

Radiology report writing skills: A linguistic and technical guide for early-career oral and maxillofacial radiologists

Mayank Pahadia^{1,*}, Sonam Khurana¹, Hassem Geha¹, S Thomas II Deahl²

¹*Division of Oral and Maxillofacial Radiology, Department of Comprehensive Dentistry, University of Texas Health School of Dentistry, San Antonio, TX, USA*

²*Oral and Maxillofacial Radiology Private Practice, San Antonio, TX, USA*

Dear Editors,

A radiology report provides a translation of images into words, presenting a synopsis of the process of image acquisition, a detailed interpretation, and thoughtful impressions and recommendations. It must convey all the pertinent details to the clinician in a clear and concise way. For this reason, every word written in a radiology report becomes of utmost importance in communicating findings and providing impressions.

Radiology reports must provide a clear benefit as the pendulum of health care swings towards quality care. Because busy clinicians with limited time are the primary audience of radiology reports, reports should be clearly written and easy to understand and digest. Proper grammar and correct spelling, definitive words and phrases, descriptive language, and logical organization are essential.¹

Before a radiologist puts fingertips to the keyboard or utters words into the microphone, he or she must have a clear sense of the definite information that he or she wants to include in the report. The information should include findings visualized on the radiographic images, the interpretation of those findings, and the referring clinician should be able to come to a diagnostic conclusion and aid in treatment planning.

The ideal radiology report should aim to accurately address the needs of the referring clinician. In a hospital or academic setting, the clinician can meet the radiologist, go through the scan, and discuss the key findings. However, with advances in teleradiology, miles can separate

the radiologist from the referring dentist or physician. What is clear to a specialist may not be as clear to a general practitioner; hence, a high-quality report is very important.²

There is a lack of substantial evidence regarding reporting guidelines and most of the literature reflects subjective judgements and opinions. There is no standardized structure of reporting in medical radiology, let alone dental radiology. The closest thing to a standardized structure is the Breast Imaging Reporting and Data System (BI-RADS) developed by the American College of Radiology (ACR).²

A typical radiology report follows the logical structure of a description of findings followed by a discussion of the possible differential diagnoses and management recommendations. Currently, there is no consensus among professional dental organizations, including the American Academy of Oral and Maxillofacial Radiology (AAOMR) or International Association of Dental and Maxillofacial Radiology (IADMFR) on the specific requirements for CBCT reporting. The ACR handbook for residents divides the radiology report into 6 sections: examination, history/indication, technique, comparison, findings, and impression.² Although these sections are not applicable for every report, this is a useful framework. Using the framework provided by the ACR and other medical organizations, the essential components of a CBCT report are outlined in Table 1.

Active voice is preferable over passive voice. Passive voice sentences often use more words, can be vague, and can lead to a prepositional tangle.³ According to *The Elements of Style*, "The active voice is usually more direct and vigorous than the passive."² Over the last decade, the active voice has gained advocates in the world of scientific and specifically medical writing, with some journals

Received March 9, 2020; Revised April 12, 2020; Accepted April 12, 2020

*Correspondence to : Dr. Mayank Pahadia

Division of Oral and Maxillofacial Radiology, Department of Comprehensive Dentistry, University of Texas Health School of Dentistry, 7703 Floyd Curl Drive, San Antonio, TX 78229, USA

Tel) 1-210-450-3224, E-mail) drmayankpahadia@gmail.com

Copyright © 2020 by Korean Academy of Oral and Maxillofacial Radiology

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Imaging Science in Dentistry · pISSN 2233-7822 eISSN 2233-7830

Table 1. Essential components of a cone-beam computed tomography report

Section	Details
Patient details	Identification and demographics
History and objective of the study	The primary objective of the study supplemented by any pertinent clinical history, laboratory findings and a provisional or working diagnosis should be included in this section
Procedure and technique	Scanner, field of view, patient exposure parameters, contrast medium, the use of an imaging guide like a radiographic stent. Technical errors (for e.g. motion artifact during acquisition)
Findings	Clinical question(s); review of structures in the field of view Relevant incidental findings, if any For a comparative study, changes from the previous study's findings
Impressions and recommendations	Address the clinical question Address any other actionable findings Include recommendations for follow-up and any further imaging or laboratory studies

advocating its use.⁴ The status quo, however, proved tenacious and passive constructions are still endemic to medical writing, and to radiology reports as well. The passive voice persists in part from good intentions to avoid the first person pronoun in an attempt to improve objectivity. A writer with less noble intentions might use the passive voice to leave the writer out of the story, in the hopes of reducing personal responsibility.⁵ Simple habit probably explains most uses of the passive voice. Most radiologists learn the use of this voice by example, in their training.

The distinction between active and passive voice sentences can be illustrated using examples. Compare these two sentences: “A well-defined low-density periapical lesion is seen at the mandibular left canine.” “The mandibular left canine exhibits a well-defined low-density periapical lesion.” The first construction (passive sentence) provides less focus than the second. Even though the sentences contain almost the same number of words, one has to read the second sentence more slowly and a hint of mystery and vagueness persists. The second sentence provides more clarity and definition. The reader can process it quickly, without any grammatical mystery. Active voice provides better clarity and concision, and radiologists should make this their goal. Improved readability and understanding should ultimately assist in patient care.

Clarity typifies excellent radiology reports. When choosing words, the radiologist should try to consider, and eliminate or reduce, any hidden meaning or ambiguity. By stating, “negative for active periapical pathology,” does the writer mean to imply an inactive lesion? The radiologist should try to speak the truth and not hide behind technical parameters, in order to avoid imposing a burden on

the referring clinician.³ Certain phrases like “evidence of” and “significant” should be not be overused and are best reserved for findings that can be inferred and not directly visualized. Clarity is not limited to words, but also encompasses the general layout and order of the findings. Clarity of thought and perception are better conveyed to the clinician if paragraphs and sentences within the paragraphs are structured clearly.

Excellent reports usually exhibit brevity and concision. A longer report does not mean a higher-quality report. Even though the length of the report depends on the descriptive details in the particular study, with brevity the writer expresses much in as few words as possible. Concise writing requires additional time and effort. As noted by Pascal, “I would have written a shorter letter, but I did not have the time.”²

The “impression” should primarily address the chief reason for scan acquisition and the disease and/or condition that requires the clinician’s attention. The following points should be remembered while formulating an impression:

The “radiological hedge” has been called “the tree of our specialty.”⁶ Hall described the hedge as “an evasive statement to avoid the risk of commitment.”⁷ The radiologist should be confident enough to write what he or she sees and not hide behind hedging language. Hedges include words such as “apparent,” “appears,” “possible,” “suspected,” “not significant,” “suggestive of,” “clinical correlation needed,” and so on. “Appears” might be a hedge. Another overused phrase, “clinical correlation needed or advised,” can imply defensive posturing by the radiologist.⁸ While avoiding hedges whenever possible,

the radiologist should also explicate residual uncertainty by using a scale of certainty (e.g., “is > indicative of > consistent with > suggestive of > is not”) in a consistent manner. If there is equivocation, the radiologist should consider writing in the first person to add a personal touch and to help the reader understand the offered opinion, avoiding the appearance of radiologist defensiveness.³

The radiologist should avoid clutter and repetitions in the report, and should not repeat findings already mentioned in the description in the impression. For example, if the radiologist notes multiple root fragments or multiple teeth regions with bone loss, there is no need to mention them repeatedly. A single simple statement like “multiple root fragments noted in the maxillary dental arch” should suffice.

It is also vitally important to keep terminological accuracy in mind before writing. In particular, the radiologist should take care to distinguish between impressions that are visualized on imaging and those that are suggested by the findings. An example of this point is the difference between visualizing a vertical root fracture on the study and encountering a J-shaped radiolucency suggestive of such a fracture. The use of correct terminology for diagnosis is also important. Some organizations, such as the American Academy of Endodontics, have a glossary of terminology and these terminologies should be incorporated in the report, particularly if the referring clinician belongs to that specialty. Multiple classification systems may exist for any given finding and the radiologist should not assume which system is used by the referring clinician. The radiologist should not state, for example, “class II dens in dente” or “type III canal configuration” without mentioning the classification system used. The radiologist should use abbreviations cautiously when writing a report for the same reason.

The components and communicating language of the report, as discussed in the above sections, need to be put together in a structured format. CBCT studies can vary in their complexity from being simple studies with a small field of view visualizing only a few teeth regions to a studies with a large field of view encompassing almost the entire skull. The creation of templates makes the job of a radiologist easier in formulating that structure. Different clinicians acquire different types of studies and with time, practice, and communication, a radiologist can formulate a template for each referring clinician. A template should include all the essential information discussed above and the findings section should be further expanded depending on the complexity or scale of the study. A small field

of view, which does not include the temporomandibular joints or the airway, should not have a template that includes those structures. Such inclusion wastes the time of both the radiologist and the reader. Why should the reader bother with statements like “airway is not included in the field of view” when the objective of the study was an endodontic assessment of the maxillary right first molar? The radiologist should adapt templates and the report structure to the needs of the referring dentist.

Another useful tool in CBCT report writing is the use of images. Many reports are still written in word processors rather than in radiological information systems, and images can be added to help the clinician visualize the findings or for patient education, thereby aiding in patient care. Images should have optimum brightness/contrast adjustments, and pointers or other callouts if needed. Like any other aspect of the report, only clinically significant images should be incorporated in the final report.

The radiology report provides an important medico-legal document, conveying the important findings noted in the radiographic study. The report is, in essence, the final artifact of a radiologists’ work. Thus, the report must convey all the essential findings and impressions in a well-structured, clear, concise, and easily comprehended document. The primary reader of the report is the clinician, not the radiologist. Therefore, the radiologist should take care not to use unnecessary radiological jargon, but instead terms, words, and phrases that are useful and meaningful to the clinician. Proofreading and inclusion of the radiologist’s contact information also add value to the report.

Correct language and grammar, active voice, brevity, clarity, minimizing hedging, and explication of uncertainty should be practiced in the relentless pursuit of the highest achievable quality of radiology reports. These practices, when implemented consistently, will increase referring dentists’ confidence and trust in the radiologist and support optimum patient care. After all, be it a dentist or a physician, a radiologist or a surgeon, the goal of every health care practitioner is the patient’s health.

Conflicts of interest: None

References

1. Lukaszewicz A, Uricchio J, Gerasymchuk G. The art of the radiology report: practical and stylistic guidelines for perfecting the conveyance of imaging findings. *Can Assoc Radiol J* 2016; 67: 318-21.
2. Wallis A, McCoubrie P. The radiology report - are we getting

- the message across? *Clin Radiol* 2011; 66: 1015-22.
3. University of Wisconsin-Madison [Internet]. Madison: The Writing Center [cited 2020 Mar 8]. Use the active voice Available from https://writing.wisc.edu/handbook/style/ccs_activevoice.
 4. Amdur RJ, Kirwan J, Morris CG. Use of the passive voice in medical journal articles. *AMWA J* 2010; 25: 98-104.
 5. Gunderman RB, Steinmeyer LA. The passive voice. *Acad Radiol* 2015; 22: 1206-7.
 6. Hall FM, Movson JS. The radiologic hedge. *AJR Am J Roentgenol* 1990; 154: 903-4.
 7. Hall FM. Clinical history, radiographic reporting and defensive radiological practice. *Radiology* 1989; 170: 575-6.
 8. Hall FM. Language of the radiology report: primer for residents and wayward radiologists. *AJR Am J Roentgenol* 2000; 175: 1239-42.