

MISSED DIAGNOSES AND DISCREPANCY IN DIAGNOSTIC RADIOLOGY —

PART 2

The first instalment, published in the May issue of *SMA News* (<https://googl/q3Zwxd>) focused on definitions and missed diagnoses originating from errors of perception, cognition and communication. We attempt to discuss some strategies that may be adopted to mitigate some of the issues/risks in this instalment.

The following are some suggestions that may reduce errors of perception and cognition.

DOUBLE READING

This is a well-established practice in the reading of screening mammograms. Two radiologists read the same mammogram independently and when there is a difference in opinion, additional imaging and reading is undertaken.

Plain radiographs that are reported by junior residents are also double read by a radiologist to varying extents, depending on their seniority. It is currently not routine for plain radiographs to be double read when reported by a senior radiologist. Based on the tremendous volume of cases, it might not be feasible to double read plain films. Therefore, audits may be the way to go.

For complex studies with hundreds or thousands of images like CT and MRI scans, is it technically feasible (or necessary) for these to be routinely double read?

Second opinion reporting occurs on an ad hoc basis and is a form of double reading. It is all very well when opinions of both radiologists concur, but when opinions differ significantly, there is a tendency to defer to the radiologist who is deemed an expert on the subject matter. Fastidious clinicians and radiologists may then send the complex study to an international centre for a final review. Where necessary and feasible, a pathological diagnosis may have to be the final arbiter.

Full double reading immediately halves productivity and incurs additional costs to the healthcare system, but may be necessary given that differences in interpretation of the same radiological finding by two different radiologists is as high as 30%, depending on modality.¹

While high quality of care is an important healthcare goal, this needs to be balanced with the accessibility/availability of care. Double reading would effectively mean double the manpower required for the same volume of work. Is there a role then for the double reading of every scan? Should double reading be implemented only for junior radiologists and those in training or should double reading be applicable to all regardless of seniority? Well-designed research studies are needed to answer some of these important questions.

With the advent of artificial intelligence, computer analytics may

soon be applied to corroborate report findings for all modalities.² Since computer-aided diagnosis has been over sensitive in detecting lesions, would this lead to complacency that all the radiologists need to do is to concur with or refute lesions brought to attention by the computer and not actively search for other potential lesions?

AUDITS

This may be a good economic alternative to double reading all scans for assessment of incidence of missed diagnosis since good sampling gives representative data.

A percentage of plain radiographs reported by residents are audited by consultant radiologists to assess for misdiagnoses and missed diagnoses. Some departments conduct audits of ultrasound imaging, though this is sporadic and there are differences on how this is done. Axial imaging including CT and MRI scans are also sporadically audited at various centres.

In the interest of improving overall standards, more attention needs to be paid to developing this area to enable 100% audit while maintaining economic viability. Software is already available to extract and analyse radiation dose data for various studies from existing databases. Perhaps the development of artificial intelligence that can trawl data and correlate imaging features may help in this cause.

PEER REVIEW LEARNING

It needs to be recognised that some conditions are rare and therefore not readily diagnosed. Some errors may be the result of interpretation variations. Yet others may be related to satisfaction of search. Complications, especially from invasive procedures, should also be reviewed in a timely manner to avoid repetition.

The best equipment for a radiology department to invest in would undoubtedly be the "retrospectoscope", in the form of peer review learning sessions or multidisciplinary mortality and morbidity rounds. These have been regular events in most, if not all, radiology departments for years, helping to correct failure of recognition (by improving clinical knowledge), reasoning fallacies and under-reading errors.

The value of peer review learning lies in the general heightened awareness of conditions, particularly in the correction of perceptual errors that are the commonest cause of false negative readings.³ The education value of these sessions is well recognised and the Royal College of Radiologists in the UK has a set of recommendations detailing their conduct.^{4,5}

INTER-SPECIALITY COMMUNICATION

Doctors who request for radiological examinations should not be shy to discuss case details with radiologists so that the most appropriate imaging modality may be agreed upon. Failure by professional caregivers to appropriately communicate known information on scan requests contributes to errors that include procedures/examinations performed on wrong patients or incorrect examinations performed on the correct patients.³ A 1997 study involving experienced radiologists reporting a series of normal and abnormal radiographs found an overall 23% error rate when no clinical information was provided, falling to 20% when clinical details were available.⁶ Experienced clinicians will attest that timely and appropriate communication with the radiologist is of as much value as the professional communication within the patient management team.

Behaviour modelling by consultant physicians/surgeons who pick up the phone to call the radiologist or make the trip down to the radiology department to initiate a collegial discussion that would help the radiologist understand the clinical issues better enables the junior clinicians to better appreciate the limitations of the imaging modality and therefore shape future practice for better clinical outcomes.

At most academic medical centres, much professional communication occurs between junior members of the managing team with the radiologist. Similarly, since the name of the requesting clinician on the form is the junior member of the managing team, the radiologist also tends to communicate significant abnormal findings with said individual. When appropriate action is not taken in a timely fashion due to inexperience of the junior clinician, there may be a compromise of patient care and the ultimate responsibility for the lapse still lies with the consultant clinician.

With the advent of electronic forms, the expectation is that radiological requests would be accompanied by relevant clinical information. In practice, this ranges from a dot in the box marked "history" to overzealous doctors reproducing the entire text from some previous clinic or admission discharge summary. This does not contribute to effective communication.

Weaving basic radiology education into medical schools and residency syllabi should yield positive clinical results in the medium- to long-term if there is an examinable component in the professional examinations. This is because the former, including course material, and didactic teaching on indications for various imaging modalities and their limitations have been in place for years but have failed to achieve desired results.⁷

On a reciprocal note, what level of significant findings should the radiologist be expected to call and inform the referring doctor? What is the responsibility that the radiologist has in the care of the patient? Should the doctor who requested for the imaging study be solely responsible for follow-up on the findings? While clinicians are busy

PROFILE



TEXT BY

DR LUKE TOH

*Teaching Faculty,
SMA Centre for
Medical Ethics and
Professionalism*

Dr Luke Toh graduated from the National University of Singapore and became a registered specialist in Diagnostic Radiology in 2009. After completing a fellowship in Sickkids, Canada, in 2011, he has been practising Interventional Radiology full-time at KK Women's and Children's Hospital and is a visiting consultant at Singapore General Hospital. His interests are in professionalism and medical ethics issues, particularly in professional communication and informed consent.

managing the many issues of their patients, similarly, the radiologist is busy interpreting and reporting scans. Would it be reasonable for the radiologist to call the clinician for every significant finding and, in doing so, inundate the clinician with calls?

Berlin espouses the shift in duty of care by the present day reporting radiologist to the patient from the 1917 standard of informing findings only to the referring clinician.⁸ It remains imperative to contact the referring doctor/team should there be "unusual, unexpected and urgent" (particularly potentially life-threatening) findings. Failing which, the patient should be informed directly so that he/she may seek appropriate medical attention.⁸

WORKLOAD AND MANPOWER MATCHING

As our population matures and as the demand for radiological imaging continues, rapid growth together with the additional need to continually improve clinical outcomes and safety (for double reading, to conduct audits and peer review sessions as alluded to above), this necessarily translates to additional manpower requirement in radiology practice.

Excessive workload in itself is a proven factor that increases the likelihood of perceptive and cognitive errors. Oestmann et al has shown that reducing the viewing time of chest radiographs to less than four seconds significantly increases lesion miss rate.⁹ Appropriate durations need to be made available for each image read. The Royal College of Radiologists has a set of guidelines on workload numbers for different reporting modalities¹⁰ that is a good reference for manpower planning based on existing and projected workloads.

CONCLUDING REMARKS FOR CASE SCENARIO

In part one of this article (<https://goo.gl/q3Zwxd>), it was mentioned that errors are an unavoidable part of medical practice and various factors were identified for the mitigation of these errors throughout the article. Albeit, when a missed diagnosis does occur, there are several factors that need to be considered.

1. Did the patient suffer a delay of treatment from this missed diagnosis?

2. Did the delay have an impact on the prognosis?

Due to the interval follow-up nature for cancer-related imaging and in this case, progression of disease, it may be suggested that the delay meant that potentially curative procedures like surgical resection or radiologically guided thermal ablation are no longer an option and delay in commencing another cycle of chemotherapy may be the direct cause for the progression of disease. However, these interventions are themselves not devoid of risks and the reality of complication from these procedures

(including haemorrhage, infection, liver or/and renal failure) may well have tipped the patient over prematurely. Also, these management measures are not guarantee that the patient may have completely avoided disease progression. Moreover, in view of the patient's age, premorbid status and life expectancy, the actual material impact is questionable for this case.

3. How should the current radiologist handle the problem with the first radiologist's report?

As alluded to earlier in the article, the current radiologist is ethically bound to inform the first reporting radiologist of the current finding so that the missed diagnosis becomes a learning opportunity to heighten sensitivity of future searches. Depending on the actual appearance and subtlety of the initial lesion, the case may be shared at a peer review session to educate other radiologists.

4. What would be the best approach to inform the patient of this finding?

While the duty of care is to the patient, it may be best to leave the communication to the referring oncologist who has a much better rapport with the patient and his family. There may be a tendency that the current radiologist may over- or understate the gravity of the case, especially when it may not have any

significant difference to the eventual outcome of the patient.

If the patient did speak to the radiologist directly for an opinion, the facts of the case need to be informed to the patient without addition of subjective statements, even when the latter may be pursued by the patient or concerned relative.

CONCLUSION

Fortunately, common experience in radiology suggests that many errors/discrepancies are of little or no significance to most patients, and certain significant discrepancies remain undiscovered.¹¹

Discrepancies are inevitable and the concept of necessary fallibility must be accepted. The value of the radiology report would otherwise be diminished with the use of defensive statements that do not aid in the management of the patient, as has been the case in some practices in North America where clinicians have to call their radiology colleagues for their actual analysis of the scan findings. While radiologists need to be able to practise in an environment that does not pin undue liability on them, a threshold of competency should equally be required of all radiologists, or any practitioner who attempts to report any radiological study as would a radiologist. ◆

References

1. The Royal College of Radiologists. *The Royal College of Radiologists in the United Kingdom in a response to the NMC and GMC – Consultation on Openness and honesty when things go wrong: the professional duty of candour*. London: The College, Dec 2014.
2. Shiraishi J, Li Q, Appelbaum D, Doi K. Computer-aided diagnosis and artificial intelligence in clinical imaging. *Semin Nucl Med* 2011; 41(6):449-62.
3. Renfrew DL, Franken EA Jr, Berbaum KS, Weigelt FH, Abu-Yousef MM. Error in radiology: classification and lessons in 182 cases presented at a problem case conference. *Radiology* 1992; 183(1):145-50.
4. The Royal College of Radiologists. *Standards for Learning from Discrepancies meetings*. London: The College, Nov 2014.
5. The Royal College of Radiologists. *Quality assurance in radiology reporting: peer feedback*. London: The College, Oct 2014.
6. Tudor GR, Finlay D, Taub N. An assessment of inter-observer agreement and accuracy when reporting plain radiographs. *Clin Radiol* 1997; 52(3):235-8.
7. Murphy KP, Crush L, O'Malley E, et al. Medical student knowledge regarding radiology before and after a radiological anatomy module: implications for vertical integration and self-directed learning. *Insights Imaging* 2014; 5(5):629-34.
8. Berlin L, Murphy DR, Singh H. Breakdowns in communication of radiological findings: an ethical and medico-legal conundrum. *Diagnosis (Berl)* 2014; 1(4):263-8.
9. Oestmann JW, Greene R, Kushner DC, et al. Lung lesions: correlation between viewing time and detection. *Radiology* 1988; 166(2):451-3.
10. The Royal College of Radiologists. *Clinical radiology workload: guidance on radiologists' reporting figures*. London: The College, Oct 2012.
11. Friedman SM, Merman E, Chopra A. Clinical impact of diagnostic imaging discrepancy by radiology trainees in an urban teaching hospital emergency department. *Int J Emerg Med* 2013; 6(1):24.