Journal of Nuclear Medicine, published on April 10, 2013 as doi:10.2967/jnumed.112.112177

Reporting Guidance for Oncologic ^{18}F-FDG PET/CT Imaging

Ryan D. Niederkohr[1], Bennett S. Greenspan[2], John O. Prior[3], Heiko Schöder[4], Marc A. Seltzer[5], Katherine A. Zukotynski[6,7], and Eric M. Rohren[8]

[1]Department of Nuclear Medicine, Kaiser Permanente Medical Center, Santa Clara, California; [2]Department of Radiology, Medical College of Georgia/Georgia Regents University, Augusta, Georgia; [3]Department of Nuclear Medicine, Lausanne University Hospital, Lausanne, Switzerland; [4]Department of Radiology, Memorial Sloan-Kettering Cancer Center, New York, New York; [5]Department of Radiology, Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire; [6]Department of Medical Imaging, University of Toronto, Toronto, Ontario, Canada; [7]Department of Radiology, Harvard Medical School, Boston, Massachusetts; and [8]Department of Diagnostic Radiology and Nuclear Medicine, University of Texas M.D. Anderson Cancer Center, Houston, Texas

Learning Objectives: On successful completion of this activity, participants should be able to discuss (1) the elements of a concise and complete oncologic ^{18}F-FDG PET/CT report; (2) the importance of obtaining and including in the report a focused history of the patient malignancy and treatments; and (3) the importance of interpreting both the ^{18}F-FDG PET and the CT findings of PET/CT and of integrating both the metabolic and the anatomic components in the report.

Financial Disclosure: The authors of this article have indicated no relevant relationships that could be perceived as a real or apparent conflict of interest.

CME Credit: SNMMI is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing education for physicians. SNMMI designates each *JNM* continuing education article for a maximum of 2.0 AMA PRA Category 1 Credits. Physicians should claim only credit commensurate with the extent of their participation in the activity. For CE credit, participants can access this activity through the SNMMI Web site (http://www.snmmi.org/ce_online) through May 31, 2016.

The written report (or its electronic counterpart) is the primary mode of communication between the physician interpreting an imaging study and the referring physician. The content of this report not only influences patient management and clinical outcomes but also serves as legal documentation of services provided and can be used to justify medical necessity, billing accuracy, and regulatory compliance. Generating a high-quality PET/CT report is perhaps more challenging than generating a report for other imaging studies because of the complexity of this hybrid imaging modality. This article discusses the essential elements of a concise and complete oncologic ^{18}F-FDG PET/CT report and illustrates these elements through examples taken from routine clinical practice.

Key Words: oncology; PET/CT; reporting

J Nucl Med 2013; 54:1–6
DOI: 10.2967/jnumed.112.112177

At most facilities, the written report (or its electronic counterpart) is the primary mode of communication between the physician interpreting an imaging study and the referring physician. This report often serves as the basis for medical treatment decisions (*1*) and is used by third-party payers to justify medical necessity for the study and validity of reimbursement (*2*). Several authors have previously addressed the topic of reporting quality in the medical literature. Studying the process and quality of reporting not only is a necessity but also provides a unique opportunity to examine and refine the role imaging physicians play in medical care (*3*).

The number of combined PET/CT studies performed annually has markedly increased over the last decade. It is estimated that between 2001 and 2010, the number of active PET/CT systems in the United States increased by approximately 10-fold (from approximately 200 to more than 2,000), and the number of PET examinations performed in the United States increased nearly 7-fold (from about 250,000 to more than 1.7 million) (*4*). At some institutions, PET/CT is now the most frequently performed nuclear medicine imaging study, surpassing myocardial perfusion imaging among others. This dramatic increase in PET/CT volume highlights the growing clinical acceptance and importance of hybrid anatomic and functional imaging.

At present, most PET/CT scans include imaging of the neck, chest, abdomen, and pelvis. The interpreting physician must review both the PET and the CT components of the study and must integrate the anatomic and metabolic findings into a single unified report. This merging of large diagnostic datasets from both the PET and the CT components magnifies the importance of careful and concise reporting.

In practice, PET/CT reports vary widely in format, content, and quality. This variance may, at least in part, stem from the different training backgrounds of the physicians interpreting PET/CT studies today (i.e., primary training in diagnostic radiology or nuclear medicine). A recent review of data from the National Oncologic PET Registry evaluated PET reports from a broad spectrum of practices throughout the United States. The authors of this study defined "essential elements"

Received Jan. 16, 2013; revision accepted Mar. 29, 2013.
For correspondence or reprints contact: Ryan Niederkohr, Kaiser Permanente Medical Center, 700 Lawrence Expressway, Department 120, Santa Clara, CA 95051.
E-mail: ryan.d.niederkohr@kp.org
Published online ■■■■.

for a PET report and found that essential elements were missing from many PET reports. Of note, certain critical elements (e.g., study indication, treatment history, comparison to prior imaging studies, and time from radiopharmaceutical injection to imaging) were missing from over 40% of reports (*5*).

Despite the importance of proper reporting, education on reporting technique varies widely among radiology and nuclear medicine training programs (*6*). Reporting quality can be difficult to define and therefore difficult to teach. Nevertheless, it is clear that certain elements should be included in a PET/CT report so that clinical, regulatory, and financial requirements are met. The objectives of this article are to describe the elements of a concise and complete oncologic ^{18}F-FDG PET/CT report and to illustrate these elements through examples taken from routine clinical practice.

WHY IS HIGH-QUALITY PET/CT REPORTING IMPORTANT?

The accuracy of image interpretation and the quality of the diagnostic report are critical to the continued success of PET/CT in the medical community. When referring physicians receive a high-quality, clinically relevant report their confidence in (and subsequent use of) this imaging modality may increase. Unfortunately, the converse is also true: when referring physicians receive reports that are confusing or contribute little to patient care, the value of PET/CT is diminished and the test could potentially be considered unnecessary. Therefore, it is imperative that reports be of high quality, both for optimal patient outcome and for the long-term success and viability of PET/CT as an imaging modality.

In addition, the imaging report should be considered a legal document that can be used as the basis for (or defense of) litigation in medical malpractice cases. Issues surrounding the diagnosis of cancer (e.g., delay in cancer diagnosis; misdiagnosis of extent of cancer spread resulting in undertreatment or unnecessary treatment; or false-positive diagnosis of cancer) are among the most common reasons for malpractice litigation in radiology, in addition to the appropriate detection of incidental or unexpected findings (*7–13*). Particular attention to these questions is needed in oncologic PET/CT imaging, because the scan covers a large body region. Inaccurate, inadequate, or vague reporting increases the imaging physician's risk of adverse litigation outcomes whereas accurate, concise, and clear reporting technique may reduce this risk.

WHAT ARE THE ESSENTIAL ELEMENTS OF AN ONCOLOGIC ^{18}F-FDG PET/CT REPORT?

The Society of Nuclear Medicine and Molecular Imaging (SNMMI), American College of Radiology (ACR), and European Association of Nuclear Medicine (EANM) (in addition to national societies of individual countries) have published practice guidelines specific to ^{18}F-FDG PET and PET/CT that list the essential elements that should be included in the imaging report of such studies (*14–16*). In addition, SNMMI and ACR have also published general reporting guidelines for all diagnostic imaging studies (*17,18*). Other organizations, including the World Health Organization, National Center for Health Statistics, American Medical Association (for Current Procedural Terminology coding), and Centers for Medicare and Medicaid Services (for clinical laboratory improvement amendments), have additional key elements related to coding and billing and to justification of medical necessity (*5*). Table 1 provides a summary of all elements considered essential to ^{18}F-FDG PET/CT reporting. [**Table 1**]

HOW CAN THESE ESSENTIAL ELEMENTS BE INCLUDED IN REPORTS?

Clinical History

Results in the literature suggest that the availability of clinical history increases the accuracy of radiologic image interpretation (*19–22*). When referring a patient for PET/CT imaging, the referring physician should provide an appropriate indication for the study and clearly state the primary clinical questions to be answered by the scan. Such information helps the interpreting physicians to provide an accurate, clinically relevant report. When the clinical information provided by the referring physician is inadequate, review of the medical record (facilitated by the increasing use of electronic medical record systems) is strongly encouraged. Documentation in the report that this clinical information was reviewed informs the referring physician of the key factors that were considered by the physician interpreting the imaging study (*5*).

The level of detail in the clinical history section of the report can vary depending on personal preference, but the following data should be included: the indication for the scan, the tumor type and site of disease, a brief statement regarding previous or ongoing treatment (e.g., chemotherapy or the type and date of previous radiation or surgery), and any specific clinical questions raised by the referring clinician. Explicit use of terminology that conforms with national or local regulatory requirements is strongly advised (e.g., Centers for Medicare and Medicaid Services guidelines in the United States favor use of terminology such as *initial treatment strategy* and *subsequent treatment strategy*) (*23*). Additional pertinent medical or surgical history that may have relevance to PET/CT interpretation should be mentioned (e.g., sarcoidosis or rheumatoid arthritis). Examples of clinical history statements include the following: "58-y-old man with diffuse large B-cell lymphoma. PET/CT performed for initial staging before therapy (development of initial treatment strategy)"; "68-y-old man with stage III diffuse large B-cell lymphoma, treated with 6 cycles of R-CHOP chemotherapy completed July 7, 2012. PET/CT performed to assess treatment response (development of subsequent treatment strategy)"; "60-y-old woman with stage I colorectal cancer, 1 y after right hemicolectomy in June 2011 with no adjuvant chemotherapy, now with rising CEA. CT of the abdomen and pelvis on May 5, 2012, showed no evidence of recurrence of metastasis. PET/CT obtained to evaluate for residual or recurrent malignancy (development of subsequent treatment strategy)."

jnm112177-sn ■ 4/9/13

TABLE 1
Essential Elements of ^{18}F-FDG PET/CT Reporting

Element	Description
Clinical history	Indication for study
	Cancer type and site, if applicable
	Brief review of treatment history, if applicable
Technique/procedure	Radiopharmaceutical name
	Radiopharmaceutical dose/activity
	Route of radiopharmaceutical administration
	Uptake time (i.e., from radiopharmaceutical injection to imaging)
	Blood glucose level
	Ancillary medications administered, if applicable
	Precise body region scanned
	CT technique (including whether oral or intravenous contrast was used; if used, name and volume of agent)
Comparison studies	Whether comparison was made with prior PET or PET/CT studies; include dates when available
	Whether correlation was made with prior non-PET imaging studies (e.g., CT or MR imaging); include dates when available
Findings	Location, size/extent, and intensity of sites of abnormal ^{18}F-FDG uptake
	Abnormal PET findings correlated with concurrent CT images or correlative imaging studies, if applicable
	Incidental PET findings
	Incidental CT findings
Impression	Clear identification of study as normal vs. abnormal
	Interpretation of findings, rather than just restatement of findings
	Succinct differential diagnosis provided, if applicable
	Recommendations for follow-up studies, if applicable
	Documentation of communication of urgent or emergent findings to referring physician or surrogate

Technique/Procedure

This section documents how the study was generated so that comparison with subsequent studies can be performed. The following information should be included in the technique section of every report: radiopharmaceutical name, administered activity, route of administration, and uptake time (i.e., time from injection to imaging). Precise radiopharmaceutical dose (if necessary, corrected for residual activity in the syringe or intravenous tubing; for example, "9.6 mCi [355 MBq]" rather than "approximately 10 mCi [370 MBq]" and precise uptake time (e.g., "68 min" rather than "approximately 60 min") should be reported since both parameters affect semiquantitative measures (e.g., standardized uptake value [SUV]) and may affect comparison with future or prior studies. Any ancillary medications administered before the study should also be listed (e.g., furosemide, 20 mg intravenously, given 30 min after ^{18}F-FDG injection, or lorazepam, 1 mg orally, given 1 h before tracer injection). SNMMI, ACR, and EANM guidelines recommend measuring and reporting blood glucose levels (in units appropriate for the locale) for patients undergoing ^{18}F-FDG PET or PET/CT (*14–16*).

Regardless of whether the PET/CT is coded as a limited or regional study (e.g., "brain only or skull vertex through adrenal glands"), "skull base to mid thigh," or "true whole-body study (skull vertex to feet)," the actual axial coverage of the scan should be documented in the report using appropriate anatomic nomenclature. For example, at some institutions some patients with cancers of the head and neck are scanned from the skull vertex to the upper pelvis. True whole-body scans (often performed on patients with melanoma or myeloma) typically extend from the skull vertex through the feet.

In certain cases, PET/CT protocols may include additional acquisitions such as delayed imaging. Certain patients may be scanned in specific positions, such as prone positioning, or using an immobilization device or face mask for radiation treatment planning. These additions to the standard PET/CT acquisition should be described. If SUVs are reported in the findings section of the report, the technique section should specify which SUV parameter (e.g., maximum, peak, normalized to body weight, lean body mass, or body surface area) is recorded.

Finally, the PET/CT report should clearly describe the CT technique. In particular, the report should clearly state whether the CT technique was fully optimized (e.g., with full tube current and intravenous or oral contrast as appropriate) or whether a low-dose, non–contrast-enhanced technique was used primarily for anatomic localization and attenuation correction. If contrast was used, the type and volume of contrast agent should be stated. The term *nondiagnostic CT* should be avoided since even low-dose, unenhanced CT scans contain valuable diagnostic information that should be reported and

jnm112177-sn ■ 4/9/13

used in the interpretation of the PET portion of the PET/CT examination. Details regarding adverse reactions to contrast material (including signs, symptoms, and treatment) and any significant deviation from standard protocol should be included in the report. In some states or countries, the inclusion of CT parameters (i.e., kVp and mAs) or patient radiation exposure estimate from the CT component of the examination (e.g., CT dose index in mGy or dose–length product in mGy·cm) may be required by law. Maximal SUV (based on actual body weight) is reported.

An example technique section is as follows:

Radiopharmaceutical: ^{18}F FDG, 373 MBq (10.1 mCi) intravenously, via left antecubital vein

Blood glucose at time of ^{18}F-FDG injection: 95 mg/dL (5.3 mmol/L)

Time from ^{18}F-FDG injection to scan: 65 min

PET/CT images were acquired from the skull base through the upper thighs; CT images were acquired at a 5-mm slice thickness using a low tube current technique and without the use of oral or intravenous contrast agent

Comparison Studies

The interpreting physician should compare the current imaging study with prior studies whenever possible. Results in the literature have shown that comparison with prior imaging improves diagnostic accuracy (*19,20*). Even when the final diagnosis is uncertain, documentation of stability versus change over time can be helpful to the referring physician. Comparison should be made with prior PET/CT studies, but current findings should also be correlated with findings of other recent imaging studies such as CT, MR imaging, or other nuclear medicine studies (e.g., bone scanning or radioiodine scanning) when applicable. The dates of any other imaging studies used for comparison or correlation should be listed. If no previous imaging studies are available, this should be stated.

Findings

It is important to have a consistent organizational scheme when reporting imaging findings. There are 3 principal styles of reporting: "order of importance," "anatomic site," and "hybrid" formats.

Order of Importance. Findings are described in the order of relevance to the clinical care of the patient. In its simplest form, such a report may follow the TNM staging classification for the type of tumor being evaluated. In other cases, it may begin with the largest or most clinically significant site of disease, followed by additional findings of less immediate importance. Once the most important PET findings (along with corresponding anatomic descriptors from the CT portion of the study) have been reported, there should be a description of significant CT findings that are not ^{18}F-FDG–avid, followed by incidental findings (on PET or CT) that are unlikely to have an impact on patient care.

This format generally begins with a description of the primary PET findings, including positive and negative findings that are directly relevant to the clinical question and that describe the primary or dominant sites of disease. This is followed by a description of PET findings suspected to represent disease spread to regional lymph nodes or distant sites. Next, incidental PET findings are described (i.e., ^{18}F-FDG–avid lesions suspected to represent a benign or malignant process unrelated to the primary cancer being studied, such as incidental pituitary adenoma, Warthin tumor, suspected colon polyp, or diffuse thyroidal ^{18}F-FDG uptake suggestive of thyroiditis). This is followed by a description of incidental CT findings (e.g., enlarged but non–^{18}F-FDG-avid lymph nodes; lung abnormalities such as emphysema, pneumothorax, and nonavid lung nodules; vascular abnormalities such as aortic dilation or aneurysm; adrenal nodules; renal masses or stones; and gallstones). Small pulmonary nodules without visible ^{18}F-FDG uptake should also be mentioned, as they may require follow-up. Mentioning prominent physiologic activity that is still within the range of normal variants (e.g., gastrointestinal tract labeling or brown fat uptake) should be considered.

Anatomic Site. Findings are organized by anatomic region (e.g., head and neck, chest, abdomen and pelvis, musculoskeletal), with both PET and CT findings described within each anatomic subsection. Some physicians adopt a "structured" format within each section whereby individual organs or organ systems are routinely listed, followed by a statement describing the presence or absence of pathology.

Hybrid. Some physicians report PET/CT findings using a combination of the order of importance and anatomic site styles. The report is organized by anatomic region (e.g., head and neck, chest, abdomen and pelvis, musculoskeletal), with findings in each section organized by order of importance. Such reports have a predictable overall structure and are presented in a clear fashion with compartmentalized information. This format may be preferred by some referring physicians because it more closely matches reports associated with anatomic imaging modalities such as CT and MR imaging.

General Guidance of Reporting of Findings. In any organizational scheme the location, extent, and intensity of abnormal radiotracer activity should be reported using standard anatomic descriptors. The use of a standardized radiology lexicon (e.g., RadLex in North American English) is encouraged (*24*). Areas of abnormal radiotracer activity should be correlated anatomically with the concurrent CT scan or other recent anatomic imaging studies.

It is appropriate to provide size measurements for nodules and masses, either as a single transaxial diameter or in 2 or 3 orthogonal directions. If a single linear measurement is reported there should be a descriptor indicating whether it represents the short or long axis. When PET/CT is used as a follow-up study to anatomic imaging (e.g., CT alone), effort should be made to compare anatomic information (i.e., increasing, stable, or decreasing lesion size) in addition to reporting the metabolic findings on PET.

jnm112177-sn ■ 4/9/13

The intensity of ^{18}F-FDG uptake within a lesion may be reported using either qualitative (e.g., mild, moderate, or intense) terminology or using semiquantitative measures such as the SUV. Both approaches have strengths and weaknesses. Use of SUV may be preferable in many situations, as it is more amenable to interstudy comparison and has prognostic value in some cancers. However, there are different ways of calculating and reporting SUV that should be standardized (e.g., mean vs. maximum SUV; SUV normalized to true body weight vs. lean body weight), and interpreting physicians need to be aware of limitations in SUV measurements and potential sources for error that may adversely affect SUV accuracy and reproducibility (*25–27*). Use of qualitative terminology may avoid these potential pitfalls of SUV, but such terminology may be interpreted variably from reader to reader and the absence of a quantitative parameter may make interstudy comparison difficult or impossible.

Regardless of the aforementioned approaches, we recommend that abnormal ^{18}F-FDG uptake be compared with uptake in a normal reference region. For example, abnormal ^{18}F-FDG uptake in a lesion can be characterized by comparing it with uptake in normal liver, with "mild" meaning less intense than normal liver uptake, "moderate" meaning similar in intensity to normal liver uptake, and "intense" meaning substantially higher than normal liver uptake. Lesion SUV can also be compared with SUV within a reference region of interest in the liver or mediastinal blood-pool activity.

Impression

The impression is probably the most important section of an imaging report. Many referring physicians begin their reading of the report with the impression, and they read the findings section only as time allows. It is essential that all important information is presented in the impression in a clear and succinct way. The impression section should be a brief and concise interpretation of findings, not simply a restatement of findings. Lengthy discussion should be avoided in the impression.

The impression should allow the reader to clearly identify whether the PET/CT findings are normal or abnormal, and it should answer the specific clinical questions raised by the referring physician. The impression should provide a clear diagnosis or a brief list of differential diagnoses with level of likelihood. For follow-up scans after therapy, both the metabolic response and anatomic response may be reported in the impression, particularly if these responses are discordant.

Some imaging physicians recommend additional imaging studies, tissue sampling, or follow-up for specific findings in the impression section. A 2009 study found that the frequency of recommendations for additional imaging in radiology reports has nearly doubled since 1995 (*28*), and a 2013 study found that recommendations for additional imaging were found in 29.6% of oncologic PET/CT reports (*29*). The latter study reported no adverse impact on patient management or outcome by not issuing or following these recommendations in more than 50% of cases, though this study was limited by several factors including retrospective design (*29*). Additional imaging studies may be needed to clarify areas of diagnostic uncertainty on the PET/CT, especially when this is critical for patient management. However, such recommendations for additional imaging should be issued sparingly because indiscriminate additional imaging may lead to unnecessary health care costs, patient anxiety or inconvenience, and potential complications as the result of these additional tests (*29,30*). It may also put referring physicians in a position where they feel medicolegally obligated to order the recommended tests, and the recommended tests could also potentially be construed as inappropriate self-referral as has been reported by some authors (*30,31*). The recommendation for additional imaging should be tailored to institutional preferences and may depend on the level of imaging expertise among both imaging physicians and referring physicians (*28*).

The language used in the impression should be as clear and unambiguous as possible. For instance, terms such as *absent, excludes,* and *definite* are clear and can be expected to be interpreted similarly by referring physicians and imaging physicians. Diagnostic uncertainty can be expressed using terms such as *probably benign* or *probably malignant*; however, such terms may have different probabilistic meanings to different people, which may lead to misunderstanding among physicians and patients (*32*). Therefor, if these terms are used, their meaning should be explained to referring physicians. The term *equivocal* or *indeterminate* should be reserved for scenarios in which a likelihood of malignancy truly cannot be reliably ascribed.

There is an increasing emphasis on the standardization of reporting with respect to assessment of treatment response. Current best practices in reporting emphasize consistency in communication so that clinical decisions can be made on the basis of imaging results. In clinical reports, the language of response assessment (e.g., *complete response, partial response, stable disease,* or *progressive disease*) is derived from the World Health Organization criteria and RECIST criteria, which were developed for trial-based imaging using anatomic imaging modalities (*33,34*). To capture the full breadth of information in a PET/CT scan, future iterations of response assessment criteria will need to incorporate parameters in addition to size, including intensity of uptake and possibly volumetric metabolic data. Several proposals for characterizing metabolic response have been put forward, including the Cheson and Deauville/London criteria (specific to lymphoma) and PERCIST (*35–39,40,41*).

Although the proposed criteria for metabolic response have many potential advantages, there are several issues that currently limit widespread use of these metrics in clinical reports. First, many of these metrics have not been rigorously validated in clinical outcome studies. Second, some of these metrics are disease-specific (e.g., Deauville/London and Cheson criteria for lymphoma), precluding application to other tumor types. Third, criteria that classify metabolic response based on percent changes in SUV or other metrics are

jnm112177-sn ■ 4/9/13

applicable only if baseline and follow-up studies are performed under nearly identical conditions. For this, the image acquisition protocol and means of image analysis need to be standardized and consistent. Finally, these schemes are constantly evolving and the optimal criteria may change over time. Currently, there is no consistent recommendation to incorporate any one metabolic response framework into clinical reports. We recommend that imaging physicians collaborate with their local oncologic colleagues to reach agreement regarding institutional reporting preferences that may or may not include these aforementioned metrics in routine clinical reports.

Urgent or emergent findings (e.g., pneumothorax, impending pathologic fracture, spinal cord compression, or intracranial hemorrhage) should be communicated rapidly to referring physicians or their surrogate, and the date, time, and means of communication should be documented at the end of the imaging report (e.g., "Dr. X discussed these results with Dr. Y by telephone on October 10, 2012, at 3:35 PM.")

Finally, imaging physicians should be aware that referring physicians at many institutions now make the reports of imaging studies directly available to patients. This is an additional incentive to avoid emotional terminology (e.g., *dramatic increase* or *too numerous to count*), which is generally unhelpful and might provoke unnecessary patient anxiety.

CONCLUSION

The interpretative report rendered by an imaging physician is the only tangible manifestation of the physician's expertise (*3*). The content of this report not only influences patient management and clinical outcomes but also serves as legal documentation of services provided. To ensure that PET/CT reports are consistently of high quality, we suggest that institutions standardize the structure and language of their reports, taking into consideration the essential elements discussed in this paper.

REFERENCES

1. Naik SS, Hanbidge A, Wilson SR. Radiology reports: examining radiologist and clinician preferences regarding style and content. *AJR.* 2001;176:591–598.
2. Thorwarth WT. Get paid for what you do: dictation patterns and impact on billing accuracy. *J Am Coll Radiol.* 2005;2:665–669.
3. Sistrom CL, Langlotz CP. A framework for improving radiology reporting. *J Am Coll Radiol.* 2005;2:159–167.
4. *2011 PET Imaging Market Summary Report*. Greenbelt, MD: IMV; 2011.
5. Coleman RE, Hillner BE, Shields AF, et al. PET and PET/CT reports: observations from the National Oncologic PET Registry. *J Nucl Med.* 2010;51:158–163.
6. Sistrom C, Lanier L, Mancuso A. Reporting instruction for radiology residents. *Acad Radiol.* 2004;11:76–84.
7. Berlin L. The incidentaloma: a medicolegal dilemma. *Radiol Clin North Am.* 2011;49:245–255.
8. Berlin L. Mock trial at 2009 RSNA annual meeting: jury exonerates radiologist for failure to communicate abnormal finding—but. . . *Radiology.* 2010;257:836–845.
9. Berlin L. Pitfalls of the vague radiology report. *AJR.* 2000;174:1511–1518.
10. Brenner RJ, Bartholomew L. Communication errors in radiology: a liability cost analysis. *J Am Coll Radiol.* 2005;2:428–431.
11. Halpin SF. Medico-legal claims against English radiologists: 1995-2006. *Br J Radiol.* 2009;82:982–988.
12. Thibierge M, Fournier L, Cabanis E. Principles of medical liability and practice in medical imaging. *J Radiol.* 1999;80:701–707.
13. Berlin L. Liability for typographical errors. *AJR.* 2011;196:W215.
14. Delbeke D, Coleman RE, Guiberteau MJ, et al. Procedure guideline for tumor imaging with ^{18}F-FDG PET/CT 1.0. *J Nucl Med.* 2006;47:885–895.
15. ACR-SPR practice guideline for performing FDG-PET/CT in oncology. American College of Radiology Web site. http://www.acr.org/~/media/ACR/Documents/PGTS/guidelines/FDG_PET_CT.pdf. Published 2009. Updated 2012. Accessed March 29, 2013.
16. Boellaard R, O'Doherty MJ, Weber WA, et al. FDG PET and PET/CT: EANM procedure guidelines for tumour PET imaging: version 1.0. *Eur J Nucl Med Mol Imaging.* 2010;37:181–200.
17. ACR practice guideline for communication of diagnostic imaging findings. American College of Radiology Web site. http://www.acr.org/~/media/ACR/Documents/PGTS/guidelines/Comm_Diag_Imaging.pdf. Revised 2010. Accessed March 29, 2013.
18. The SNM procedure guideline for general imaging, version 6.0. Society of Nuclear Medicine and Molecular Imaging Web site. http://interactive.snm.org/docs/General_Imaging_Version_6.0.pdf. Revised 2010. Accessed March 29, 2013.
19. Berlin L. Accuracy of diagnostic procedures: has it improved over the past five decades? *AJR.* 2007;188:1173–1178.
20. Doubilet P, Herman P. Interpretation of radiographs: effect of clinical history. *AJR.* 1981;137:1055–1058.
21. Leslie A, Jones A, Goddard P. The influence of clinical information on the reporting of CT by radiologists. *Br J Radiol.* 2000;73:1052–1055.
22. Loy CT, Irwig L. Accuracy of diagnostic tests read with and without clinical information: a systematic review. *JAMA.* 2004;292:1602–1609.
23. Medicare national coverage determinations manual. Centers for Medicare & Medcaid Services Web site. http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/ncd103c1_part4.pdf. Published March 8, 2013. Accessed March 29, 2013.
24. What is RadLex? Radiological Society of North America Web site. http://rsna.org/RadLex.aspx. Accessed March 29, 2013.
25. Lindholm H, Johansson O, Jonsson C, Jacobsson H. The distribution of FDG at PET examinations constitutes a relative mechanism: significant effects at activity quantification in patients with a high muscular uptake. *Eur J Nucl Med Mol Imaging.* 2012;39:1685–1690.
26. Teo BK, Badiee S, Hadi M, et al. Correcting tumour SUV for enhanced bone marrow uptake: retrospective ^{18}F-FDG PET/CT studies. *Nucl Med Commun.* 2008;29:359–366.
27. Osman MM, Muzaffar R, Altinyay ME, Teymouri C. FDG dose extravasations in PET/CT: frequency and impact on SUV measurements. *Frontiers Oncol.* 2001;1:1–6.
28. Sistrom CL, Dreyer KJ, Dang PP, et al. Recommendations for additional imaging in radiology reports: multifactorial analysis of 5.9 million examinations. *Radiology.* 2009;253:453–461.
29. Shinagare AB, Shyn P, Sadowa C, Wasser E, Catalano P. Incidence, appropriateness, and consequences of recommendations for additional imaging tests in oncological PET/CT reports. *Clin Radiol.* 2013;68:155–161.
30. Ginsberg LE. "If clinically indicated:" is it? *Radiology.* 2010;254:324–325.
31. Arenson RL. Recommendations for additional imaging in radiology reports: radiologists' self-referral or good clinical practice? *Radiology.* 2009;253:291–292.
32. Kong A, Barnett G, Mosteller F, Youtz C. How medical professionals evaluate expressions of probability. *N Engl J Med.* 1986;315:740–744.
33. Eisenhauer EA, Therasse P, Bogaerts J, et al. New response evaluation criteria in solid tumours: revised RECIST guideline (version 1.1). *Eur J Cancer.* 2009;45:228–247.
34. Miller AB, Hoogstraten B, Staquet M, Winkler A. Reporting results of cancer treatment. *Cancer.* 1981;47:207–214.
35. Wahl RL, Jacene H, Kasamon Y, Lodge MA. From RECIST to PERCIST: evolving considerations for PET response criteria in solid tumors. *J Nucl Med.* 2009;50(suppl 1):122S–150S.
36. Barrington SF, Qian W, Somer EJ, et al. Concordance between four European centres of PET reporting criteria designed for use in multicentre trials in Hodgkin lymphoma. *Eur J Nucl Med Mol Imaging.* 2010;37:1824–1833.
37. Meignan M, Gallamini A, Haioun C. Report on the First International Workshop on interim PET scan in lymphoma. *Leuk Lymphoma.* 2009;50:1257–1260.
38. Cheson BD, Pfistner B, Juweid ME, et al. Revised response criteria for malignant lymphoma. *J Clin Oncol.* 2007;25:579–586.
39. Juweid ME, Stroobants S, Hoekstra OS, et al. Use of positron emission tomography for response assessment of lymphoma: consensus of the Imaging Subcommittee of International Harmonization Project in Lymphoma. *J Clin Oncol.* 2007;25:571–578.
40. Shankar LK, Hoffman JM, Bacharach S, et al. Consensus recommendations for the use of ^{18}F-FDG PET as an indicator of therapeutic response in patients in National Cancer Institute Trials. *J Nucl Med.* 2006;47:1059–1066.
41. Young H, Baum R, Cremerius U, et al. Measurement of clinical and subclinical tumour response using [^{18}F]-fluorodeoxyglucose and positron emission tomography: review and 1999 EORTC recommendations. European Organization for Research and Treatment of Cancer (EORTC) PET Study Group. *Eur J Cancer.* 1999;35:1773–1782.

jnm112177-sn ■ 4/9/13