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Title:

An evaluation of CT head reporting radiographers' scope of practice within the United Kingdom

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Introduction

Computed Tomography (CT) is a common medical imaging examination in the United Kingdom (UK). The National Health Service (NHS) England¹ estimates that on average 0.49 million CT examinations a month have been undertaken in the last 12 months. The Royal College of Radiologists (RCR)² further advise CT imaging has increased by 54% over the last five years. The RCR workforce consensus² indicates a 23% radiologist workforce shortage in the UK, resulting in only 2% of UK NHS radiology departments being able to meet national reporting deadlines. In 2003 the Department of Health³ introduced the skills mix initiative to support service delivery to meet the demand for urgent and timely reporting of medical imaging through implementing reporting radiographers into NHS clinical practice. The initiative was further endorsed by the RCR and Society and College of Radiographers (SCoR) team working on reporting guidance.⁴ The latest data for managing the reporting demand indicates that 84% of UK NHS trusts now employ reporting radiographers across a range of imaging modalities.²

In recent years there has been criticism levied at the reporting radiographer service, citing that radiographers' reports are "observational and descriptive, without any depth of medical interpretation in the context of the individual patient concerned: such reports are therefore of little, or no, added value to the referring doctor in imaging studies of any complexity (such as chest x-rays or CT or MR scans)".⁵

The literature on CT head reporting by radiographers in clinical practice post qualification is limited. The majority of papers have concentrated on training and endpoint assessment,⁶⁻¹⁰ or drivers and barriers to training.¹¹ To date, the specific role of CT head reporting by radiographers has been supported by both the SCoR^{12,13} and the Care Quality Commission¹⁴ and the National CT Head Reporting Special Interest Group (CT Head SIG).¹⁵ The CT Head SIG aims, and objectives include investigating how the advanced practice reporting role is embedded within clinical practice, promotion of the role and profile, and sharing best practice and national standards of reporting radiographers.

This study aims to investigate the scope of practice of the CT head reporting radiographer role in the UK and to gain a comparison to professional body standards and guidance.

Method

The study received ethical approval from the institutional ethics and governance approval panel (Ref:18/H&W/25C). A pilot questionnaire was trialled (n=4) for online access, reliability, validity and appropriateness of questions. The pilot was based upon critical themes identified from four national guidance documents¹⁵⁻¹⁸ recommendations on a scope of practice for radiographer reporting roles should be implemented. The questionnaire instrument was refined from the pilot testing and was themed into key four areas (comprising thirty questions in total) on demographics, the scope of practice, referrals, and on-going competence (Table 1). The online questionnaire utilised both multiple choice and multiple response (closed questions), and qualitative open question free text response (to allow participants to provide their preferred answers based on their local clinical practice variation) to reduce response bias. The questionnaire was hosted online through a third-party software provider (Online Surveys (Jisc) 2019, Belfast, UK). The application of a self-administered questionnaire further reduced social desirability bias in responses.

Accessing the UK population of CT head reporting radiographers to distribute the questionnaire too was problematic. There is no mandatory register of all the individuals practising CT head reporting held by any professional body. Convenience sampling of the questionnaire was applied due to the restriction on available data of the population being sampled, and as such, the study acknowledges this as a limitation. Dissemination of the online link to the questionnaire with information background sheets and consent forms were circulated via email to members of the CT Head SIG through gatekeeper access via the chair of the CT Head SIG. Additional advertisement of the study via social media (Twitter, 2019, San Francisco, USA) during May and June 2019 promoted the study and questionnaire. Social media platforms have been evidenced to engage with radiographers to discuss and debate professional development activities and overcome issues of geographical location, speed and ease of access.^{19,20} Eligibility criteria required participants to be NHS CT head reporting radiographers within the UK.

Further confirmation of consent was required at the start of the online questionnaire to confirm participants had read and understood the study information sheet before starting. Anonymised free text data responses were coded using text search software analysis (NVivo 12, QSR International 2018, Victoria, Australia) to group common themes in responses and identify keywords, and map re-occurring prominent phrases from the qualitative data. The quantitative responses applied descriptive statistics (Microsoft Excel 2019, Washington, USA) to summarise observations of the study sample. The results were displayed in central tendency bar chart histograms, mean, median, mode; and measures of variability and dispersion using standard deviation (SD), Standard Error (SE), range, and sample variance.

Results

Sample demographics

The total amount of individuals that completed the questionnaire was n=58, two were removed due to partial completion, one set of data was removed due to ineligibility (outside the UK), a further was a historic response of no longer reporting, the final sample size was n=54. There was no returnable data on whether the participants responded via the CT Head SIG email or Twitter advertisement of the questionnaire. A breakdown of the Twitter responses is shown in Table 2 with the amount of Impressions (reach of the tweet advertisement of the questionnaire to individual Twitter accounts) the amount of Engagements (the number of times individuals interacted with the Tweet advertisement) and Link Clicks (the number of individuals who accessed the questionnaire via the Twitter link, although this does not evidence submission of completed questionnaires).

Subgroup locations of the participants completing the questionnaire displayed 94.4% (n=51/54) were represented within England, with 3.7% (n=2/54) of the proportion of respondents in Northern Ireland, and a single respondent from Scotland (1.9%; n=1/54), no responses were returned from Wales. A detailed location breakdown is presented in Figure 1, displaying the largest proportion of responses came from the South East and North West of England. Further specifics of the demographics, detailed 92.5% (n=50/54) were in NHS employment in England, 1 (1.9%) participant came from an NHS Board in Scotland, 1 (1.9%) participant came from a Health and Social Care Trust in Northern Ireland, and 2 (3.7%) declined to share their employer. The respondent's qualification award (Figure 2.) displayed a central tendency towards a postgraduate certificate qualification. An anomaly noted in the data is a high proportion of responses attaining masters level credits as an alternative to a full award. Factors leading to this outcome were not further explored to determine if this was additional training on-top of or supplementary to a previous reporting qualification or a standalone training course. The responses to the initial qualification in reporting CT heads (Figure 3.) displayed a wide range and variety with a mean response of 8.3 years' experience in this sample group.

Scope of practice responses

Exploration of the scope of practice disclosed 79.6% (n=43/54) had an age restriction of the patient reporting workload detailed within their scope of practice, of which 98.2% (n=53/54) of respondents reported adult examinations, and only 11% (n=6/54) reported paediatric examinations (0-18 years). In addition to this, the responses further indicated 100% (n=54/54) reported non-contrast enhanced scans, 68.5% (n=37/54) reported venous contrast enhanced examinations, and 46.3% (n=25/54) of the respondents reported arterial contrast examinations of the brain.

Further detail within their scope of practice reflected 40.7% (n=22/54) of the radiographers identified anatomical areas/examinations that were excluded from their scope of practice. These included CT examinations whose field view of extended beyond the head or multiple CT examinations / multiple areas of anatomy scanned within the same attendance, which included facial bones, petrous bones, paranasal sinuses, orbits, mastoids and the cervical spine, and therefore the examinations were outside of their scheme of work to report.

Referral responses

The referral pathways that the radiographers accepted within their scope of practice included a broad and diverse medical community (Figure 4). The peak distribution of responses leaned towards General Practitioners as the most commonly accepted referral source (83.3%; n=43/54). The distribution (Figure 4) displayed a wide outlier of choices in referral categories displaying a range of referral sources accepted within this study sample, and not a task specific or limited scope of referral practice.

The radiographers were further asked about their ability to refer on post examination reporting to assist the patient management and treatment. The data returned reflected 96.2% (n=52/54) of respondents had a scope of practice that allowed them to refer for further (or repeat) imaging in their clinical reports. With 55.5% (n=30/54) allowed to refer on their own accord and 40.74% (n=22/54) allowed to refer on after discussion with a consultant radiologist. The choice of modality included within their scope of practice incorporated all possible radiological examinations, with cross-sectional imaging, the most popular (Figure 5), potentially due to the type of neurological examinations reported.

Subsequent further inquiry on referral practices demonstrated 90.7% (n=49/54) of the respondent's scope of practice authorised them to recommend onward referral to specialist clinical teams for input into the treatment and management of the patient. The range of clinical and surgical teams noted within their scope of practice is displayed within Figure 6. These findings demonstrate the wide and varied medical and surgical teams that the radiographers interact and communicate their findings onwards to assist the patient's management and treatment pathway. The free text response eluded to the type of communication recommend in the treatment and management options, and common examples are displayed below:

"Equivocal CT for query subarachnoid haemorrhage suggest lumbar puncture if there are no contra-indications to the procedure for CSF sampling to rule out SAH".

"Expeditious commencement of anti-viral therapy (Acyclovir) in suspected encephalitis".

"An MRI brain scan with contrast is advised to characterise this complex lesion further".

On-going competence responses

The questionnaire additionally investigated the respondent's on-going competency reviews to support quality assurance within their clinical practice. Of the radiographers questioned 88.8% (n=48/54) received an annual performance review of their reporting role, and 98.1% (53/54) participated in routine audit cycles to confirm their reporting performance level. The pattern of the audit cycle in each respondent's clinical department varied (Figure 7), with the most popular category voted as 12-month audit cycles. Furthermore, the radiographers were asked how many CT head cases were incorporated into each audit cycle (Figure 8) the responses distribution indicated the category of more than 10 CT heads in each audit cycle as the most popular (59.2%; n= 32/54) in this sample.

Discussion

The sample of respondents was small, although the results highlight new and important data on the scope of practice of CT head reporting radiographers and provide some significance beyond academia to enhancing the evidence of reporting radiographers in the healthcare environment. The sample size in this study was smaller than a previous survey,²¹ although the range and variance of both the qualification award (Figure 2) and years of reporting (Figure 3) increases the validity of the respondent's voice in this study as reflected by their years of experience and exposure to CT head reporting to be able to provide sufficient testimonials of their clinical practice. The recruitment would have been more robust if an accessible database or voluntary register of reporting radiographers was held by a professional body such as the SCoR. At present the only available system is an optional advanced / consultant practitioner accreditation register which applies to all higher-level clinical practice and not just reporting. The response rate to topics on application of an agreed and defined scope of practice and accepted referral pathways (100% compared to 74%²¹), audit completion (100% compared to 36%²¹) and annual appraisal of ongoing performance (100% compared to 68%²¹) reflect adherence to national guidance standards.¹⁵⁻¹⁸ Further work on comparing practices between different services/individuals could expand upon the audit cycle practice to review caseload age ranges, pathology prevalence, range of conditions, and expand upon the exact number of cases routinely reviewed (especially if greater than 10, as noted in Figure 8).

A key theme shown in the data on referral recommendations within the reports demonstrated a broader view of the variables of the scope of practice, with 90.7% (n=49/54, Figure 6) communicating findings onwards to be actioned. It was unclear why a small percentage of

respondents do not refer on to specialist teams. Reasons could include the department protocol (potentially, some departments would prefer the original referrer to take responsibility for the patients' care pathway) or newly qualified reporters' confidence to communicate directly to specialist teams. The majority of radiographers that did refer evidenced that radiographers' reports are more than just 'descriptive in nature' and provide actionable recommendations and communications to and with a range of healthcare professionals to assist the management of patients post CT examination. Furthermore, they reflected adherence to RCR standards¹⁷ of the description of the findings and diagnosis, and the suggestion of further imaging, patient management if appropriate). As well as conforming to the SCoR clinical reporting guidance recommendations^{15,16} and the Health and Care Professions Council (HCPC)¹⁸ requirements set out within the Standards of Proficiency to interpret medical images and data and record appropriate information to assist when further action is required.

Brealey²² considered the logistical conundrum of how to evidence the effect of a radiographer's report on a clinician's judgement and patient outcome. This would require an observational follow-up study of the many factors involved within the written report of structure,²³ content,²⁴ and readability of the report,²⁵ to then relate these to the patient's records on treatment and management post CT examination. Although this is not as straight forward as it seems as follow-up studies post clinical report to measure the effects on patient outcomes are complicated. The imaging report could be correct, and referral onwards recommended to a specific surgical or medical management pathway, but the clinicians may choose a different treatment and management of their own opinion or assessment. Recently the Healthcare Safety Investigations Branch produced guidance²⁶ in collaboration with the RCR, SCoR and Academy of Royal Medical Colleges recommending clinicians act on all radiological reports (especially any urgent, critical or unexpected findings) and document the response in the patient's records. Observational studies may be possible in specific CT head pathways such as ischaemic stroke,²⁷ traumatic head injury²⁸ or subarachnoid haemorrhage²⁹ tracking patient medical records post CT scan and radiographer report to see if the clinician adheres to the recommended surgical^{28,29} or medical²⁷ managements. However, physician judgements will always be multifactorial, and the imaging report is but one test in combination with medical histories, blood chemistry results, physical examinations, mechanism of cause in combination with potentially pre-existing chronic or acute conditions, clinical advice from medical/surgical teams and patient choice/consent. As such observational studies may not answer all potential reasoning of patient treatment and management decisions downstream from imaging reporting.³⁰⁻³²

The effect of radiographer reports on patient treatment and management options has been attempted in plain film reporting by radiographers.³³⁻³⁷ Likewise in chest reporting by radiographers studies have endeavoured to establish if there is a measurable outcome effect through observational studies on chest x-ray reporting advising referral for same day CT lung cancer screening³⁸ or urgent respiratory medicine management.³⁹ Despite the small but growing studies evidencing outcomes, the current collective pool of studies on radiographer reporting demonstrates that the advance practice role is now beyond the threshold of being task specific and limited in scope.⁴⁰ Indicators of the impact and contribution to the healthcare sector of CT head reporting by radiographers are now cited and endorsed in stakeholder strategy and policy documents by the SCoR,^{12,13} the British Institute of Radiology,⁴¹ Health Education England,⁴² NHS England,^{43,44} and the UK independent healthcare regulator the Care Quality Commission.¹⁴

Limitations

Data from the sample (n=54) within this study (drawn from the population) are not generalisable to the whole population of radiographers reporting CT head examinations within the UK; exact population numbers are unknown; thus, convenience sampling was applied via email to the CT SIG group and online media which introduces some inherent bias in the dataset. The CT Head SIG guidance on Scope of Practice¹⁵ was developed by the CT Head SIG members, an acknowledgement that two of the 138 members of the CT Head SIG are SCoR employees introduces some bias of independence between the two groups. It is further acknowledged that not all CT Head SIG members are CT head reporting radiographers, the collective also includes radiology service managers, radiologists, trainee reporting radiographers, and radiographers that do not report but share an interest in the topic, thus the questionnaire response rate would not reflect the full CT Head SIG membership population.

Conclusion

The testimony and confirmation of CT head reporting by radiographers within the UK displayed in these findings demonstrate the progressive growth and establishment of the advanced practice within this modality and the associated additional reporting capacity and service delivery to benefit the healthcare system. Consideration of the practical relevance of these findings is reflected in the structured specific scope of practice which confirmed it aligns to national recommended guidance.¹⁵⁻¹⁸ Information and data on CT head reporting by radiographers in clinical practice is sparse, this paper has the potential to increase the knowledge of its role and highlight key areas it contributes to in the healthcare sector which is transferable regionally, nationally, and internationally.

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Questionnaire Key Themes	CT Head SIG 2018 ¹⁵	SCoR 2013 ¹⁶	RCR 2018 ¹⁷	HCPC 2013 ¹⁸
Demographics	E3	2.0, 5.1, 6.1, 6.2, 6.3	1.0, 2.0	
Scope of Practice	SP1, SP2, SP3, SP4 L6a, All	4.0, 5.3, 6.2	1.0	1.1, 13.5, 13.14, 13.15, 13.16, 13.21, 13.22, 14.7, 14.8, 14.10, 14.11, 14.12, 14.35
Referrals	SP7, SP8, L3, L5, All		1.0, 2.0, 3.0, A1, A2	4.5, 8.1, 9.5, 11.2, 13.4, 13.8, 13.13, 13.22, 14.2, 14.14
On-going competence	KS2, KS3, KS4, KS6	2.0, 5.2, 6.2	1, A3	12.1, 12.3, 12.4, 12.5, 12.6, 12.7, 13.19

Table 1. Key themes selected from national guidance for the questionnaire.

Date	Impressions	Engagements	Link Clicks to the Survey
13.06.2019	1,305	34	2
06.06.2019	2,562	30	3
31.05.2019	1,183	41	8
24.05.2019	1,899	23	5
20.05.2019	695	37	18
15.05.2019	1,712	50	6
14.05.2019	1,914	94	21

Table 2. Tweet analysis of questionnaire advertisement.

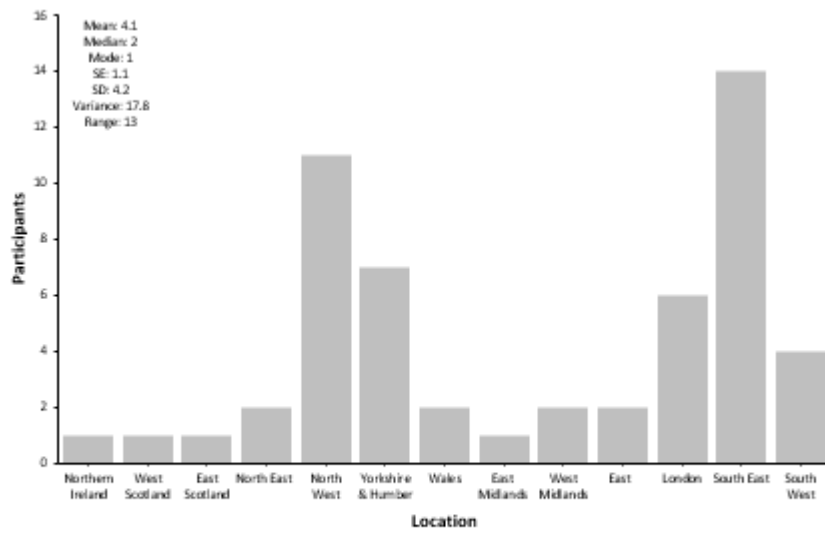


Figure 1. Regional location of participants (each participant chooses one option).

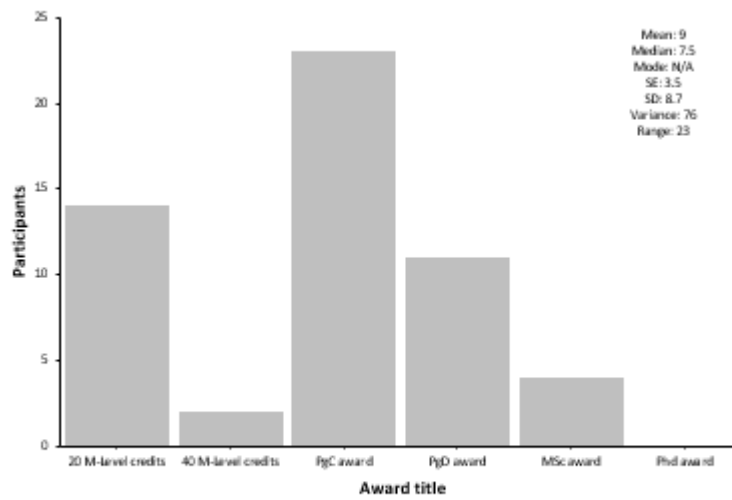


Figure 2. Reporting postgraduate qualification of the surveyed radiographers (each participant chooses one option).

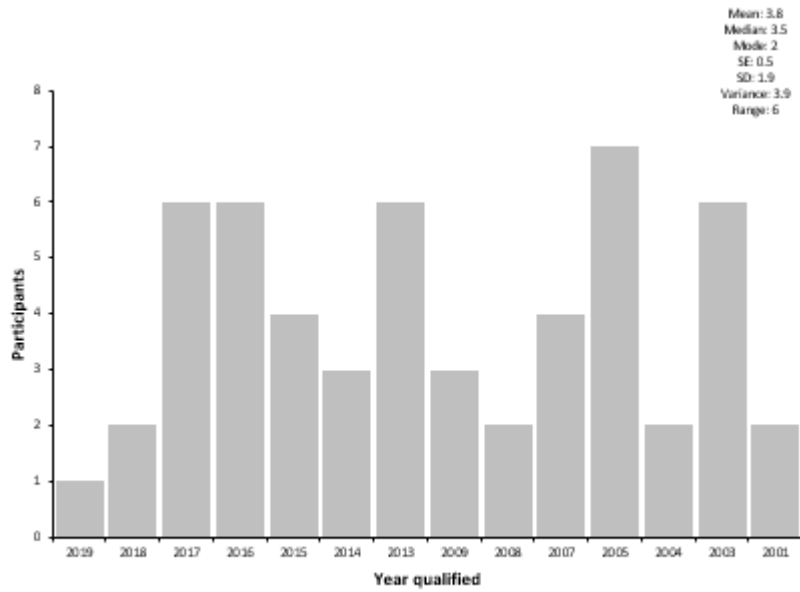


Figure 3. Year of qualification of respondents (each participant chooses one option).

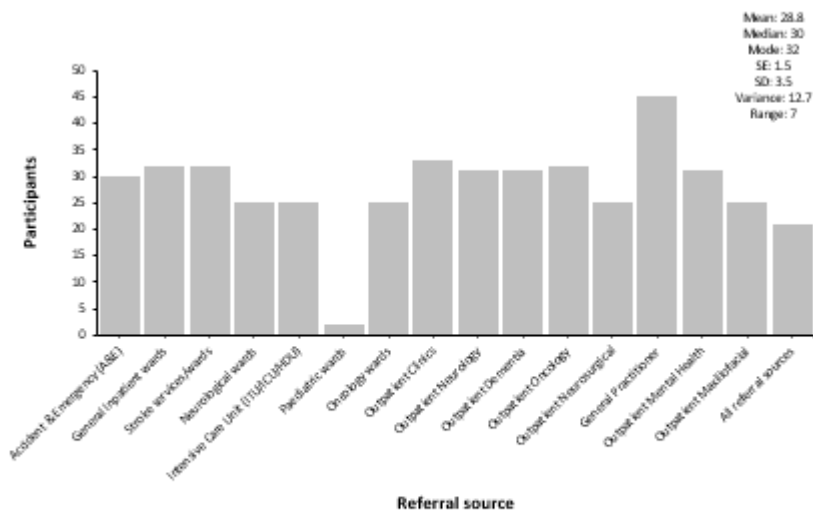


Figure 4. Agreed referral pathway written within the respondent's scope of practice (this was a multiple answer option; percentage of respondents who selected each answer category shown (if all chose a category it would represent 100% of respondent's choice).

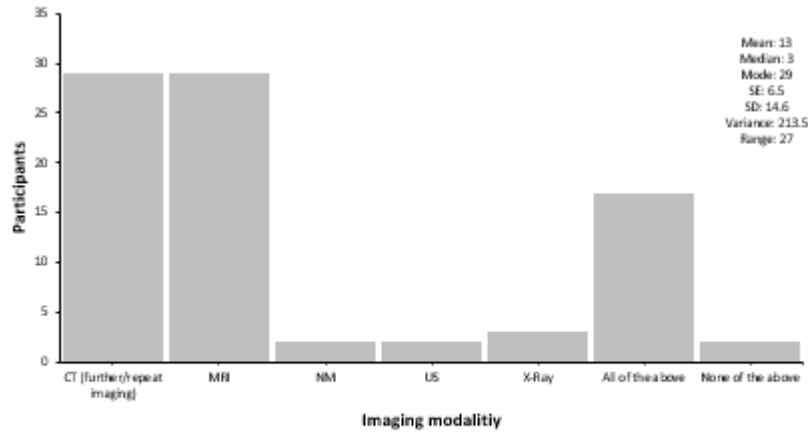


Figure 5. Referral onwards for imaging allowed within the scope of practice (this was a multiple answer option; percentage of respondents who selected each answer category shown (if all chose a category it would represent 100% of respondent's choice).

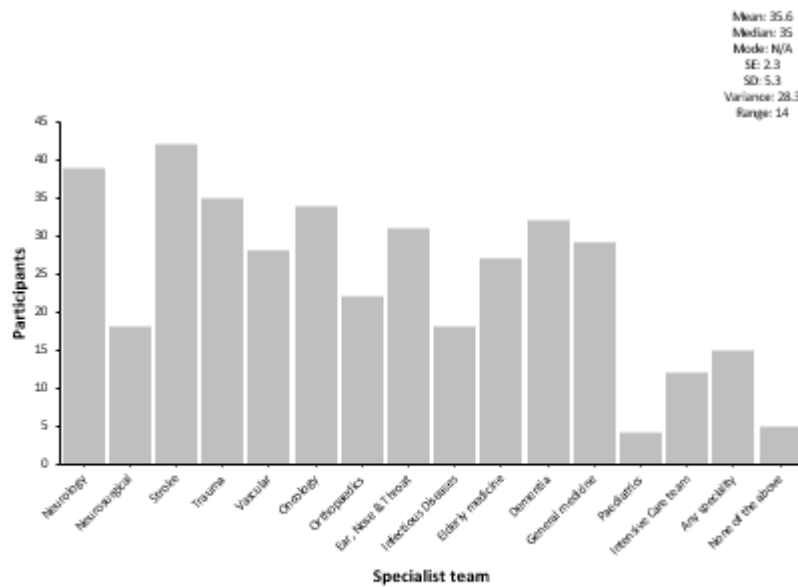


Figure 6. Referral onwards to a specialist team within the clinical report allowed from the radiographer's scope of practice (this was a multiple answer option; percentage of respondents who selected each answer category shown (if all chose a category it would represent 100% of respondent's choice).

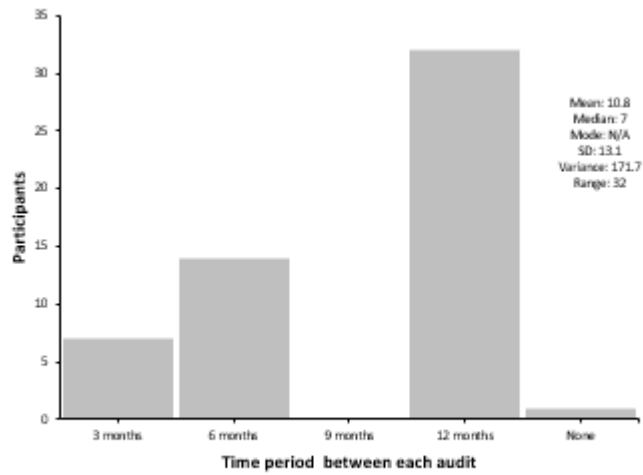


Figure 7. Audit cycle in months for each respondent (each participant chooses one option).

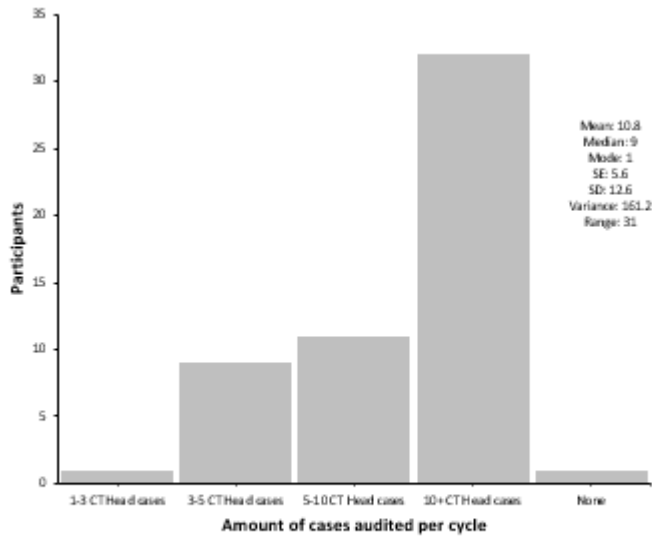


Figure 8. Amount of CT head cases included in each audit cycle (each participant chooses one option).