COMMON RADIOLOGICAL REPORTING ERRORS AND THEIR SUGGESTED SOLUTIONS

Imaad-ur-rehman, Faiza Javed

Department of Radiology, Islamabad Diagnostic Centre, Islamabad, Pakistan.

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Introduction

"To err is human" is one of the oldest proverbs in English language and a universal truth that is applicable to human race of all ages. Although human error can never be totally eliminated, yet there are some instances where human error can have very grave consequences and it is desirable that they should be minimized as much as possible. A study performed at John Hopkins University School of Medicine reported that about 250,000 people die each year in the US due to medical errors. These medical errors constitute the third leading cause of death in the United States.

Radiologist Leo Henry Garland (1903 - 1966) was the pioneer to evaluate radiologic errors. The prevalence rate of these errors by radiologists does not appear to have changed since they were first estimated in 1960. Today, this rate is around 10 to 15 percent.[1] A review made in 2001 reported that the prevalence of clinically significant errors in radiology was in the range of 2 to 20 percent.[2] Approximately, 1 billion annual radiological examinations are performed and most of the resulting images are interpreted by radiologists. If these interpretations carried an average error rate of only 4% (the lowest estimate for the rate of radiologic error) this would be approximately 40 million radiologist errors per year.[1] In a recent study of second readings performed by experienced abdominal imaging radiologists, they disagreed with each other more than 30% of the time and disagreed with themselves more than 25% of the time.[3]

In this article, we wish to highlight the common causes of radiological errors and to give suggestions to decrease possible errors in radiology reports in order to improve patient care and standards of reporting.

Correspondence : Dr. Imaad-ur-rehman
Department of Radiology,
Islamabad Diagnostic Centre,
Islamabad, Pakistan.
Email: imaadur@gmail.com

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COMMON ERRORS AND STRATEGIES FOR THEIR MINIMIZATION:

MRI, CT and ultrasound radiologic errors are categorized in four major categories. The perceptual errors are the most common among them with miss rate of 60 - 80%:[1,4,5]

1) ***Technique or image acquisition errors:*** Finding is missed because of the technical or physical limitations of the imaging modality. Contributors to these types of errors include inadequate equip-ment, shortage of staff or inexperienced staff members.

a. **Artifacts:** the imaging artifacts or technical factors might obscure the pathology due to distortion of image (false negative) or might mimic pathology. (false positive)

b. **Inappropriate study:** when the indication of an imaging test is wrong and the capability of a particular radiologic technique or method might not be able to answer the particular question.

c. **Incomplete study:** when the indication of an imaging test is absolutely correct, however, it does not include the particular areas that must be imaged.

SOLUTIONS:

1. Trained staff should be hired or untrained staff should work under direct supervision of some senior staff member for optimizing patient care and avoiding the adverse outcome.
2. If the examination quality is not optimal, the nature of the limitations and their impact on interpretation should also be stated, as well as, whether the examination needs to be repeated or whether an

alternative method would be more appropriate.

3. Adopt standardized and optimized imaging protocols.
4. Recognize and correct imaging artifacts by having a basic knowledge of CT and MR physics. Technicians should be trained accordingly.

2) ***Perceptual errors (most common type of error):***

when an abnormality is not identified.

a. **Under-reading:** when the finding is not detected. It is the most common type of error.
b. **History:** when a finding is missed because of an inaccurate, incomplete, or misleading clinical history.
c. **Satisfaction of search:** when a finding is missed because of failure to complete a systematic search after discovering an abnormality. It is the second most common type of error.
d. **Satisfaction of report:** when a finding is missed because of over reliance on the radiology report from a previous examination.
e. **Location:** when a finding is missed because it is outside the area of interest.
f. **Image manipulation:** when a radiologist fails to perceive an abnormality because of an inappropriate window (CT) or pulse sequence (MR).

SOLUTIONS:

1. Under reading can be avoided by making algorithms and following them during reporting scan. Systematic search or a structured image evaluation should be followed. A well-designed checklist might remind radiologists to take a second look.
2. Always categorize the relevant imaging findings as specifically as possible including description of precise anatomical location with the help of anatomical terminology specific to each modality. Always mention the size, shape or extent of lesion as well as anatomical /pathological characteristics relevant to particular diagnosis or treatment. Pertinent normal findings should be given in report when the absence of abnormality is related to diagnosis or subsequent management or the absence of abnormality is used for staging of disease process.
3. Interruptions, distractions and glare affecting the monitor should be minimized.
4. Human factors such as excessive workload and fatigue should be avoided to maintain constant vigilance in interpretation of studies.
5. Create review panel committees, particularly for clinically serious patients, cancer care and for repeated/complex surgery follow ups.
6. An important element here is the double reading of images that is made within the appropriate clinical scenario.
7. Always comment on structures visualized within the field of view.
8. Try to address the clinical questions of referring physician and give best possible differential diagnosis. When it is not possible to answer a particular clinical question, the reason for this should be clearly mentioned and recommendations regarding further investigation of follow up should be included in reports. Where possible, state the most likely specific diagnosis or a limited number of the most likely alternatives with an indication of their relative likelihoods. Where imaging findings are non-specific or indeterminate this should also be stated, and suggestions about how a more specific diagnosis might be reached should be made.
9. Conclusion should be precise and clinically relevant interpretation of the previously described imaging observations, and include a comparison with previous studies where appropriate.
10. If findings are normal or non-significant, this should be stated explicitly.
11. Where there is an accepted classification of imaging findings that affects management, this should be included in the report and conclusion.
12. If report is brief or less complex, conclusion may not require a separate section, but the clinical radiologist's interpretation remains an integral component of report.
13. Check all relevant history. If clinically pertinent notes are not available, call medical officer taking the history or physician or review the patient's file or hospital record. Radiologist should go through previous imaging and reports thoroughly.
14. Review prior reports or imaging studies after the initial interpretation. Information from previous studies might improve diagnostic accuracy and might help to avoid significant errors.
15. Use appropriate and variable grayscale settings

when evaluating CT studies so images have an appropriate contrast resolution to optimize the visualization of pathologic findings. For example the fractures should be evaluated on bone window.

3) ***Cognitive / interpretative errors:*** when an abnormality or a normal variant is seen but its meaning or importance is not correctly understood, resulting in an incorrect diagnosis.

a. **Complacency / Normal variant:** when a clinically unimportant finding was appreciated but attributed to the wrong cause (false positive).
b. **Faulty reasoning:** when the finding was appreciated and interpreted as abnormal, but attributed to the wrong cause (a true positive misclassified).
c. **Lack of knowledge:** when the finding is correctly identified on the image, but its diagnostic importance is missed because of the reader's lack of knowledge.
d. **Complication:** when the finding missed is a complication from a procedure.
e. **Prior examination:** when a finding is missed because of failure to consult prior studies or reports.

SOLUTIONS:

1. Be familiar with causes of diagnostic pitfalls such as anatomic blind spots or normal anatomic variants to reduce a common cause of misinterpretation. Consult the literature when formulating conclusions about an unknown case to formulate a sufficiently broad range of differential diagnoses and create a program of continuous learning to prevent knowledge gaps.
2. Use internet search engines and literature: Few common examples are Radiopedia ,Radiology Assistant, Radsource, articles and specialized books for sub specialities.
3. Consult liberally with colleagues and referring physicians when a challenging case is encountered. Information obtained from these conversations often influences the final report and helps to avoid interpretative errors.

4) ***Communication errors:***

When the radiologist fails to effectively communicate the results including errors in the report, in making recommendations and in communicating important findings.

SOLUTIONS:

1. Identify emergency cases and a system should be in place that findings of all such cases should be communicated to the referring physician or patient.
2. Details of time and date of communication of emergency findings and name and details of person to whom the findings were communicated should be mentioned in the report.
3. In case of a comparative study, it should be mentioned that comparison is made with previous study performed on a specific date.
4. In case of neoplastic disease follow up, a statement should be made if comparison is not available.
5. Details of the prior radiological tests used for comparison should be mentioned.
6. If a recommendation for further imaging, investigations and/or referral is appropriate in the particular clinical context, it should be described precisely.

Conclusion

We hope and pray that increased awareness of radiology errors and their remedial steps given above will improve overall efficiency and result in better patient care.

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