Tell it like it is! The nuclear-medicine scan report

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The report of a nuclear medicine scan forms the final and often the only link between the eye of the expert (nuclear medicine physician) and the mind's eye of the inexpert (the treating physician) [1]. It should follow that clearly conveying what is seen is of utmost importance, but it is surprising that reporting clearly and concisely is still not taught as a subject in most training programs [2]. The report is also a legal document, like a contract, most often without an exit clause. The penalty of a wrong report, a missed finding, an inaccurate interpretation, or a false implied prognostication could carry considerable consequences, should there be a cause for litigation. A report written with the best intentions or the highest consideration for patient wellbeing can be found wanting when examined under the unrelenting glare of legal opinion. This has resulted in a considerable body of literature on what to expect when reports go wrong. Some authors have written extensively on the consequences of inadequate or inaccurate reporting (Leonard M Berlin has published a phenomenal 300 plus articles on radiological reporting) [3].

The need for standardization of a radiology report was first discussed more than a hundred years ago [4]. At about the same time, there was lamentation about the poor quality of reports [5]. These considerations definitely apply to nuclear medicine as well.

Despite over a century of realization, there is still not much consensus on what constitutes a good report; many publications have attempted to define what is a good report, each a little differently, but everyone seems to recognize what a "bad report" is. Most of what is published relates to the way language is used, words articulated, sentences formed, and impressions conveyed.

One way to arrive at a "good report" might be to recognize and avoid things that contribute to a "bad report". While language use makes up the bulk of what differentiates a good from a bad report, I have noted a few peculiar weaknesses in our reports that come into play even before the report is articulated.

The bad report.

Bad habits!

"Tells much, yet almost nothing [5]". A detailed description of the findings but nothing about what it means, what conclusions are drawn, and how the report might direct toward the next waypoint on the journey of management. This type of report is all too common, especially for scans that are done without proper indications (majority of thyroid scans), scans reported in a hurry (most scans anyway), or laziness of the reader to think about what might actually be causing the findings.

According to one expert, most scintigraphy reports do not have a diagnosis, let alone an answer to what the referring physician's question is [6].

One way to avoid this is for the reporting nuclear medicine physician to ask him or herself at the end of the report "so what?" So what if the thyroid shows multiple cold nodules or the bone scan shows multiple hot areas. How will the treating physician use this information to go further along the management pathway of the patient? If you have not contributed to patient management, you have been remiss in your duty as a nuclear medicine physician. Remember it is the responsibility of the nuclear medicine physician to interpret reports unambiguously, to relegate this responsibility to any other physician means abrogating your privileges as an expert.

One and only one! When only the findings of the current scan are reported. A temporal context is not provided because connections are not made with the patient's history, other investigations, and/or previous investigations. When this happens, the patient and his physician are denied a wealth of useful information regarding the progress of the condition (in either direction). There can be no justification for this and no explanation for this, except laziness, and a failure of departmental policy to ensure basic quality control in reporting.

The pendulum can swing to the other side with each previous test being described in the same detail, this

would result in a magnum opus every time, onerous to read, and difficult to comprehend. The text of comparison should be economically worded with only the relevant and changing features mentioned. If a series of tests has been done with no interval change, just the number of tests with the dates done and a mention that the features have not changed should suffice.

This comparison should be placed after the description of the findings of the current report. This should be followed by an impression or comment saying how the features have changed or not [6].

The **nontouch technique** of reporting. With time, many nuclear medicine physicians evolve to reporting images rather than reporting a particular patient's scan. There are instances, unfortunately not rare, of patients never encountering a nuclear medicine physician during his or her several hours of stay in a nuclear medicine department. Necks never get palpated for nodules, abdomens never examined for surgery scars or masses, the side of renal pain never asked for, and the list goes on. A direct result is diagnosing acute cholecystitis in a patient with previous cholecystectomy, ignoring a midline neck lump (thyroglossal cyst) that was actually the cause of concern in a patient who came for a thyroid scan, etc. Referring physicians are blamed for not providing adequate clinical details, not stating the clinical questions, and not understanding the strengths and limitations of the nuclear medicine procedure asked for. That may well be the case, but it is still no excuse for not asking what is wrong from the patient and doing a focused and quick clinical examination. An extra few minutes of clinically evaluating the patient will go a long way in preventing future embarrassment (and worse).

Bad language! Six "Cs" have to be considered for a report to be considered as good [7], these include clarity, correctness, concision, confidence, completeness, and consistency. To this list, two more "Cs" were added, communication and consultation [8]. Words have to be used accurately, but the resulting text should be easy to understand without needing a lexicographer's expertise. Difficult words do not make for a more impressive report, it is not a contest where you need to establish your superior vocabulary. If one needs to struggle to understand the words, the meaning of the text can be lost. So keep it simple without sacrificing accuracy. Keep is short too, short sentences, short paragraphs, and short length of the whole body. Reports that span multiple pages are intimidating and have usually lost some of the meaning by the time the end is reached.

By the way, writing a brief note takes more thought and effort. Blaise Pascal said in 1657: "I would have written a shorter letter, but I did not have the time".

"Impression" by any other name. Call it what you wish, impression, interpretation, conclusion, diagnosis, or even opinion. There must be a sentence or more at the end of the description of the procedure and findings that answers the clinical question, with a diagnosis or a short list of differential diagnosis. It can be used to exclude specific pathology if that is irrelevant. It should not be a repetition or condensation of the findings, it should certainly not say "see above and decide".

The use of a differential diagnosis should be judicious. A list to include virtually every possibility is of no use, and a *differential* diagnosis is of no use if a diagnosis is already confirmed. If a diagnosis is certain, the referring physician is interested to learn if new findings have emerged that would suggest worsening of the situation or hopefully a resolution; it is also important to report and emphasize if the findings have remained stable.

Passing the buck. If every nuclear medicine report ends with the recommendation that another test be done, an ultrasound after every thyroid scan, a Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI) after every bone scan (sometimes both), then the whole exercise of getting a nuclear medicine scan can become futile. The only way to avoid this is to ensure that the nuclear medicine physician is well versed with the strengths of nuclear medicine and other modalities in specific clinical scenarios. Only those tests should be accepted that are expected to yield useful information. Many a times nuclear medicine tests are used for screening, in which case the majority are expected to be reassuringly normal. There are guidelines on appropriate use of tests in different situations that have been developed to maximize the usefulness of specific imaging in various conditions. These guidelines should be followed.

Hedging. The hedge is an evasive statement to avoid the risk of commitment. Common hedge terms include apparent, appears, possible, borderline, doubtful, suspected, indeterminate, identified, seen, no definite, no gross, no obvious, no overt, no evidence of, no significant, possible, probable, suggested, suspected, suspicious for, vague, clinical correlation needed, and equivocal [9]. The word "significant" in scientific writing is usually used only in the context of statistical significance. No significant disease might mean this is normal or it might mean there could be disease, but I am too obtuse to recognize it or it might mean there is no disease in the images I have but there might be elsewhere. A more honest way might be to say exactly what you are thinking, "the spot views of this bone scan are normal, but I haven't seen the whole skeleton so there remains a possibility of disease elsewhere". A direct consequence of this honesty would be the extent of the use of appropriate imaging that would automatically increase the report confidence.

Descriptive but not accurate. Small, large, big, massive, near, nearer, farther, more, or less are often used but difficult to quantify, thus difficult to monitor for change over time. If possible to do so accurately, numbers should be given that would make objective follow-up feasible.

Proof reading. The report is not yet complete after it has been written. The first draft is frighteningly full of typographical and other errors that slip through the squiggly red and green lines that is the computer's attempt to identify errors. It will not correct laterality errors (right–left errors) or errors introduced by autocorrect (symmetry for asymmetry), vascular for avascular, etc. Proofing also gives the opportunity to make the report more focused by removing extraneous words that are mere repetitions, to improve consistency of tenses, and to ensure the uninterrupted flow of thought in the text.

Despite a general realization of the risks inherent in inadequate or inaccurate reporting, there is still no resource devoted only to the art of gleaning important and relevant clues from the scan, no atlas with a collection of typical and some atypical scans *with* their reports, and no courses dedicated to the lexicon of reporting vocabulary. While specific courses on how to report as part of formal training programs are few and far between, professional societies and boards should recognize the importance of good reporting skills and organize courses, workshops, and resources dedicated to reporting. The Asian Nuclear Medicine Board has taken upon itself to develop a teaching resource on reporting different scans. These are available for free use (as long as properly acknowledged) and can be accessed at WWW.ANMBoard.org/education/Book. These chapters are constantly being upgraded and form a template or starting point for other organizations to design courses, workshop, or other documents.

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