Frequency of errors in the radiological report of abdominal computed tomography and related factors in three institutions in the city of Medellín third and fourth level

Frecuencia de errores en el informe radiológico de tomografías computarizadas de abdomen y factores relacionados en tres instituciones de Medellín de tercer y cuarto nivel

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Summary

Introduction: A radiological report containing valuable information is the ultimate goal of a radiologist's work. The quality of the report is a fundamental aspect of a radiologist's professionalism. Understanding the types of errors and their frequency allows for analysis and the development of solutions. ***Objective:*** To investigate the frequency of errors in radiological reports in three clinical institutions in Medellín, Colombia. ***Methodology:*** Observational cross-sectional analytical study. A sample of 380 abdominal CT scan reports was defined. The reports were evaluated collectively by at least two researchers to determine the presence or absence of each reporting error category. Data collection was done using a Google form. Data unification was performed with Microsoft Excel. Statistical analysis was carried out using the Jamovi tool. Bivariate analysis was done. ***Results:*** The mean age of the patients was 50.7 years. 51.3% of the population were men. 60.8% of the reports corresponded to clinical studies, and 93.4% were contrast-enhanced CT scans. A total of 754 errors were found. 299 reports had one or more errors. In 25% of the cases, there was only one error. The average number of errors per report was 1.98. The most frequent category was lack of indication or conclusion (52.9%), followed by attenuation language (35.3%). ***Conclusion:*** Reporting errors are common. Disseminating reporting guidelines and classifications of errors are tools to improve the quality and performance of radiology.

Resumen

Introducción: Un informe radiológico que contenga información valiosa es el fin último del ejercicio del radiólogo; la calidad del informe es parte fundamental de su profesionalismo. Conocer los tipos de error y su frecuencia permite su análisis e idear soluciones. ***Objetivo:*** Investigar la frecuencia de errores en informes radiológicos en tres instituciones hospitalarias de Medellín, Colombia. ***Metodología:*** Estudio observacional analítico tipo corte transversal. Se definió una muestra de 380 informes de tomografías de abdomen. Los informes fueron evaluados en conjunto por mínimo dos de los investigadores para determinar la presencia o ausencia de cada una de las categorías de error de informe. La recopilación de datos se hizo en un formulario de Google. La unificación de los datos se hizo con Microsoft Excel. El análisis estadístico se realizó empleando la herramienta Jamovi. Se hizo análisis bivariado. ***Resultados:*** La edad media de los pacientes fue de 50,7 años. El 51,3% de la población eran hombres. El 60,8% de los informes correspondieron a estudios hospitalarios y el 93,4% a tomografías contrastadas ambulatorias. Se encontraron 754 errores. En 299 informes había uno o más errores. En el 25% había un solo error. Se obtuvo una media de 1,98 errores por informe. La categoría más frecuente fue falta de indicación o de conclusión (52,9%) seguida por el lenguaje de atenuación (35,3%). ***Conclusión:*** Los errores en el informe radiológico son frecuentes. Difundir las guías de informe y las clasificaciones de errores son herramientas para mejorar la calidad y el desempeño de la radiología.

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Introduction

A radiology report containing valuable information for the clinician and the patient is the ultimate goal of the radiologist's work. It is useless for a patient if the radiologist finds their disease but is unable to effectively communicate the finding to guide the clinician. The quality of the radiologist's communication is a fundamental part of their professionalism (1-9). Radiology is, in essence, information management (10).

The radiology report is the way in which the radiologist communicates with the clinician and the patient. Its structure has evolved, and there are now several guidelines designed to improve it and make it more effective as a communication system (11-17).

Many errors in radiology reports have been described. The first known compilation and classification of errors was published by Dr. Marcus Smith in his book *Error and variation in diagnostic radiology* (18). In this compilation, radiology errors are grouped into six classes, one of which is related to reporting errors and is called poor communication, in which there are fifteen categories. This classification was reorganized in 2016 by González (19), and four categories were added to the category of reporting errors, based on reporting guidelines. Currently, 19 categories of reporting errors have been described (Table 1).

At least 5% of adults seeking outpatient care experience diagnostic errors, which contribute to nearly 10% of annual deaths and up to 17% of adverse hospital events (20). These errors also result in unnecessary medical expenses, with estimated costs ranging from $17 billion to $29 billion annually. Approximately 75% of malpractice lawsuits filed against radiologists involve radiology reports (21).

The Asociación Colombiana de Radiología held a retraining workshop on radiology reporting in 2018. It was conducted in person and virtually. This workshop disseminated guidelines for reporting and the 19 categories of reporting errors.

Investigating the frequency of errors in radiological reports is vitally important. Identifying and understanding them will help to design new improvement programs that will result in quality and patient safety.

A study was designed to determine the frequency of errors in radiology reports in three hospitals in Medellín, Colombia. To date, there are no data available in Colombia on the frequency or types of errors in radiology. Computed tomography (CT) scans of the abdomen were chosen for the study due to their high frequency. The three institutions selected perform approximately 20,000 CT scans per year. In the United States, approximately 70 million abdominal CT scans are performed in emergency departments (22).

Methodology and statistical analysis

This is a cross-sectional observational analytical study. A sample of 380 plain or contrast-enhanced abdominal CT scans performed on patients over 18 years of age between July 1, 2020, and June 30, 2021, at three tertiary and quaternary care institutions in Medellín, Colombia, was defined. A number proportional to the number of CT scans performed was selected from each institution.

To calculate this sample, and due to the lack of literature on the frequency of reporting errors in abdominal CT scans, the worst-case scenario was used, based on the assumption that 50% of reports contain errors, in order to cover the largest possible sample. An error range of 5% was accepted in this study, and a figure of 20,000 abdominal CT scans per year from the institutions included was taken into account. With this, the formula for estimating a proportion was used using EPIDAT 3.1 *software*, which is based on the formula recommended by Lwanga and Lemeshow (23). The result was a sample of 380 reports.

The outcome variable was the presence of one or more errors in the radiology report, as defined by González Vásquez and specified in the guideline article. Of the 19 categories described by the author, three were omitted from the evaluation because they involved reviewing the medical history and previous studies: "discrepancy between oral and final report," "inadequate comparison with previous studies," and "finding a finding and not reporting it." Only the radiology reports were used for the study.

After compiling the databases of the three hospitals into Microsoft Excel tables, they were randomized and the corresponding reports were extracted in PDF format.

To ensure the quality and consistency of the evaluation, a training phase was carried out in which 38 initial reports were reviewed jointly by six evaluators. The purpose of this phase was to familiarize the evaluators with the criteria and procedures for analyzing the reports, ensuring a consistent interpretation. Once the training stage was complete, the remaining 342 reports were evaluated randomly in groups of at least two people. Data collection was carried out using Google Forms, in which evaluators answered whether each of the error categories was present or not in the report. The data was consolidated using Microsoft Excel.

Statistical analysis of the data was performed using Jamovi, a platform that facilitates the interpretation of results and the drawing of statistical conclusions. The findings were discussed among the group members and analyzed.

A bivariate analysis was performed to look for differences between the groups. Calculations were made using the Chi-square test or Fisher's exact test. A p-value < 0.005 was used to determine statistical significance. For this bivariate analysis, the presence or absence of errors was established, regardless of the number found in each report or the type of error.

To ensure ethics in data collection and analysis, special care was taken to anonymize the information of patients and reading physicians. All personal and sensitive data that could identify individuals were removed. Consent was obtained from the institutions, and all necessary ethical requirements and regulations for conducting the research were met. The study was reviewed and approved by the Institutional Research Ethics Committee of CES University, which indicated that it is a risk-free investigation, as the information is retrospective in nature based on the CT scan reports. This ensures compliance with the ethical standards established in the scientific and medical community.

Results

A total of 10,815 reports were collected from three institutions in Medellín, corresponding to abdominal CT scans performed between July 2020 and June 2021. From this number, a quantity proportional to the total number of reports from each institution was randomly selected to complete the established sample of 380 reports.

The mean age of the patients was 50.7 (SD = 20.2) years, with an age range between 18 and 95 years. Male patients comprised 51.3% of the population (n = 195). Of the 380 reports selected, 60.8% (n = 231) corresponded to hospital studies and 1.6% (n = 6) to outpatient studies; the remaining percentage corresponded to patients for whom no information was available regarding their location at the time of the study.

93.4% (n = 355) of the tomographic reports corresponded to contrast-enhanced abdominal CT scans and 6.6% (n = 25) to simple CT scans. Regarding the sample from each institution, 31% (n = 118) of the reports evaluated corresponded to institution A; 32.4% (n = 123) to institution B, and 36.6% (n = 139) to institution C (Table 2).

A total of 754 errors were found in the 380 reports; 299 reports had one or more errors and 81 reports had no errors. The most common finding was a single error per report, which was present in 25% (n = 95). An average of 1.98 (SD 1.68) errors per report was obtained, with a range of 0 to 9 errors per report (Table 3).

The most frequent category was "lack of indication or conclusion," present in 52.9% (n = 201) of the studies, representing 26.7% of the errors. The second most frequent category was "attenuating language," found in 35.3% (n = 134) of reports, representing 17.8% of errors. The least frequent errors were "untimely report" and "report not corresponding to the requested study" with 0.3% (n = 2). Table 4 shows the percentage for each of the 16 categories evaluated.

71.4% (n = 165) of inpatient reports contained at least one error, with a total of 397 errors in these reports (average 1.7). In comparison, 66.7% (n = 4) of outpatient reports contained at least one error, with a total of 12 errors for an average of 2. When comparing inpatient and outpatient reports, a 7% higher risk of error was found in inpatient reports, but this was not statistically significant (RR 1.07; 95% CI: 0.61-1.90; p = 1.0) (Table 5).

In terms of the type of study, at least one error was found in 78.3% (n = 278) of contrast-enhanced CT scans, for a total of 696 errors and an average of 2. In plain CT scans, 84% (n = 21) had at least one error, for a total of 58 errors and an average of 2.3. Simple CT scans had a 7% higher risk of reporting errors than contrast-enhanced CT scans, although this was not statistically significant (RR 1.07; 95% CI: 0.89-1.28; p = 0.502) (Table 6).

Discussion

The study shows that radiological reporting errors are common. 78.7% of the reports evaluated had at least one error. In previously published classifications, "reporting error" is the second most frequent error after "perception error" (18,19). Voice recognition systems have not improved this, and some show that the problem may be increasing (24). Considering that the report is the final product of the radiologist's work, greater efforts must be made to correct the problem, and training in reporting must be included in postgraduate radiology programs.

The most frequently found error was the "lack of indication or conclusion" in the report. It was present in 52.9% of the studies and accounted for 26.7% of the errors. All reporting guidelines published since 2004 insist that both the indication and the conclusion must be part of every radiology report (11-17). Failure to adhere to the guidelines may be a manifestation of ignorance or non-acceptance of them because it has been learned that each radiologist reports as they see fit and is unwilling to evolve in their style. Heillman, in an article entitled "What's wrong with radiology" (7), posits that strict adherence to the question-and-answer format would resolve the ambiguity that currently characterizes radiology. For this reason, reporting guidelines should be studied in postgraduate radiology programs.

The second most frequent error was "attenuating language," present in 35.3% of reports, representing 17.8% of errors. Attenuating language is part of defensive radiology and has the opposite effect: it is grounds for lawsuits (8.25-28). Anything that falls within the spectrum of defensive medicine is bad medicine.

Every report must be reviewed before approval. "Errors due to lack of review," "poorly constructed sentences," and "word errors" accounted for 12.3%, 7.8%, and 5.6%, respectively. This can be seen as a dismissive attitude toward the report. With sarcasm, Dr. Smith writes in his book that "some reports should say: dictated, but not read by the doctor [...]" (18).

"Lack of affirmation or brainless report" was the fourth most common error, at 9.9%. Describing without concluding is a way of evading the radiologist's commitment to their patient. This practice has been criticized since 1923. In that year, Dr. Enfiel wrote: "Such a report is, in its perfect form, a futile recital of radiological signs. It requires vision and description from the radiologist. It is linked to verbosity; it says a lot without saying anything" (29).

The "heading error" was detected in 4.7% (n = 18) of the studies. One possible explanation for the lower percentage is the automation of computer systems.

The least frequent errors were "untimely reporting" (0.3% (n = 2)) and "reporting that does not correspond to the requested study" (0.3% (n = 2)). These two types of errors are underestimated. The timeliness of the report could only be evaluated in one of the institutions that has a field in the report for the time of completion and another for the time of reporting. In the other institutions, only the time of reporting is recorded. The category "report does not correspond to the requested study" could only be evaluated if the report corresponded to the study described in the technique, but it was not possible to establish which study was requested by the physician in the medical record.

The bivariate analysis showed no statistically significant difference between reports for hospitalized and outpatient patients or between simple and contrast studies. These were not associated factors for the presence or absence of reporting errors.

Brady (30) described an error frequency of 3-5% in daily reports; however, although he acknowledges the existence of errors in report preparation, his focus was on diagnostic errors.

The article proposes as possible explanations a healthcare system that expects a hyper-efficient radiology service with immediate readings, excessive workloads, staff shortages, and a precarious environment for producing reports. It also acknowledges that the lack of clinical information and adequate indications limits the work of radiologists.

Although reporting guidelines and errors have been widely disseminated, ignorance of them may explain their perpetuation. Not knowing about them prevents people from realizing that they are making mistakes. This work contributes to their visualization and provides a starting point for analysis.

Various studies propose the use of structured reports to improve report quality (4, 8, 28, 31-34). It has been shown to improve content, provide greater clarity, and enhance clinician understanding. None of the reports evaluated were structured. Most radiologists still prefer prose reports.

Conclusion

Errors in radiology reports are common. In this study, they were present in 78.7% of reports. Efforts to disseminate reporting guidelines and error classifications should continue. These are tools for improving the quality and performance of radiology.

Table 1. Categories of error in radiology reports

#	Category name	Description
1	Error in the heading	The name of the study or its location does not correspond to the study performed
2	Discrepancy between the text and the conclusion	Abnormalities are described in the body of the report but not in the conclusion, or vice versa
3	Discrepancy between the preliminary oral report and the final report	Verbally reporting findings that are later modified in the report and not notifying the change
4	Incomplete report	The radiologist agrees to make an addendum or comparison and fails to do so
5	Finding a finding and not reporting it	Findings measured in images but not reported in the report
6	Inadequate comparison with previous studies	Lesions reported in different anatomical sites due to inadequate comparison
7	Report that does not correspond to the requested study	Report that corresponds to another modality or another part of the body different from the requested study
8	Enumeration or measurement errors	Confusing centimeters and millimeters or miscounting ribs or vertebrae
9	Word error	Confusing right and left, tibia and fibula, metacarpal and metatarsal, etc.
10	Poorly constructed sentences	Reflection of insecurity; the radiologist hides their lack of certainty by describing their reasoning process in long sentences
11	Language of attenuation and words that weaken and obscure the meaning of the report	Words that give an inaccurate or non-objective estimate. Used to avoid responsibility or for fear of committing oneself
12	Lack of assertion or "brainless report"	The radiologist does not give an opinion on what is most likely or make a recommendation
13	Non-descriptive names	Words used by radiologists that represent images that are imprecise, abstract, or nebulous to treating physicians
14	Failure to review reports	Not reading the report or correcting dictation errors before publishing it
15	Untimely report	Late or untimely completion or publication of the report
16	Ambiguous report	Use of non-diagnostic words that can lead to different interpretations or diagnoses
17	Unnecessary recommendations (defensive radiology)	Medical acts performed not to alleviate symptoms, but to avoid medical-legal lawsuits
18	Unanswered report	Failure to answer the treating physician's question
19	Report without indication or conclusion	Failure to describe the reason for requesting the report or to provide a conclusion based on the findings described

Table 2. Sociodemographic characteristics of the study population

Characteristics		*N* = 380	%
Institution	A	118	31
	B	123	32.4
	C	139	36.6
Type of patient	Outpatient	6	1.6
	Hospitalized	231	60.8
	No information	143	37.6
Type of study	Contrasted	355	93.4
	Simple	25	6.6
Sex	Male	195	51.3
	Female	185	48.7
Age	Mean (SD)	50.7 (20.2)	
	Median (IQR)	51 (33-67.3)	
	Range (Lower limit: Upper limit)	18:95	

Notes: N: number. SD: standard deviation. IQR: interquartile range. Lower limit: lower bound. Upper limit: upper bound.

Table 3. Characterization of radiological reports

Characteristics		N = 380	%
Presence of errors	Yes	299	78.7
	No	81	21.3
Number of errors	0	81	21.3
	1	95	25.0
	2	68	17.9
	3	73	19.2
	4	33	8.7
	5	16	4.2
	>5	14	3.7
Average number of errors	Mean (SD)	1.98 (1.68)	
	Median (IQR)	2 (1:3)	
	Range (Lower limit: Upper limit)	0:9	

Notes: N: number. SD: standard deviation. IQR: interquartile range. Lower limit: lower bound. Upper limit: upper bound.

Table 4. Proportional distribution according to error category

Error category	N = 754	%
No indication or no conclusion	201	26,7
Mitigating language	134	17,8
No revision	93	12,3
Lack of affirmation, mindless	75	9,9
Poorly constructed sentences	59	7,8
Word error	42	5,6
Unnecessary recommendations	38	5
Ambiguous	36	4,8
Discrepancy between text and conclusion	24	3,2
Heading error	18	2,4
No response	13	1,7
Non-descriptive names	8	1,1
Incomplete report	5	0,7
Enumeration or measurement error	4	0,5
Report does not correspond to requested study	2	0,3
Not timely	2	0,3

N: number.

Table 5. Characteristics related to the presence of errors

Characteristic		Number of reports	Reports with errors		Error rate	
			N	%	Total errors	Average
Patient type	Outpatient	6	4	66.7	12	2.0
	Inpatient	231	165	71.4	397	1.7
Study type	Contrasted	355	278	78.3	696	2.0
	Simple	25	21	84.0	58	2.3

N: number.

Table 6. Factors associated with error

Characteristic		Errors		RR	p-value	95% CI
		Yes (*N* = 299)	No (*N* = 81)			
Type of patient	Hospitalized	165 (97.6%)	66 (97.1%)	1.07	1.0*	0.61-1.9
	Outpatient	4 (2.4%)	2 (2.9%)			
Type of study	Simple	21 (7%)	4 (4.9%)	1.07	0.502*	0.89-1.28
	Contrasted	278 (93%)	77 (95.1%)			

* Calculation using Fisher's exact test. p < 0.005 was used to determine statistical significance.

RR: relative risk. CI: confidence interval.

References

1. Berlin L. The duty to communicate. Am J Roentgenol. 2011;197(5):W962-W962. Disponible en: https://www.ajronline.org/doi/10.2214/AJR.10.5528
2. Del Cura JL. La comunicación en radiología. Rev Colomb Radiol. 2015;26(3):4236-7.
3. Elizondo Riojas G. La radiología: ¿una especialidad en extinción? Rev Mex Radiol. 1994;48(4):153-6.
4. Friedman P. Radiologic reporting: structure. Am J Roentgenol. 1983;140(1):171-2. Disponible en: https://www.ajronline.org/doi/10.2214/ajr.140.1.171
5. Goldberg-Stein S, Chernyak V. Adding value in radiology reporting. J Am Coll Radiol. 2019;16(9):1292-8. Disponible en: https://linkinghub.elsevier.com/retrieve/pii/S1546144019306933
6. Gunderman RB. The true purpose of a radiology report. J Am Coll Radiol. 2018;15(10):1450. Disponible en: https://linkinghub.elsevier.com/retrieve/pii/S1546144018307129
7. Heilman RS. What's wrong with radiology. N Engl J Med. 1982;306(8):477-9.
8. Ware JB, Jha S, Hoang JK, Baker S, Wruble J. Effective radiology reporting. J Am Coll Radiol. 2017;14(6):838-9. Disponible en: https://linkinghub.elsevier.com/retrieve/pii/S1546144017301783
9. Maynard CD. Radiologists: physicians or expert image interpreters? Radiology. 2008;248(2):333-6. Disponible en: http://pubs.rsna.org/doi/10.1148/radiol.2482080375
10. Brady AP, Bello JA, Derchi LE, Fuchsjäger M, Goergen S, Krestin GP, et al. Radiology in the era of value-based healthcare: a multi-society expert statement from the ACR, CAR, ESR, IS3R, RANZCR, and RSNA. Radiology. 2021;298(3):486-91. Disponible en: http://pubs.rsna.org/doi/10.1148/radiol.2020209027
11. American College of Radiology. ACR practice parameter for communication of diagnostic imaging findings. Disponible en: https://gravitas.acr.org/PPTS/GetDocumentView?docId=74
12. The Royal College of Radiologists. Standards for the reporting and interpretation of imaging investigations. 2018. Disponible en: https://www.rcr.ac.uk/our-services/all-our-publications/clinical-radiology-publications/standards-for-interpretation-and-reporting-of-imaging-investigations-second-edition/
13. Canadian Association of Radiologists. CAR standard for communication of diagnostic imaging findings. 2010. Disponible en: https://car.ca/wp-content/uploads/Communication-of-Diagnostic-Imaging-Findings.pdf
14. European Society of Radiology (ESR). Good practice for radiological reporting. Guidelines from the European Society of Radiology (ESR). Insights Imaging. 2011;2(2):93-6. Disponible en: https://insightsimaging.springeropen.com/articles/10.1007/s13244-011-0066-7
15. Goergen SK, Pool FJ, Turner TJ, Grimm JE, Appleyard MN, Crock C, et al. Evidence-based guideline for the written radiology report: Methods, recommendations and implementation challenges. J Med Imaging Radiat Oncol. 2013;57(1):1-7. Disponible en: https://onlinelibrary.wiley.com/doi/10.1111/1754-9485.12014
16. Hong Kong College of Radiologists. Guide on good medical practice for radiologists [internet]. 2014. Disponible en: https://www.hkcr.org/templates/OS03C00336/case/lop/goodpractice2.pdf
17. Pool FJ, Siemienowicz ML. New RANZCR clinical radiology written report guidelines. J Med Imaging Radiat Oncol. 2019;63(1):7-14. Disponible en: https://onlinelibrary.wiley.com/doi/10.1111/1754-9485.12756
18. Smith MJ. Error and variation in diagnostic radiology. 1st ed. Springfiel, Illinois, USA: Charles C Thomas Publisher; 1967. 191 p.
19. González Vásquez CM. Errores en radiología: nueva clasificación. Rev Colomb Radiol. 2016;27(1):4407-16.
20. Itri JN, Tappouni RR, McEachern RO, Pesch AJ, Patel SH. Fundamentals of diagnostic error in imaging. RadioGraphics. 2018;38(6):1845-65. Disponible en: http://pubs.rsna.org/doi/10.1148/rg.2018180021
21. Lee CS, Nagy PG, Weaver SJ, Newman-Toker DE. Cognitive and system factors contributing to diagnostic errors in radiology. Am J Roentgenol. 2013;201(3):611-7. Disponible en: https://www.ajronline.org/doi/10.2214/AJR.12.10375
22. Bhatt A, Yang X, Karnik N, Sill A, Kowdley G. Use of computerized tomography in abdominal pain. Am Surg. 2018;84(6):1091-6. Disponible en: https://journals.sagepub.com/doi/10.1177/000313481808400671
23. Lwanga SK, Lemeshow S. Determinación del tamaño de las muestras en los estudios sanitarios: manual práctico. World Health Organization; 1991. 80 p. Disponible en: https://iris.who.int/handle/10665/37589
24. McGurk S, Brauer K, Macfarlane TV, Duncan KA. The effect of voice recognition software on comparative error rates in radiology reports. Br J Radiol. 2008;81(970):767-70. Disponible en: https://academic.oup.com/bjr/article/81/970/767-770/7444113
25. Berlin L. Pitfalls of the vague radiology report. Am J Roentgenol. 2000;174(6):1511-8. Disponible en: https://www.ajronline.org/doi/10.2214/ajr.174.6.1741511
26. Makhnevich A, Sinvani L, Cohen SL, Feldhamer KH, Zhang M, Lesser ML, et al. The Clinical utility of chest radiography for identifying pneumonia: accounting for diagnostic uncertainty in radiology reports. Am J Roentgenol. 2019;213(6):1207-12. Disponible en: https://www.ajronline.org/doi/10.2214/AJR.19.21521
27. Khorasani R, Bates DW, Teeger S, Rothschild JM, Adams DF, Seltzer SE. Is terminology used effectively to convey diagnostic certainty in radiology reports? Acad Radiol. 2003;10(6):685-8. Disponible en: https://linkinghub.elsevier.com/retrieve/pii/S1076633203800892
28. Rogers LF. Information transfer: Radiology reports. Am J Roentgenol. 2001;176(3):573. https://org/doi/10.2214/ajr.176.3.1760573
29. Enfield CD. The scope of the roentgenologist's report. JAMA J Am Med Assoc. 1923;80(14):999. https://doi.org/10.1001/jama.1923.02640410029013
30. Brady AP. Error and discrepancy in radiology: inevitable or avoidable? Insights Imaging. 2017;8(1):171-82. Disponible en: http://link.springer.com/10.1007/s13244-016-0534-1
31. Brady AP. Radiology reporting-from Hemingway to HAL? Insights Imaging. 2018;9(2):237-46. Disponible en: https://insightsimaging.springeropen.com/articles/10.1007/s13244-018-0596-3
32. Blais C, Samson L. The radiologic report: a realistic approach. Can Assoc Radiol J J Assoc Can Radiol. 1995;46(1):19-22.
33. Caicedo CA, Martínez RA, Mantilla R, Dávila CP. ¿Cómo y por qué migrar hacia el informe radiológico estructurado contextualizado? Rev Colomb Radiol. 2019;30(3):5194-8.
34. Hall FM. The radiology report of the future. Radiology. 2009;251(2):313-6. Disponible en: http://pubs.rsna.org/doi/10.1148/radiol.2512090177

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