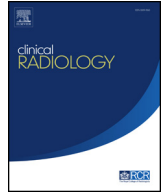




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Accelerated implementation of remote reporting during the COVID-19 pandemic



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AIM: To assess, via a survey of UK radiological departments, if the COVID-19 pandemic led to a change in radiological reporting undertaken in a home environment with appropriate IT support.

MATERIALS AND METHODS: All imaging departments in the UK were contacted and asked about the provision of home reporting and IT support before and after the first wave of the pandemic.

RESULTS: One hundred and thirty-seven of the 217 departments contacted replied, producing a response rate of 61%. There was a 147% increase in the provision of remote access viewing and reporting platforms during the pandemic. Although 578 consultants had access to a viewing platform pre-pandemic, this had increased to 1,431 during the course of the first wave.

CONCLUSION: This survey represents work undertaken by UK NHS Trusts in co-ordinating and providing increased home-reporting facilities to UK radiologists during the first wave of this global pandemic. The impact of these facilities has been shown to allow more than just the provision of reporting of both elective and emergency imaging and provides additional flexibility in how UK radiologists can help support and provide services. This is a good start, but there are potential problems that now need to be overcome.

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Introduction

On the 23 March 2020, the Prime Minister indicated that the UK was to go into a national lockdown because of the COVID-19 pandemic. Individuals were encouraged to work from home where possible; measures supporting social distancing at work had to be introduced for those not able to work from home. Additionally, staff who had come into contact with an individual with symptoms of COVID-19

were required to self-isolate for up to 14 days. Those defined as clinically vulnerable were required to shield at home.¹ These unique circumstances challenged the ability of imaging departments to continue working at full capacity through a hospital-based service alone.

Social distancing within imaging departments proved challenging. With many departments having communal reporting rooms, social distancing requirements meant that several work stations in these areas could not be used,

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reducing reporting capacity; however, clinical radiologists can work from home when supported by the appropriate information technology (IT) and this includes imaging reporting, teaching, and participating in multidisciplinary team (MDT) meetings.

There are many established models for the practice of home reporting.² These are used by teleradiology companies currently and this includes NHS outsourced work to address NHS reporting backlogs and provide out of hours' emergency reporting services to NHS Trusts and Health Boards. During the first wave of the COVID-19 pandemic, many teleradiology companies allowed radiology consultants that already undertook reporting work for them to use their reporting workstations to report non-outsourced NHS work.

These unique circumstances led to an increased need and desire for imaging departments to provide the facilities to work from home to more radiologists. Consequently, the Royal College of Radiologists (RCR) issued interim guidance to support the rapid deployment of home-reporting systems during the pandemic.³ This national survey is a review of the changes that occurred in the provision of home reporting to consultant radiologists during this period.

Materials and methods

A short online questionnaire was sent to all audit leads at radiology departments in NHS hospitals across the UK (Electronic [Supplementary Material Appendix A](#)). Twenty-two questions were asked about the provision of home-reporting facilities, the systems used and the work performed, and if the provision of these services had changed during the COVID-19 pandemic. The Survey was conducted between the 9 and 31 October 2020. Data were analysed using Microsoft Excel (2010, Microsoft, Redmond, CA, USA). Missing data were excluded from the analysis.

Results

Responses were received from 132 of the 217 (61%) UK imaging departments contacted. The geographical distribution of responding departments comprised England $n=103$ (78%), Scotland $n=18$ (14%), Wales $n=5$ (4%), and Northern Ireland $n=6$ (5%). Seventy-nine (60%) of the responses were from teaching hospitals, 45 (34%) from non-teaching hospitals and eight (6%) from specialist hospitals. Of the departments that responded to the questions on remote access imaging reporting provision, 111 of 128 (87%) provided a remote access workstation with diagnostic monitors and/or a laptop to at least some of their consultant radiologists. There was a 147.6% increase in the availability

of remote access viewing and reporting platforms during the COVID-19 pandemic, which were available to 578 consultants pre-COVID-19 pandemic and 1431 consultants during the pandemic ([Table 1](#)).

For most departments (75 [69%]), this remote access was reported to be through the provision of a desktop reporting station, but 50% of respondents ($n=54$) reported using laptops for remote working, indicating that some departments offer a mix of remote working solutions. Seventy-four per cent ($n=80$) of departments made images available through a virtual private network (VPN). Many respondents (52 [48%]) indicated that images were compressed to improve the speed with which examinations could be transferred although a majority of respondents (56 [52%]) were not aware of how data were compressed for download to their remote work station. Most centres depend on a combination of their local PACS team and the hospital information technology (IT) department to deliver IT support for remote working; although for most, this support was only available routinely from Monday to Friday between 9.00 am and 5.00 pm with limited support outside these periods ([Table 2](#)).

The remote access systems were most commonly used for either elective (104 [96%]) or emergency (85 [79%]) imaging reporting but were also used to enable other functions, such as the delivery of MDT meetings (78 [72%]), meetings other than MDT meetings (70 [65%]), teaching and training (55 [51%]).

Most centres (84 [78%]) felt the impact of COVID-19 had had a positive effect on the roll out of home-reporting services, with the interim guidance provided by the RCR having a positive influence in 26 (21%) departments, while a further 73 (58%) departments were aware of the guidance.

The most quoted barriers to implementation of remote reporting were a lack of funding and IT support. Other issues reported were availability of VPNs within the trust and slow transfer speeds due central server availability and bandwidth issues.

Discussion

The COVID-19 pandemic has had a significant impact on ways of working throughout the UK and appears to have had a major positive impact on the rollout and provision of home-reporting facilities. This survey comprised responses from 61% of UK imaging departments, which was felt to be a good result for a survey of this kind bearing in mind working pressures at the time it was run, and it was therefore a reasonable representation of what occurred during the pandemic. The survey showed there was a 147.6% increase in the provision of remote access for home working

Table 1
Proportion of consultant radiologists who have a remote access workstation now compared with pre-COVID.

	<i>n</i>	%	95% CI	% increase
How many consultant radiologists work in your department?	2,777	—	—	—
How many consultant radiologists had remote access workstations pre-COVID?	578	20.8	19.3 to 22.4	—
How many consultant radiologists have a remote access workstation now?	1,431	51.5	49.7 to 53.4	147.6

Table 2

How IT support is provided to radiology departments.

	9–5 Mon–Fri		24/7		Other	
	n	%	n	%	n	%
PACS team (n=94)	78	83	12	13	4	4
Hospital IT department (n=92)	53	58	33	36	6	7
External provider (n=16)	8	50	3	19	5	31

IT, information technology.

throughout this period. The authors estimate that 50–53% of all UK radiologists now have access to home reporting, in comparison with 19–22% before the pandemic began. Although this particular comparison is to some extent indicative as it does not take into account any change in the overall number of consultant radiologists between the two time points (Table 1), the most recent figure for growth in consultant workforce for the year ending September 2019 was only 3%.⁴ Where home working has been adopted, it has enabled social distancing within radiology departments without compromising reporting capacity. Disadvantages of remote working include potentially less interaction between radiologists and possibly less frequent discussion of difficult cases with colleagues and referring clinicians. Teaching may also be compromised, as there is less face-to-face interaction, which would particularly impact on procedural training in ultrasound and interventional radiology; however, radiologists have embraced videoconferencing programs to overcome some of these challenges.

The major barriers to the roll out of home workstations are funding and a lack of appropriate IT support and technology infrastructure (Fig 1). Funding should be addressed by demonstrating sustained reporting capacity despite the physical capacity limitations necessitated by COVID-19 and in keeping with the objectives at national level to maintain

diagnostic capacity for non-COVID indications as far as possible during the pandemic.^{5,6} There is a potential cost saving for departments who need to use teleradiology companies to meet their reporting demands as home-reporting workstations have the potential to increase flexibility and reporting capacity. This will become particularly important as workload increases again, recognising that during the pandemic 10 million fewer imaging investigations were carried out compared with the same period in 2019.⁷ With national acknowledgment of the fundamental shortfall in diagnostic capacity across the UK,⁸ the need to maximise capacity and productivity has never been greater.

IT support and technology infrastructure

Less than 50% (n=48) of departments reported having access to IT support 24 h a day and 7 days per week (24/7). This indicates potential system vulnerability. One respondent observed that teleradiology providers who allowed their equipment to be used for NHS work at the start of the pandemic offered 24/7 support for IT issues. Another theme emerging from respondent feedback was the issue of bandwidth capacity within hospital sites, which limited the efficacy of VPN connections and image transfer.

Most departments (52%) were not aware of the methods of image compression used in the transfer of imaging. Methods of compression can affect transfer speed and the overall diagnostic quality of the images. Transferring only axial images and performing reconstructions on workstations at home is one way to reduce the amount of data needing to be transferred and reduce download time, therefore potentially improving efficiency. Most departments (58%) reported that their remote monitors were self-calibrating, representing another aspect of quality control in providing access to the images.

This study describes the extent to which consultant radiologists at teaching, non-teaching and specialist hospitals across all four nations of the UK are enabled to work remotely from home in October 2020. The response rate of >60% suggests a low risk of severe non-response bias.⁹ Moreover, it compares favourably with other similar published studies.^{10,11} Ninety-five percent of responding departments provided complete data. The risk of measurement error from retrospective data gathering of the number of consultant radiologists who had remote access workstations pre-COVID was mitigated by an option to input “don’t know” and excluding these data from the analysis.

Limitations

There are several limitations that should be acknowledged with this paper; firstly, this survey did not explore the different methods used to connect to hospital networks, and therefore the effect of bandwidth or other IT factors on user experience cannot be discussed. Although the survey identified the large-scale use of non-self-calibrating monitors, the survey did not review what methods were

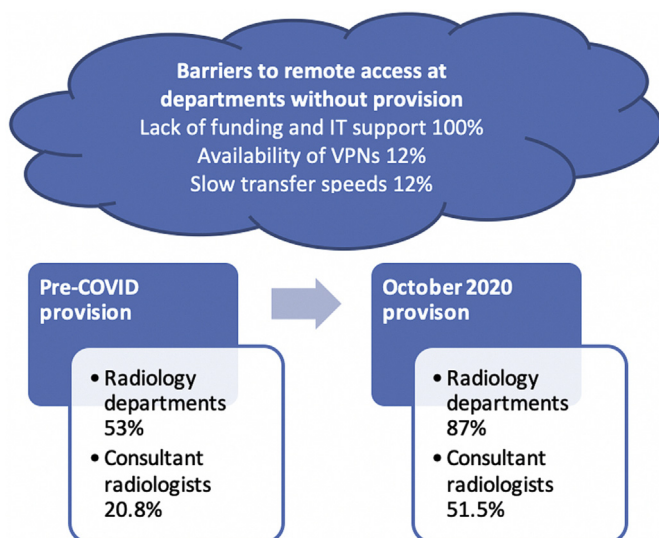


Figure 1 Based on survey results, provision of remote access workstations to consultant radiologists is greater now (October 2020) compared with pre-COVID; however, barriers, such as lack of funding and IT support, leave a minority (13%) of radiology departments without any such provision.

undertaken to ensure if departments had assessed consumer monitor adequacy and calibration using such methods as a photometer and the TG18 test pattern.

In conclusion, this survey demonstrates that home reporting has been integrated into most UK imaging departments in response to the challenges posed by social distancing, isolating, and shielding because of the COVID-19 pandemic. This represents a huge amount of work undertaken by UK NHS Trusts and Health Boards in coordinating and providing these facilities in a very short time. It has enabled a diversity of working practices, and many of the traditional barriers that have limited the roll out of this technology have been overcome; however, very few departments have a comprehensive system in place to deal with IT issues, which may impact the delivery of this service outside normal working hours, and this needs to be addressed particularly if these systems are being used to deliver emergency imaging reporting. It is likely that the need for home reporting will remain, not only given the likelihood of further peaks of infection, but also to address the increasing demand for imaging studies from remote consultations and reporting the backlog of patients whose imaging was delayed during the pandemic. Although this represents good progress, it is crucial this momentum is maintained to truly embed this service reliably into UK radiology practice.

Conflict of interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.crad.2021.01.004>.

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