Quality and Language Characteristics of Lumbar Spine MRI Reports: A Comparative Analysis of In-House and Teleradiology Reporting Practices

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Abstract

Background: Lumbar spine MRI frequently identifies degenerative findings that may not correlate with symptoms. As teleradiology services become increasingly integrated into healthcare systems, differences in reporting practices and communication quality warrant evaluation.

Methods: A retrospective comparative analysis was performed on 54 lumbar spine MRI reports from Cardiff and Vale University Health Board. Twenty-seven reports produced by in-house radiologists were compared with 27 reports from Everlight radiologists. Reports were assessed using a predefined coding framework evaluating report structure, clinical history, conclusion statements, potentially nocebic terminology, incidental findings, and word count.

Results: Everlight reports demonstrated significantly greater use of clinical history sections, conclusion statements, and structured formatting. No significant differences were identified in report length or potentially nocebic terminology burden.

Conclusion: Differences between reporting models were primarily related to report structure and communication rather than diagnostic terminology.

Introduction

Low back pain is one of the leading causes of disability worldwide and represents a substantial burden on healthcare systems (1). Magnetic resonance imaging (MRI) plays an important role in the assessment of patients with suspected spinal pathology, particularly in the investigation of neurological symptoms, suspected cauda equina syndrome and persistent or complex low back pain. Consequently, lumbar spine MRI represents one of the most commonly performed musculoskeletal MRI examinations (1).

Interpretation of lumbar spine MRI findings can be challenging because many commonly reported abnormalities are highly prevalent in asymptomatic individuals. Jensen et al., reported that over half of asymptomatic adults exhibited at least one lumbar disc bulge on MRIs (2), whilst Brinjikji et al., showed that imaging features such as disc degeneration, disc bulges, annular fissures and facet degeneration increase progressively with age, even in the absence of symptoms (3). These findings suggest that many abnormalities identified on lumbar spine MRI may represent age-related changes rather than the direct cause of a patient's symptoms.

Despite this, degenerative spinal findings are frequently described within routine radiology reports using terminology such as “degeneration”, “disc bulge”, “disc protrusion” and “facet

arthropathy" (3,4). It has been suggested that this terminology may contribute to over-medicalisation of low back pain and reinforce beliefs that the spine is damaged or structurally vulnerable (4). Darlow et al., identified that clinician language can have a lasting influence on patient beliefs regarding back pain and recovery (5), whilst Morgan et al., reported that diagnostic labels may alter patient perceptions and management preferences despite identical clinical scenarios (6).

The increasing accessibility of radiology reports has further highlighted the importance of report communication. Although radiology reports were traditionally intended for referring clinicians, widespread adoption of electronic health records and patient portals now enables many patients to access imaging reports directly. Alarifi et al., demonstrated that patients frequently report difficulty understanding radiology reports, particularly with respect to terminology, structure and interpretation (7). Consequently, greater attention has been paid to both the language and structure of radiology reports.

Increasing radiology workload, workforce shortages and demand for out-of-hours reporting have driven widespread adoption of teleradiology services across the United Kingdom (8). Providers such as Everlight now contribute substantially to both emergency and routine radiology reporting within many NHS organisations. As teleradiology services become more integrated into clinical practice, understanding potential differences in reporting style, communication and report quality between reporting models has become increasingly relevant for service evaluation and quality assurance.

Structured reporting has been associated with improved consistency, completeness and communication of radiological findings. Referring clinicians consistently report a preference for reports containing relevant clinical information, clear conclusions and standardised formatting (9, 10), whilst the European Society of Radiology has advocated wider adoption of structured reporting approaches to improve report quality and facilitate communication between radiologists, clinicians and patients (11). Despite the widespread use of both in-house and teleradiology reporting services, relatively little is known about how reporting characteristics differ between these reporting models.

The primary aim of this study was to compare lumbar spine MRI reports produced by in-house and Everlight radiologists. Specifically, the study aims to evaluate differences in report structure, including the presence of clinical history sections, conclusion statements and structured formatting. Secondary aims were to compare the use of potentially nocebic (i.e., language that may unintentionally increase fear, anxiety or negative beliefs about pain) terminology, report length and broader reporting characteristics identified through thematic analysis.

Methods

Study Design

A retrospective comparative analysis was performed to evaluate differences in lumbar spine MRI reporting between in-house and Everlight radiologists.

Data Collection

A total of 54 consecutive lumbar spine MRI reports were identified from Cardiff and Vale University Health board using the Philips Vue PACs system between 29 May 2026 and 18 June 2026. Twenty-seven reports were produced by in-house radiologists and twenty-seven by Everlight radiologists.

Reports were anonymised prior to analysis, and all patient identifiers were removed. Reports that were duplicated, incomplete, non-lumbar examinations, or did not contain the full report text were excluded.

Coding Framework

Reports were analysed using a predefined coding framework developed prior to data analysis and reviewed with a consultant spinal surgeon.

Variables assessed included:

- Clinical history present
- Conclusion present
- Structured report format
- Potentially nocebic terminology burden
- Incidental findings
- Word count

Variable	Definition
Clinical history present	Presence of a clinical history, clinical information or indication section
Conclusion present	Presence of a conclusion, impression or opinion section
Structured report	Presence of recognised report headings
Potentially nocebic terminology burden	Number of predefined potentially nocebic terms identified per report
Incidental findings	Findings unlikely to explain the presenting clinical concern

Word count	Total number of words contained within the report

Table 1: Coding Framework

Potentially nocebic terminology was identified using a predefined terminology dictionary informed by published literature regarding musculoskeletal imaging language and patient interpretation of imaging findings (12). Incidental findings were classified using a predefined incidental findings dictionary.

Thematic Analysis

A thematic analysis was performed to identify recurrent reporting characteristics and differences between reporting groups. Initial theme generation was assisted using Microsoft Copilot within an NHS-approved environment (13). AI-generated outputs were treated as exploratory and all final themes, coding decisions and interpretations were independently reviewed by the investigators.

Statistical Analysis

Descriptive statistics were used to summarise reporting characteristics. Continuous variables were compared using the Mann–Whitney U test. Categorical variables were compared using Fisher's exact test. Statistical significance was defined as $p < 0.05$.

Results

A total of 54 lumbar spine MRI reports were included in the analysis, comprising 27 in-house reports and 27 Everlight reports.

Report Structure

Significant differences were observed in report structure between reporting groups. Reports produced by Everlight radiologists were more likely to contain a clinical history section (100% vs 70%, $p = 0.0043$), a conclusion section (100% vs 41%, $p < 0.001$) and a structured reporting format (100% vs 44%, $p < 0.001$) compared with in-house reports.

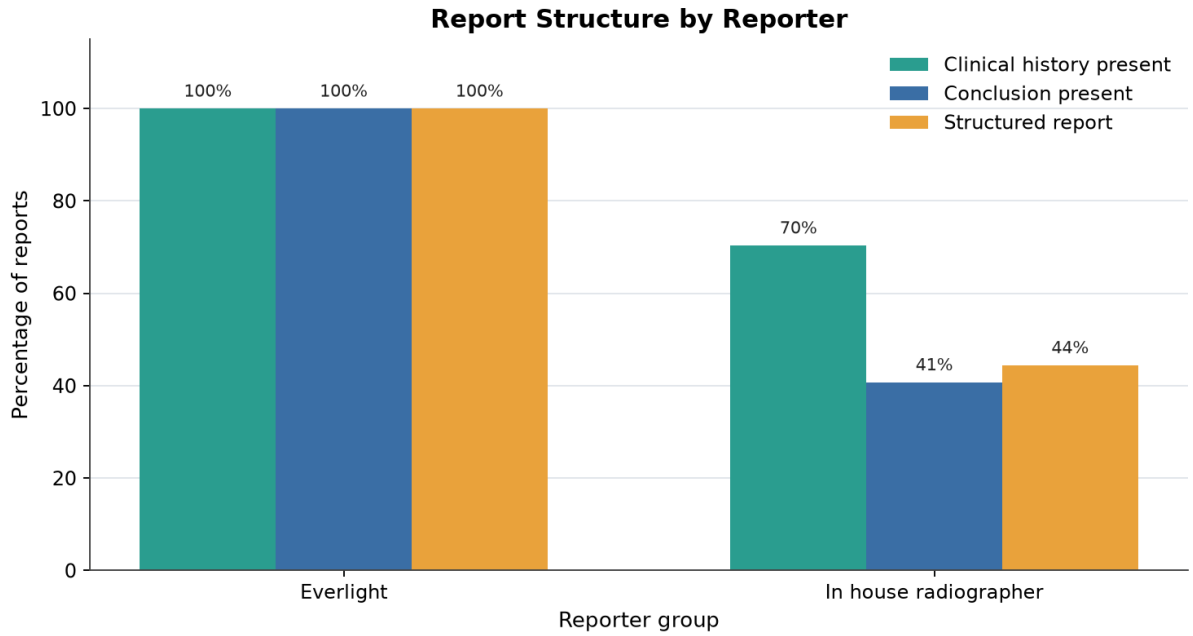

Figure 1: Graph of report structure by reporter group

Potentially Nocebic Terminology Burden

Potentially nocebic terminology was identified in reports from both groups. The mean terminology burden was higher in the in-house reporting group (7.37 terms per report) compared with the Everlight group (4.37 terms per report). However, this difference did not reach statistical significance (p = 0.0839).

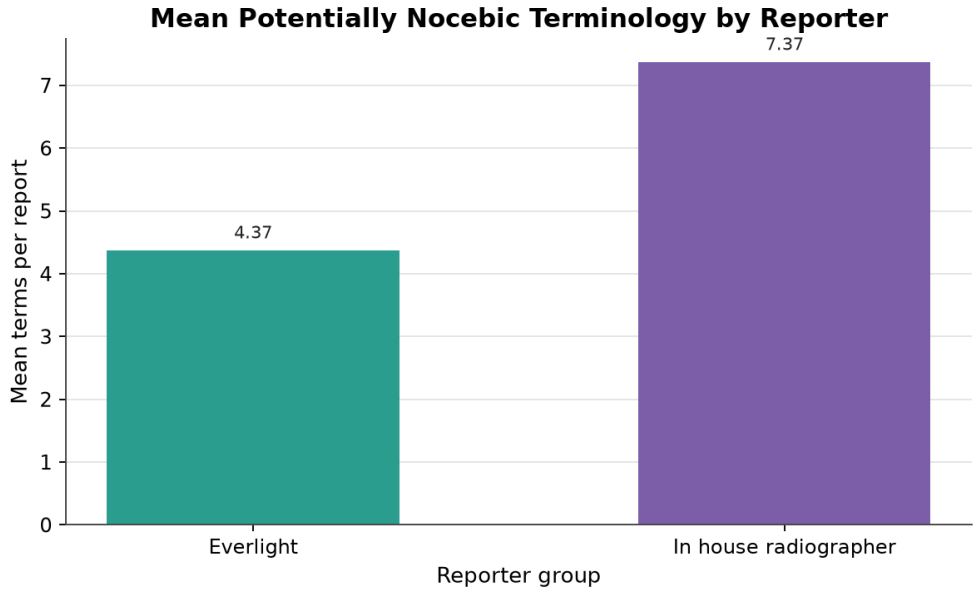

Figure 2: Graph of mean potentially nocebic terminology by reporter group

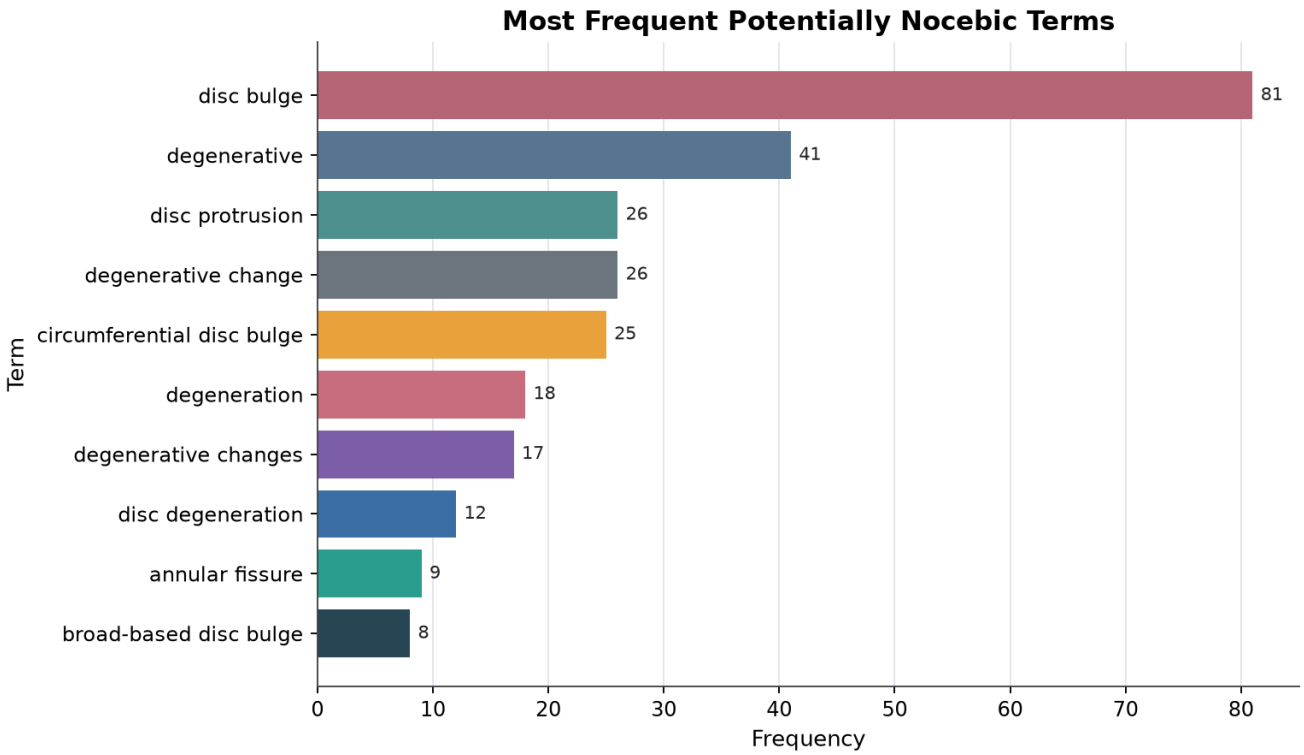

Figure 3: Graph of most frequent potentially nocebic terms on the MRI reports

Report Length

The median word count was 153 words for Everlight reports and 142 words for in-house reports. No statistically significant difference in report length was identified (p = 0.6528).

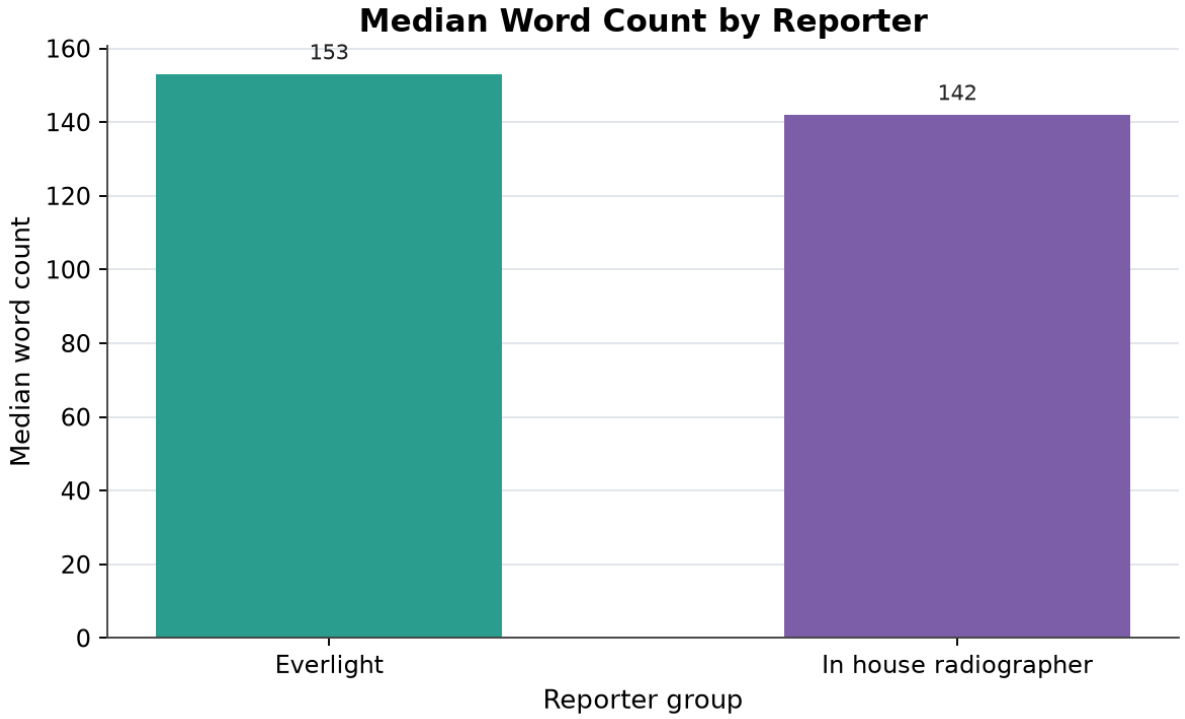

Figure 4: Graph of median word count by reporter group

Incidental Findings

Incidental findings were present in 18.5% of in-house reports and 11.1% of Everlight reports.

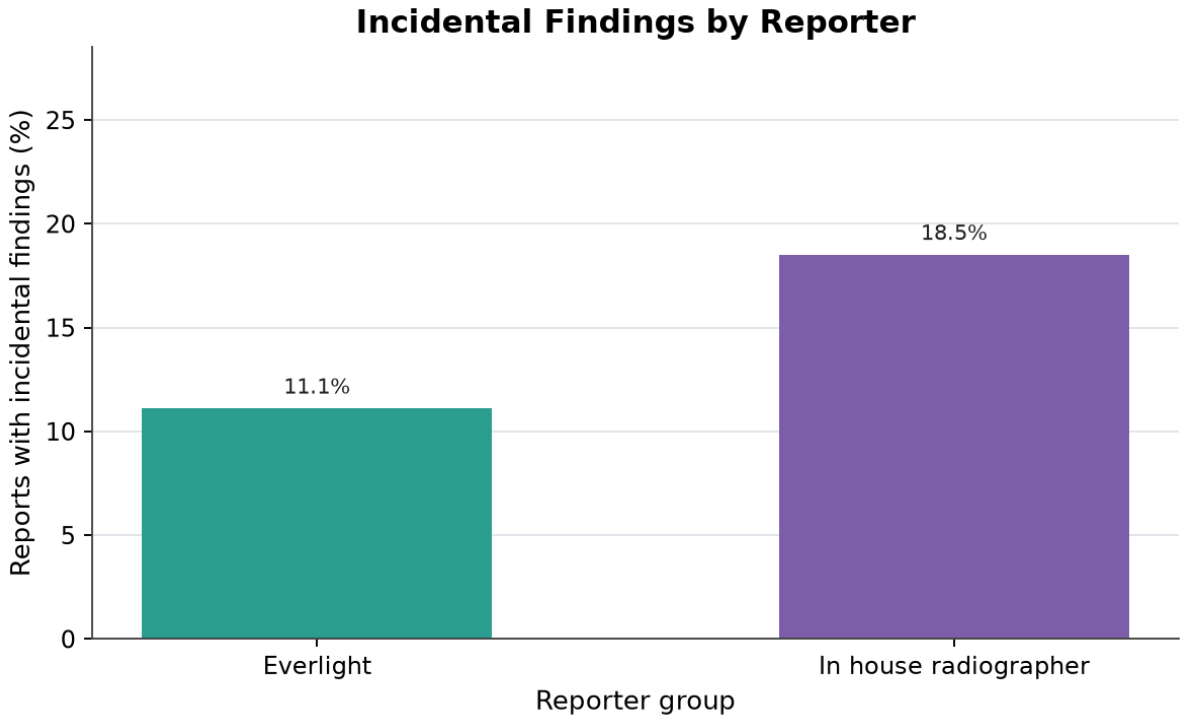

Figure 5: Graph of incidental findings by reporter group

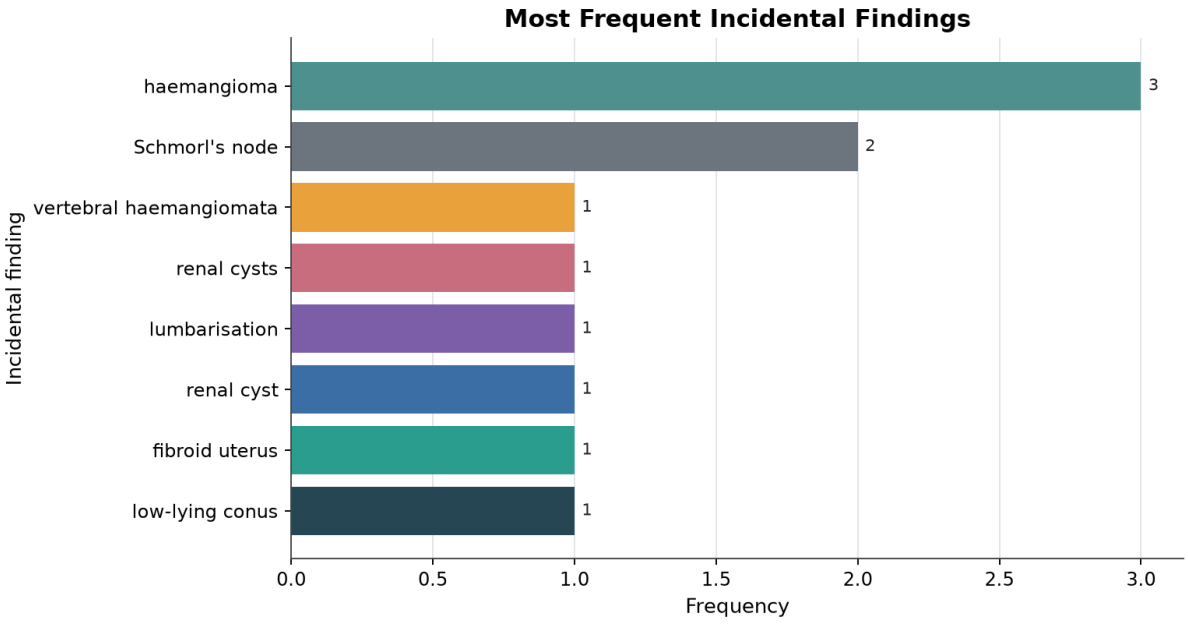

Figure 6: Graph of most frequent incidental findings on the MRI reports

Thematic Analysis

Four principal themes emerged from the thematic analysis: report architecture and signposting, diagnostic closure, potentially nocebic terminology and incidental findings.

The most prominent theme was reporting structure and signposting. Reports produced by Everlight radiologists consistently incorporated clinical history, findings and conclusion sections, whereas in-house reports showed greater variability in organisation and formatting.

A second theme related to diagnostic closure. Everlight reports more frequently provided explicit conclusion statements and direct answers to the clinical question.

Potentially nocebic terminology was common across both reporting groups, with frequent use of terms such as “disc bulge”, “degenerative change” and “disc protrusion”.

Incidental findings were identified in both cohorts and were generally reported alongside the primary spinal pathology.

Discussion

This study identified significant differences in lumbar spine MRI reporting between in-house and Everlight radiologists. The most notable differences related to report structure, whilst potentially nocebic terminology and report length were broadly similar between reporting groups.

The clearest difference between reporting groups was the consistent use of structured reporting within the Everlight cohort. Reports produced by Everlight radiologists were significantly more likely to contain clinical history sections, conclusion statements and standardised formatting. In contrast, in-house reports revealed greater variation in report organisation. These findings suggest that differences between reporting providers may relate more to reporting processes and report design than to interpretation of imaging findings. These findings have practical implications given the preference of referring clinicians for reports containing relevant clinical information and clear conclusions, greater consistency in report structure is likely to improve report usability and communication (9, 10, 11).

The thematic analysis supported this observation. Beyond the presence of formal report headings, Everlight reports more frequently reported diagnostic closure through explicit conclusion statements and direct answers to the clinical question. This was particularly evident within suspected cauda equina syndrome investigations, where reports often provided a clear statement regarding the presence or absence of clinically significant compression to answer the clinical question. Such signposting may reduce ambiguity for referrers and improve efficiency of clinical decision-making (9, 10).

In contrast to the structural differences observed, use of potentially nocebic terminology was common in both reporting groups. Although the in-house cohort demonstrated a higher numerical terminology burden, this difference was not statistically significant. The frequent use of terms such as “disc bulge”, “degenerative change” and “disc protrusion” across both cohorts suggests that these descriptors remain common within routine lumbar spine MRI reporting irrespective of the reporter.

This finding is particularly relevant given the well-recognised prevalence of degenerative MRI findings within asymptomatic populations and may not necessarily represent the source of a patient’s symptoms (2, 3, 14)**.** Whilst the present study was not designed to assess patient outcomes, the findings of widespread use of degenerative descriptors across both reporting groups support the need for future investigation regarding how age-related spinal changes are communicated within radiology reports.

Incidental findings were identified within both cohorts and were generally unrelated to the primary clinical question. Whilst the absolute number of incidental findings was low, their presence reinforces the importance of clearly distinguishing clinically relevant pathology from background findings. As patients increasingly access radiology reports directly, contextualisation of incidental abnormalities may become increasingly important (7, 8, 15).

Taken together, the findings suggest that the most important distinction between reporting groups relates to report communication rather than report content. Significant differences were identified in report structure, organisation and diagnostic closure, whereas terminology describing lumbar spinal pathology appeared broadly similar between providers. This may indicate that opportunities for quality improvement lie primarily in report design and communication rather than changes to diagnostic interpretation.

This study has several strengths. A predefined coding framework was developed prior to analysis and reviewed with a consultant spinal surgeon. Consecutive reports were analysed, reducing selection bias, and all reports were anonymised before review.

Several limitations should be acknowledged. The study was performed at a single centre and included a relatively small sample size. Furthermore, many examinations were performed within suspected cauda equina syndrome pathways, which may limit generalisability to routine outpatient lumbar spine MRI reporting. The study evaluated report content rather than patient outcomes and therefore cannot determine whether differences in report structure or terminology influence clinician behaviour, patient understanding or healthcare utilisation.

Future work should explore whether greater contextualisation of common age-related spinal findings and wider adoption of structured reporting approaches can improve communication without compromising diagnostic accuracy. Larger studies incorporating clinician and patient-reported outcomes may provide further insight into how report design influences interpretation and decision-making.

Conclusion

Everlight lumbar spine MRI reports demonstrated significantly greater use of structured reporting, clinical history sections and conclusion statements compared with in-house reports. No statistically significant differences were identified in report length or potentially nocebic terminology. These findings suggest that report structure and communication style may represent more important distinguishing characteristics between reporting providers than terminology alone.

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