is welcome but is also a challenge to a limited workforce and careful planning is essential.

Previously, a focus on increasing image acquisition resulted in large backlogs of examinations waiting for a report, and a usable tool for assessment of reporting capacity has been elusive. The area has become more complex as the role of the radiologist continues to expand and other staff groups, particularly reporting radiographers, make an increasing and vital contribution to reporting.

There are numerous variables affecting the number of reports issued in a certain period by an individual and the use of reporting figures for performance management has proved unhelpful and often counterproductive. It is, however, essential that system leaders and managers understand the need for high-quality reporting of studies and have some tools with which to assess the necessary resources when planning services.

To date, there is no agreed methodology for measuring reporting activity, which makes demand and capacity calculations within individual departments, imaging networks and nationally very difficult.

In producing this guidance The Royal College of Radiologists (RCR) convened a radiologist-led steering group to provide a peer view on radiology productivity. The steering group membership had representation from across the workforce, including radiologists working in hospitals throughout the UK, the teleradiology sector, a trainee, a radiographer, national leads and advisers and RCR officers.

The figures contained within this guidance are based on a combination of real-world data and expert opinions. These should be used only for the purposes of business planning (for example recruitment) and *not* for the line management of individuals.

3 Reporting as part of a radiologist's role

There is a changing clinical picture globally. The role of radiologist is moving from being largely a reporter to more active participation in patient management, including treatment discussions. In addition, there has been a proliferation of more complex imaging such as contrast ultrasound, multiparametric magnetic resonance imaging (MRI) and cardiac computed tomography (CT), which may need specific training and more time to report. The overall impact on reporting times of artificial intelligence (AI) at this stage remains unclear.

The problem with RVUs

A number of systems exist for dividing reporting activity into transferrable blocks of time, known as RVUs (relative value units). These include:

- Gishen ready reckoner (see The Royal College of Radiologists, *Clinical radiology workload: guidance on radiologists' reporting figures* 2012).[2]
- Pitman–Jones (see Royal Australian and New Zealand College of Radiology (RANZCR), Measuring radiologist workload: Progressing from RVUs to study ascribable times).[3]
- Recommendations in Care Quality Commission, *Radiology review: A national review of radiology reporting within the NHS in England*.[4]

Previous systems have a number of significant problems, outlined below:

- Time demand for reporting – a 2004 Dutch survey showed that reporting accounted for approximately 30% of radiologists' time commitment.[2]
- RVUs and other figures were designed as an aid to pay for performance and insurance reimbursement and they rely on consensus of time estimates, which can be subjective.
- Consideration of 'primary' reporting only and not re-review for verification of trainee reports, second opinions or blind re-reporting for certain multidisciplinary team meetings (MDTs).
- No account taken of ever-increasing procedural work and non-countable activity.
- Absence of measured impact of a trainee's presence while reporting.
- No consideration of double reading time (for example, in mammography or cardiac).
- No consideration of personal or organisational factors such as subspecialisation and its attendant complexity, split-site working, overall experience, intensity of mental effort, medico-legal risk and stress, or time of reporting.
- Formal double reporting as part of departmental audit, with support for radiology departments to digitise the peer review process.
- Variation in skill mix between teaching hospitals, district general hospitals and specialised centres.
- Wide variation in local IT and networking support.
- Interruptions during reporting, clarification of requests and case-related discussion with referrers.
- No factoring for vetting and protocolling.
- No factoring for personal attendance during procedure.
- No factoring for pre- and post-procedural care.
- No clear demarcation of hot reporting versus cold reporting and related factors.

Local guidelines

If in-house guidelines are to be developed locally, these should be based on how to manage the entirety of the imaging department workload and should take into account all the factors above.

4 Circumstances of reporting

There is a paucity of evidence evaluating the accuracy, performance and speed of radiologists in different reporting environments.

The circumstances in which radiologists find themselves reporting vary considerably between organisations, specific sessions, departments and reporting rooms.

Reporting sessions may, in some centres, be categorised as 'hot' (during which focus is on acute reporting, troubleshooting and protocolling) and 'cold' (during which reporting is more outpatient focused and may be at less at risk of interruption). The specific roles and responsibilities of a radiologist in a given session vary between institutions.

Interacting with clinical colleagues and other healthcare professionals is a crucial component of a radiologist's working day, but it may be difficult to safeguard uninterrupted reporting time given the pressures on both imaging departments and other clinicians' time.

Circumstances that may impact on a radiologist's output and performance are manifold and include (but are not limited to):

- Whether the session is specifically designed to be without interruption.[5]
- Whether the radiologist has duties other than reporting during a session (for example, holding a phone or bleep; fielding queries in person; communication of unexpected findings by phone or email; vetting and protocolling studies; providing on-table review of images; or other practical responsibilities such as cannulation, pneumocolon or contrast injections).[6]
- The modality, type and complexity of the studies to be reported.
- The volume of studies to be reported.
- The configuration, ease of use and integration of the picture archiving and communication system (PACS) and radiology information system (RIS).[7]
- The quality and efficiency of IT (including the accuracy and reliability of voice recognition technology) and technical support thereof. This includes the ease of accessing previous studies for comparison.
- Access to and effective utilisation of home-reporting sessions.
- The expected use of, or access to, AI software and training to enable appropriate use thereof.
- The use, expected or otherwise, of structured reporting templates.[8]
- The presence or absence of trainees.
- The quality of administrative or secretarial support.
- Environmental ergonomics (including background noise, ambient light levels and temperature).

- Ergonomic factors related to the layout and physicality of the workspace (including the quality, comfort and suitability of chairs, use of standing desks, number of people in the reporting room and use or otherwise of screen partitions).[9]
- The time of day.[10]
- Personal factors (including medical factors or disability); work-related or unrelated stress; fatigue;[11] repetitive stress syndromes;[12] and digital eye strain.[13]
- Discrepancy rates in various circumstances. According to a 2018 study:[14]
  - Day/night: the total discrepancy rate was higher at night.
  - During a less busy session (defined as <24 reports), more discrepancies were made.
  - Start/end of session: radiologists demonstrated increased symptoms of fatigue, oculomotor strain, decreased ability to focus and to detect fractures and reduced diagnostic accuracy for detecting pulmonary nodules at the end of a working day. These factors were most pronounced during the final two hours of a 12-hour session, demonstrating the impact of consecutive hours of work on radiologists' reporting.

While radiologists may have some scope to optimise the specific environment in which they find themselves reporting, many of these factors are outside their immediate control and are related to the specifics of their department or organisation.

The 'ideal' reporting environment is rarely encountered, and the circumstances of the departments reporting should be considered when forecasting or analysing reporting figures.

Teaching and training

The core deliverers of radiology training to specialist trainees and reporting radiographers in the UK remain consultant radiologists and advanced practitioners, at local, regional and national levels. Thus, training of the next generation of reporters must not be compromised in the pursuit of increasing reporting numbers by reducing training.

Teaching and reporting output

There is conflicting evidence over the impact of trainee presence on a department's efficiency and consultant workload.

The seniority of a trainee is a major determining factor in their ability to contribute positively to the clinical output of a department.

Arguments proposed that favour a positive impact include:

- The ability of more senior trainees to independently perform and report studies, fluoroscopy, ultrasound and some basic interventional procedures.
- The ability of trainees of a variety of levels of seniority to provide acute/hot reporting and troubleshooting cover either in face-to-face discussions or on the phone.
- The ability of trainees to protocol scans.
- Trainees providing out-of-hours cover in some centres.
- The ability of some trainees to prepare and present cases at MDT.

Arguments in favour of a negative impact include:

- The need for trainees of all levels of seniority to be supervised in all areas of their practice (and the need for studies and procedures performed by trainees to be checked by consultants, as well as feedback given).
- MDT preparation and case presentation may take longer in the presence of a trainee.
- Trainee interruptions may reduce the productivity of a consultant in a given session.

One study measuring the impact of informal teaching on consultant productivity reported a near 50% drop in plain radiograph reporting figures if a junior trainee requires teaching in the same session;[15] and senior trainees, by contrast, might contribute to a net gain in reporting speed (productivity) by the same amount. The crossover point seems to be ST2–3 (pre-FRCR).

Time spent teaching and training

The Royal College of Surgeons Ireland (RCSI) system of RVUs (modification of the RANZCR system)[16] attributes a mean time spent on non-countable activity of 32.47%, including the delivery of formal teaching, across all hospitals. This figure is greater (51.84%) in larger teaching hospitals. Through a combination of external observation and radiologist consensus, trainee-focused activities have been estimated as representing 17.5% of a consultant radiologist's working week.[17]

A Canadian observational study is consistent with this finding, estimating teaching time as representing 14.6% of consultant radiologist hours worked.[18]

Teaching and training are delivered in both formal and informal settings, with the latter accounting for an amount of time which is, by its nature, difficult to factor into formal job plans but will fall within direct clinical care (DCC) time.

Accounting for teaching

In both the RANZCR and the RCSI systems, the impact of trainees on consultant workload was not specifically factored in given the uncertainty over the true effect of trainees on the output and efficiency of a department. The RCSI system did not log informal time spent training trainees, relying on this time being factored into specific study RVUs.

Based on anecdotal evidence, it would not be unreasonable to suggest that **a junior trainee might on average reduce reporting by 33%**.

It also worth noting that senior trainees will teach and potentially supervise their juniors, so minimising the impact of the most junior registrars/radiographers and that this might be as much as 30% of their time, reducing the impact on a consultant radiologist's workload. Trainees also contribute to a large proportion of the audit and research outputs from a department, so it is not unreasonable to suggest that any department should have a good mix of both junior and senior trainees.

One key consideration is that, even when using radiology business intelligence, RIS workflows will not take full account of training when undertaken in the traditional training environment at the reporting workstation.

Consultant job plans

The structure and nature of consultant job plans are important considerations when viewing reporting figures with respect to the output of both imaging departments and individual radiologists. In particular, the precise responsibilities placed on the radiologist in any given session should be understood and accounted for. To support departmental planning a guidance on job planning will be published in 2022 by the RCR.

5 Reporting output guidance

Many scales used within the NHS, outsourcing companies and the independent sector use a method based on the number of 'body parts' per examination. While this methodology has been used for some time, it is widely recognised that this does not truly represent the work that goes into reporting as examinations with the same body part count can be very different depending on the body parts in question.

Recognising that departments and networks have variable analytics capability, we present two versions of the figures for use.

Model 1: A quick guide based on the body part method of counting and using real-world evidence of reporting outputs from the East Midlands Imaging Network.

Model 2: A more detailed model developed by the North West London Health and Care Partnership Imaging Board following extensive consultation within the member departments.

Using the reporting model figures

The model figures should *not* be used for the line management of individuals or medico-legally.

They should be used pragmatically to inform departmental planning only. As real-world data, they automatically include time requirements for the majority of issues highlighted above such as breaks and teaching and show what is currently being achieved in large departments. These figures represent a departmental average and are for guidance only. Individual reporting figures will vary widely, and in many cases the reporter may actually exceed these figures, so they should not be used to set a minimum or maximum reporting figure. The figures carry a number of assumptions:

- They assume an 'average' case mix, meaning a mixture of mainly 'routine easy' cases with some more complex cases; an oncology reporting list will (especially scans assessing response to treatment) necessarily be much slower to report.
- They make no allowances for either inherent reporting speeds, which vary considerably between individuals (and which are poorly related to reporting accuracy), and fatigue, environments that may slow reporting down.
- Emergency/hot reporting (referral from emergency and inpatient departments) of CT and MRI is variable and carries considerable responsibility other than pure reporting. In addition, there are more disturbances and interruptions compared with elective reporting.

- Vetting of requests may be performed during a reporting session, which is not factored in here.
- Specialist complex reporting such as virtual colonoscopy and cardiac CT will take longer than simple assumption of body parts and is accounted for in model 2.

Model 1

How these figures were calculated

Real-word data was obtained from the database maintained by the East Midlands Imaging Network. This represents the largest database currently available of real-world reporting times in the UK. The measures taken are the minutes from the reporter clicking to edit the report to clicking to verify. While this provides accurate measures of time taken writing the report, there may be time spent reviewing the current or prior imaging before the report is started. We have, therefore, included some additional time as well as some time for choosing and loading the next study. For the plain films the figure of 80 was agreed within the writing team following review of the London data.

Modality	Number of body parts	Number of reports expected on average over a six-month minimum period per in-hours on-site non-acute four-hour reporting session in the NHS
CT	1	16
CT	2	10
CT	3	8
CT	4	6
MRI	1	14
MRI	2	10
MRI	3	8
Plain film	1	80

Model 2

How these figures were calculated

Real-word data was obtained from the North West London partnership followed by extensive in-house consultation and testing. These data have also been retrospectively tested against actual reporting activity and shown to be accurate.

To use these figures, a spreadsheet or equivalent software is required. Each examination code is assigned a number of minutes or number reported per hour and thus reporting output in actual and expected figures can be calculated on a departmental level. These data can be used to calculate the required reporting time for backlogs or the departmental workload as a whole and thus the number of 'pure reporting' consultant and equivalent professional activities (PAs) required for the department.

An Excel spreadsheet of this data is available from the RCR website labelled Model 2 Appendix.

Appendix
East Midlands Imaging Network data used as evidence for model 1

Three years' data for 187 radiologists working for seven trusts. The reporting time pulled from the business intelligence tool is recorded as minutes between the reporter clicking 'edit' to clicking 'verify'. Times over 60 minutes and under 1 minute were excluded.

The total number of scans is 316,810 CTs and 172,316 MRIs.

		Other circumstances							
		All studies		In hours (9am–5pm)		Out of hours (5pm–9am)		Insourcing (out of hours paid per item)	
Modality	Body parts	Number	Average (mean) mins taken	Number	Average mins taken to report	Number	Average mins taken to report	Number	Average mins taken to report
CT	1	187,706	14	119,937	15	58,344	10	9,425	7
CT	2	57,970	16	36,094	17	18,189	13	3,687	10
CT	3	67,347	17	44,449	17	17,617	14	5,281	11
CT	4	3,787	18	2,252	18	1,142	13	393	14
MR	1	153,511	13	100,609	14	33,312	11	19,590	8
MR	2	6,110	16	3,994	17	1,534	12	582	9
MR	3	12,695	18	8,929	18	2,727	13	1,039	11

Notes

In hours is all studies reported between 9am and 5pm.

Out of hours is all studies reported between 5pm and 9am. These are likely 'acute' and 'on-call' examinations without outpatient or 'cold' reporting, such as cancer follow-up, and without 'complex' examinations, such as CT colonoscopy and cardiac MRI.

Insourcing is a voluntary pay-per-item scheme of 'cold' studies, including cancer follow-ups, and performed in reporters' non contracted time.

Further reading

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The Royal College of Radiologists. *Radiology reporting figures for service planning 2022*. London: The Royal College of Radiologists, 2022.