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Variation in the length and structure of reports written by reporting radiographers: A retrospective study

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ABSTRACT

Introduction: The literature suggests that there is variation in various features of the written radiology report for a range of body areas and imaging modalities. The retrospective study presented here aims to determine if similar variation is demonstrated in a group of 5 reporting radiographers in a UK NHS Trust.
Methods: Full reports for 1530 knee radiographic examinations performed from accident and emergency referrals were extracted for a 12-month period from a Radiology Information System (RIS) into Excel. Copied into Word, the word count function was used for each report and the number of words and characters (without spaces) was returned into Excel. Average word count and word length per report, by radiographer, were calculated for the following sections of the report: report title, main body and signature. SPSS was used to perform inferential statistical analysis.
Results: A wide range in the maximum and minimum average report lengths (60.88 v 17.83 words) was demonstrated. Statistically significant differences ($p < 0.05$) were seen between all but one pair-wise comparison (Rad 2 v Rad 4; $p = 0.98$) for the overall report length; for the length of the findings section, four pair-wise comparisons did not reach significance. Average word length demonstrated less variation. 4 out of 5 radiographers always included a report title; 3 out of 5 never included a report signature. There was a strong negative correlation between experience and report length.
Conclusion: Variation in report structure and length, as well as word length, was seen, comparable to studies of radiologist reports. Further research is required to investigate the drivers of this variation, and determine if there is any clinical significance.

Introduction

The written radiology report is the primary method of communicating the findings from imaging studies, and must accurately convey these findings to the referring physician in a timely manner.[1,2] The report should contain no ambiguity, and clearly identify recommendations for further treatment or imaging, should they be required. Consistent language and nomenclature should be used, with the terminology contained within the report not interfering with the communicative process; as reported in the literature[3] for some oncology staging reports, up to 16 different stakeholders may receive the report, so communicating results in an accurate and easily understood manner is essential. Given the range of stakeholders potentially receiving a radiological report, the use of unambiguous and clear language, as well as a focus on the salient findings, will ensure the meaning of the radiology report is not lost.

As some authors have noted, historically, the process of writing a radiology report has been perceived more as an art,[4] with the decision as to the format and length of the report the result of preference and experience; attempts at standardisation may be resisted. The result is that different reporting practices may develop through variations in local preferences and experiences of the reporting community. For example, research investigating the structure and format of computed tomography (CT) reports of the abdomen across a number of sites in two countries with a common language found a wide variation in report structure.[5] Significant differences were found in word count, with averages higher in trainee versus qualified radiologists, University versus Community

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hospitals and in Flanders versus The Netherlands. Another study[6] found significant differences in the inclusion of a conclusion, with the overall length of chest radiograph reports dependent upon whether they were written by specialist or generalist radiologists. A review of available literature to elucidate the important elements of a high-quality radiology written report identified a number of important components as targets for optimisation, including report length, language and format.[7] Further research has also identified that the reporting styles, or the 'report signature' of individual radiologists is not only distinctive, but can be learnt through training a neural network; a machine learning approach led to 100% accuracy in identifying the report author in 60 reports, based on 12 lexical parameters of the report.[8]

Radiographers are well placed in a team based approach, and through approved training, to fulfil the increased reporting demands placed upon imaging departments, as highlighted by the College of Radiographers (CoR), with the role of reporting radiographer now a common role-extension in the UK.[9] Radiographer reporting has received renewed attention, with the Cancer Workforce Plan[10] (2017) identifying increases in reporting radiographers as a vital component of a strategy to reduce inefficiencies and inequalities in radiology reporting turnaround. Radiographer reporting of chest radiographs has also recently been demonstrated to represent a cost-efficient solution to optimising efficient use of radiologist and radiographer skill-sets in radiology service delivery.[11] Previous research has demonstrated that the quality of radiographer reporting is to a standard comparable to radiologists.[12–14] Given radiographer reporting is well-established in the UK, and is set to continue to play an important role in service delivery, further research is required in order to optimise the output of reporting radiographers, particularly in light of the variations in report structure noted for the professional groups discussed above. The retrospective review presented here therefore aims to determine if the report length and structure for a cohort of five reporting radiographers from a single Trust in the North-West of England demonstrates similar variation.

Method

Ethical consideration was given to the study, although it was noted that no active recruitment of patients/participants, or alteration to treatment plans, was required. Use of the NHS Health Research Authority online decision tool[15] subsequently confirmed this retrospective study did not require ethical approval. The decision tool has three questions which help identify whether ethical approval is required, which were all answered 'no'. No randomisation to groups or patient care/treatment changes were required; the reports that each radiographer produced were part of their routine working day, and not actively allocated to them. It was also assumed that local practice at the Trust would not necessarily be generalizable to other Trusts given variation in local protocols, and variations in local practice identified above for radiologists.

The radiology information system (CRIS) for a major trauma centre in the North-West of England was interrogated for a 12-month period (1st October 2015 to 30th September 2016). Data including report text for every radiographic knee examination performed via Accident and Emergency was obtained through this query and exported into a spreadsheet (Microsoft Excel, 2013). The data was further filtered in the spreadsheet, with certain report types excluded; any reports which indicated that the knee radiographs were part of a femur/lower leg examination were not considered as 'true' knee reports and excluded; some reports which were captured from CRIS were 'empty' for the same reason, and were excluded. A small minority of reports for knee examinations performed via referral from a clinic, ward or GP (i.e. non A&E sources) were also excluded; however, given the reporting radiographers employed by the Trust did not report from these referral sources these were automatically excluded. After this process a total of 1530 reports confirmed as authored by a reporting radiographer were identified.

For each report, the report text was copied and pasted into Microsoft Word (2013), with word and character counts (without spaces) for the overall report, the report title, the main body (findings) of the report and the report signature recorded. The report title was considered to be the information at the start of the report containing technical details of the examination, such as information on the projections obtained and details of comparisons to any previous imaging. The report signature was considered to be that part of the report where the radiographer identified their name, role and registration number. From the word and character count data, average word length was calculated. Note was made of inclusion of a separate conclusion or impression section.

Data analysis was performed using Excel (descriptive statistics) and IBM Statistics SPSS (Version 24) (inferential statistics). For the inferential statistics, normality of the distribution of each variable was determined through inspection of the histograms for each data set to establish the degree of kurtosis; where data was not normally distributed an appropriate transformation was performed. To test for statistical significance the ANOVA with a Tukey add-on was performed, with a p-value of less than 0.05 considered statistically significant. ANOVA is considered a robust statistical test that can be used for normally distributed data or transformed data; simulation studies have demonstrated that ANOVA is not sensitive to moderate deviations from normality.[16–18]

To determine the consistency of the data analysis methodology a second researcher performed the analysis for a stratified sample of over 13% of the reports.

Results

Radiographer attributes

Table 1 demonstrates that radiographers 3 & 5 are the most experienced and studied the Post-Graduate Certificate in reporting at the same university, whilst radiographers 1, 2 and 4 studied at a different university, and were relatively less experienced. Fig. 1 further demonstrates the correlation between experience and length of the findings section of the report; as demonstrated by the calculated Pearson's correlation co-efficient ($r^2 = -0.99$), there is a very strong negative correlation between length of experience and length of the findings section of the report.

Descriptive statistics

The breakdown of the total number of reports (1530) for each reporting radiographer is shown in Table 2. The greatest number were reported by radiographer 4 (496), with the least by radiographer 5 (81).

Table 1
Attributes of the five reporting radiographers.

	PgCert (reporting)	Qualified (days)	Mean length (words)	
			Overall	Findings
Rad 1	University B	670	51.71	39.44
Rad 2	University B	183	60.77	44.80
Rad 3	University A	3835	18.76	18.24
Rad 4	University B	275	60.02	40.79
Rad 5	University A	3927	17.83	15.80

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