ACR–SPR–STR PRACTICE PARAMETER FOR THE PERFORMANCE OF HIGH-RESOLUTION COMPUTED TOMOGRAPHY (HRCT) OF THE LUNGS

Revised 2020 (Resolution 33)

PREAMBLE

This document is an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. Practice Parameters and Technical Standards are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care[1]. For these reasons and those set forth below, the American College of Radiology and our collaborating medical specialty societies caution against the use of these documents in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the practitioner considering all the circumstances presented. Thus, an approach that differs from the guidance in this document, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in this document when, in the reasonable judgment of the practitioner, such course of action is indicated by variables such as the condition of the patient, limitations of available resources, or advances in knowledge or technology after publication of this document. However, a practitioner who employs an approach substantially different from the guidance in this document may consider documenting in the patient record information sufficient to explain the approach taken.

The practice of medicine involves the science, and the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment. Therefore, it should be recognized that adherence to the guidance in this document will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The purpose of this document is to assist practitioners in achieving this objective.

---

1 *Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing, 831 N.W.2d 826 (Iowa 2013) Iowa Supreme Court refuses to find that the "ACR Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures (Revised 2008)" sets a national standard for who may perform fluoroscopic procedures in light of the standard's stated purpose that ACR standards are educational tools and not intended to establish a legal standard of care. See also, Stanley v. McCarver, 63 P.3d 1076 (Ariz. App. 2003) where in a concurring opinion the Court stated that "published standards or guidelines of specialty medical organizations are useful in determining the duty owed or the standard of care applicable in a given situation" even though ACR standards themselves do not establish the standard of care.*

I. INTRODUCTION

High-resolution computed tomography (HRCT) imaging of the lungs is well established for diagnosing and managing many pulmonary diseases [1-7]. Optimal methods of acquisition and interpretation of HRCT images require knowledge of anatomy and pathophysiology [8] as well as familiarity with the basic physics and techniques of CT. This parameter outlines the principles for performing high-quality HRCT of the lungs.

The main objective of HRCT is to detect, characterize, and determine the extent of diseases that involve the lung parenchyma and airways.

HRCT is the use of thin-section CT images (=1.5-mm slice thickness) with a high spatial frequency reconstruction algorithm to detect and characterize diseases that affect the pulmonary parenchyma and small airways [9]. Following the development and widespread availability of multidetector CT (MDCT) scanners capable of acquiring near-isotropic data throughout the entire thorax in a single breath-hold, HRCT is generally performed using MDCT [10-14]. This permits the acquisition of volumetric single breath-hold data sets, allowing spaced, contiguous, and/or overlapping HRCT images to be reconstructed. With MDCT, the volumetric data enables multiplanar (MPR) thin-section HRCT reconstruction, facilitating evaluation of the distribution of diffuse lung disease [12] evaluation of coexisting focal lung disease and the application of postprocessing techniques, such as maximum intensity projection (MIP), minimum intensity projection (minIP), and software that uses volumetric data for quantification of features in the lungs and airways [11]. Quantitative CT is emerging as an important technique for determining the extent of fibrotic and obstructive lung diseases and requires specific standardized protocols that will not be addressed here [15]. An older approach to HRCT used noncontiguous inspiratory thin-section images acquired at 10-20mm intervals through the lungs. Although this method substantially reduces the radiation dose, its diagnostic value is more limited; it may have a limited role in screening individuals at risk for diffuse lung disease.

HRCT images are routinely acquired at suspended full inspiration with patients in the supine position. Additional options, useful in many cases, include obtaining inspiratory prone images to differentiate posterior lung disease from dependent atelectasis and end-expiratory images to evaluate for air trapping [16].

II. INDICATIONS AND CONTRAINDICATIONS

A. Indications

The indications for the use of HRCT of the lungs include, but are not limited to, the following [5,8,17-25]:

1. Evaluation of known or clinically suspected diffuse lung disease
2. Evaluation of suspected small airway disease
3. Visual estimation of the extent of diffuse lung disease for evaluating effectiveness of treatment
4. Guidance in selection of the most appropriate site for biopsy of diffuse lung disease

B. Contraindications

There are no absolute contraindications to HRCT of the lungs. As with any imaging procedure, the benefits and risks should be considered prior to thoracic CT performance.

For the pregnant or potentially pregnant patient, see the ACR–SPR Practice Parameter for Imaging Pregnant or Potentially Pregnant Patients with Ionizing Radiation [26].

For imaging of diffuse lung disease in the pediatric patient, please refer to the ACR–ASER–SCBT–MR-SPR Practice Parameter for the Performance of Pediatric Computed Tomography (CT) [27].

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

See the ACR Practice Parameter for Performing and Interpreting Diagnostic Computed Tomography (CT) [28].

The physician is responsible for reviewing all indications for the examination, specifying the precise technical factors to be used for the HRCT study, generating a final report, and monitoring and maintaining the quality of images and interpretation.

The physician should be thoroughly acquainted with the many anatomic and physiologic manifestations of thoracic disease. Additionally, supervising physicians should have appropriate knowledge of alternative modalities for imaging of the thorax, including chest radiography and standard thoracic CT as well as angiography, ultrasonography, magnetic resonance imaging (MRI), and nuclear medicine studies.

The CT technologist must be familiar with optimal techniques for acquiring an HRCT examination, and in particular, need to communicate breathing instructions with the patient to ensure high-quality, motion-free inspiratory and expiratory images.

IV. SPECIFICATIONS AND PERFORMANCE OF THE EXAMINATION

A. Written Request for the Examination

The written or electronic request for HRCT of the Lungs should provide sufficient information to demonstrate the medical necessity of the examination and allow for the proper performance and interpretation of the examination.
Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). The provision of additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.
The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state scope of practice requirements. (ACR Resolution 17 adopted in 2006 – revised in 2009, 2013, Resolution 52)

B. Technical Parameters

Although many of the operations of a CT scanner are automated, many technical parameters remain operator dependent. Because these factors can significantly affect the diagnostic value of the HRCT examination [3,29-31], it is necessary for the supervising physician to be familiar with the following:

1. Radiation exposure factors (mAs, kVp)
2. Collimation
3. Table increment or pitch and gantry rotation time and table speed
4. Matrix size, scan field of view, and reconstruction field of view
5. Window settings (width and center)
6. Reconstruction algorithm (kernel) and iterative reconstruction techniques
7. Display section thickness for multidetector systems and image reconstruction interval or increment
8. Detector configuration for multidetector systems
9. Automatic exposure control (angular and longitudinal tube current modulation) and image quality reference parameter Radiation dose report
10. Reformatted images (MPR, curvilinear, MIP, and minIP) and image plane (axial, coronal, sagittal)
11. Axial or helical acquisition mode

C. Optimal HRCT Protocol

Optimization of the CT examination requires the supervising physician to develop an appropriate HRCT protocol based on careful review of relevant patient history and clinical indications as well as all prior available imaging studies that are relevant.

1. Protocols should be prepared according to the specific medical indication. Techniques that provide image quality consistent with the diagnostic needs of the examination at acceptably low radiation dose levels to the patient should be selected. When volumetric HRCT data are acquired, utilization of MPR capabilities is encouraged to facilitate assessment of disease distribution and morphology. For each indication, the protocol should include at least the following:

a. Tube potential and tube current appropriate to patient size. For the lowest dose to provide diagnostic quality, see the ACR–AAPM–SPR Practice Parameter for Diagnostic Reference Levels and Achievable Doses in Medical X-Ray Imaging [32]. Using similar technical parameters for each study facilitates direct comparison between studies and is of value if quantitative CT measurements are employed.
b. Techniques available to minimize dose (eg, tube current modulation) should be utilized. Imaging using lower radiation settings is subject to image noise, which can be offset with iterative reconstruction techniques [33]. However, special caution should be taken when utilizing iterative techniques because high degrees of iterative reconstruction weighting may obscure subtle interstitial pulmonary findings and lead to an inaccurate characterization of the patient's underlying lung disease.
c. Proper supine and/or prone patient positioning with optimal breathing instructions.
d. State of respiration (inspiration and/or expiration) with appropriate breathing instructions; it is critical to obtain inspiratory scans on full inspiration. Expiratory images are typically acquired at end-maximal expiration.
e. Table speed for volumetric HRCT to enable single breath-hold acquisition, when possible.
f. Axial (incremental HRCT) or helical (volumetric HRCT) modes of data acquisition. As mentioned above, helical, volumetric acquisition is generally recommended for the inspiratory acquisition. For expiratory and prone acquisitions, axial acquisition with nonirradiated increments of 10–20 mm or more is preferable to reduce radiation dose.
g. Gantry rotation: =1 s.
h. Reconstructed image thickness (= 1.5 mm for axial CT, =1.5-mm nominal slice thickness for helical CT).
i. Moderately high spatial-frequency reconstruction algorithm, such as a bone algorithm for lung images. Avoid use of an overly sharp reconstruction algorithm, which would create excessive image noise and high degrees of iterative reconstruction, which can decrease spatial resolution [33,34].
j. Proper patient positioning at isocenter to minimize radiation dose and optimize image quality
k. Superior and inferior extent of the region of interest to be imaged, typically from the lung apices to the costophrenic sulci. For additional series, such as prone or expiratory HRCT imaging, shorter z-axis coverage and/or greater increment between imaging locations is encouraged to decrease patient radiation exposure.
l. When possible, scan field of view should be selected appropriate to patient size at time of imaging.
m. Reconstructed field of view limited to the lungs, optimizing spatial resolution for each patient.
n. Plane, thickness, and interval for reconstructions or reformats (eg, coronal, sagittal, oblique MPRs and MIPs) sent to the picture archiving and communications system (PACS).
o. Retention of the radiation dose report in the radiological record, in alignment with the ACR–SCBT-MR–SPR Practice Parameter for the Performance of Thoracic Computed Tomography (CT) [35].

2. Attention should be directed toward the following:
    a. Radiation dose to the degree indicated in the ACR–SCBT-MR–SPR Practice Parameter for the Performance of Thoracic Computed Tomography (CT) [35], considering factors influencing radiation dose, particularly for small adults, and techniques such as increasing pitch, lowering tube current or kV, and limiting the z-axis coverage to the region of clinical question. Other factors that can decrease radiation dose are the use of sequential acquisition and larger interscan gap, which can be employed when expiratory and prone HRCT imaging is performed to supplement an inspiratory examination. The appropriateness of prone imaging should be determined in all patients, particularly on subsequent HRCT scans; omitting unnecessary sequences provides an opportunity to reduce dose.
    b. Producing motion-free images at the appropriate inspiratory and expiratory level

3. Intravenous (IV) iodinated contrast should not be used when performing an HRCT to evaluate the

lung parenchyma and small airways because subtle pulmonary findings may be obscured by intrapulmonary contrast. In addition, IV contrast adds little value to the interpretation of diffuse lung disease yet exposes patients to the risks associated with the administration of iodinated contrast.

4. Periodic update and review of the HRCT protocol

V. DOCUMENTATION

Reporting should be in accordance with the ACR Practice Parameter for Communication of Diagnostic Imaging Findings [36,37].

VI. EQUIPMENT SPECIFICATIONS

Equipment performance monitoring should be in accordance with the ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Computed Tomography (CT) Equipment [38].

To achieve acceptable clinical HRCT scans of the lungs, a CT scanner should meet or exceed the following capabilities as specified in the ACR–SCBT-MR–SPR Practice Parameter for the Performance of Thoracic Computed Tomography (CT) [35]:

1. Scan times: =1 s per image; a scan time of <1 s per image may apply to direct axial acquisition but may not apply to helical CT acquisition of HRCT images
2. Image thickness: = 1.5 mm
3. Algorithm available: bone or moderately high spatial frequency
4. Axial mode available on CT scanner

Review capability of a PACS workstation should be available to the radiologist; authorized health care providers should be able to review images remotely. A method for digitally transmitting the image data should be available.

VII. RADIATION SAFETY IN IMAGING

Radiologists, medical physicists, non-physician radiology providers**,** radiologic technologists, and all supervising physicians have a responsibility for safety in the workplace by keeping radiation exposure to staff, and to society as a whole, "as low as reasonably achievable" (ALARA) and to assure that radiation doses to individual patients are appropriate, taking into account the possible risk from radiation exposure and the diagnostic image quality necessary to achieve the clinical objective. All personnel who work with ionizing radiation must understand the key principles of occupational and public radiation protection (justification, optimization of protection, application of dose constraints and limits) and the principles of proper management of radiation dose to patients (justification, optimization including the use of dose reference levels). https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1775_web.pdf

Nationally developed guidelines, such as the ACR's Appropriateness Criteria®, should be used to help choose the most appropriate imaging procedures to prevent unnecessary radiation exposure.

Facilities should have and adhere to policies and procedures that require ionizing radiation examination protocols (radiography, fluoroscopy, interventional radiology, CT) to vary according to diagnostic requirements and patient body habitus to optimize the relationship between appropriate radiation dose and adequate image quality. Automated dose reduction technologies available on imaging equipment should be used, except when inappropriate for a specific exam. If such technology is not available, appropriate manual techniques should be used.

Additional information regarding patient radiation safety in imaging is available from the following websites – Image Gently® for children (www.imagegently.org) and Image Wisely® for adults (www.imagewisely.org). These advocacy and awareness campaigns provide free educational materials for all stakeholders involved in imaging (patients, technologists, referring providers, medical physicists, and radiologists).

Radiation exposures or other dose indices should be periodically measured by a Qualified Medical Physicist in accordance with the applicable ACR Technical Standards. Monitoring or regular review of dose indices from patient imaging should be performed by comparing the facility's dose information with national benchmarks, such as the ACR Dose Index Registry and relevant publications relying on its data, applicable ACR Practice Parameters, NCRP Report No. 172, Reference Levels and Achievable Doses in Medical and Dental Imaging: Recommendations for the United States or the Conference of Radiation Control Program Director's National Evaluation of X-ray Trends; 2006, 2009, amended 2013, revised 2023 (Res. 2d).

VIII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education appearing under the heading *ACR Position Statement on Quality Control and Improvement, Safety, Infection Control and Patient Education* on the ACR website (https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Quality-Control-and-Improvement).

ACKNOWLEDGEMENTS

This parameter was revised according to the process described under the heading *The Process for Developing ACR Practice Parameters and Technical Standards* on the ACR website (https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards) by the Committee on Body Imaging (Thoracic) of the Commission on Body Imaging and the Committee on Practice Parameters – General, Small and Rural Practice of the Commission on General, Small, and Rural Practice, in collaboration with the STR.

Writing Committee

Members represent their societies in the initial and final revision of this practice parameter.

ACR	STR
Jane P. Ko, MD, Chair	Paul Cronin, MB, BCh, BAO, FACR
Jonathan H. Chung, MD	Terrance T. Healey, MD
Carolyn A. Haerr, MD	
Andetta R. Hunsaker, MD	
Candice A. Johnstone, MD	
David A. Lynch, MB, ChB	

Committee on Body Imaging (Thoracic)

(ACR Committee responsible for sponsoring the draft through the process)

Lynn Broderick, MD, FACR, Chair

Jonathan H. Chung, MD

Stuart L. Cohen, MD

Subba R. Digumarthy, MD

Andetta R. Hunsaker, MD

Jane P. Ko, MD

Ann N. Leung, MD

David A Lynch, MB, ChB

Reginald F. Munden, MD, DMD, MBA, FACR

<u>Committee on Practice Parameters – General, Small, Emergency and/or Rural Practices</u>

(ACR Committee responsible for sponsoring the draft through the process)

Candice Johnstone, MD, Chair

Lynn Broderick, MD, FACR

Justin P. Dodge, MD

Brian D. Gale, MD, MBA

Rachel Gerson, MD ,

Carolyn A. Haerr, MD

Charles E. Johnson, MD

Steven E. Liston, MD, MBA, FACR

Derrick Siebert, MD

Samir S. Shah, MD

Jennifer L. Tomich, MD

Lincoln L. Berland, MD, FACR, Chair, Commission on Body Imaging

Robert S. Pyatt, Jr., MD, FACR, Chair, Commission on General, Small, Emergency and/or Rural Practice

Jacqueline A. Bello, MD, FACR, Chair, Commission on Quality and Safety

Mary S. Newell, MD, FACR, Chair, Committee on Practice Parameters and Technical Standards

<u>Comments Reconciliation Committee</u>

Eric Stern, MD, FACR– Chair

Catherine Everett, MD, MBA, FACR– Vice Chair

Andetta R. Hunsaker, MD

Terrance T. Healey, MD

Comments Reconciliation Committee

Richard A. Barth, MD, FACR
Jacqueline Anne Bello, MD
Lincoln L. Berland, MD, FACR
Lynn S. Broderick, MD, FACR
Jonathan H. Chung, MD
Paul Cronin, MB, BCh, BAO, FACR-
Richard Duszak, Jr., MD
Carolyn A. Haerr, MD, FACR
Candice Johnstone, MD
Amy L. Kotsenas, MD
Jane P. Ko, MD
Paul A. Larson, MD, FACR
David A. Lynch, MB, ChB
Mary S. Newell, MD
Beverley Newman, MB, BCh, BSc, FACR
Robert S. Pyatt Jr, MD, FACR

REFERENCES

1. Travis WD, Costabel U, Hansell DM, et al. An official American Thoracic Society/European Respiratory Society statement: Update of the international multidisciplinary classification of the idiopathic interstitial pneumonias. American journal of respiratory and critical care medicine 2013;188:733-48.
2. Baughman RP, Meyer KC, Nathanson I, et al. Monitoring of nonsteroidal immunosuppressive drugs in patients with lung disease and lung transplant recipients: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2012;142:e1S-e111S.
3. Webb WR, Muller NL, Naidich DP. *High-resolution CT of the Lung.* Fourth ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2008.
4. Watadani T, Sakai F, Johkoh T, et al. Interobserver variability in the CT assessment of honeycombing in the lungs. Radiology 2013;266:936-44.
5. Lynch DA, Travis WD, Muller NL, et al. Idiopathic interstitial pneumonias: CT features. Radiology 2005;236:10-21.
6. Gupta N, Finlay GA, Kotloff RM, et al. Lymphangioleiomyomatosis Diagnosis and Management: High-Resolution Chest Computed Tomography, Transbronchial Lung Biopsy, and Pleural Disease Management. An Official American Thoracic Society/Japanese Respiratory Society Clinical Practice Guideline. American journal of respiratory and critical care medicine 2017;196:1337-48.
7. Lynch DA, Sverzellati N, Travis WD, et al. Diagnostic criteria for idiopathic pulmonary fibrosis: a Fleischner Society White Paper. The Lancet Respiratory Medicine 2018;6:138-53.
8. Webb WR. Thin-section CT of the secondary pulmonary lobule: anatomy and the image--the 2004 Fleischner lecture. Radiology 2006;239:322-38.
9. Kazerooni EA. High-resolution CT of the lungs. AJR. American journal of roentgenology 2001;177:501-19.
10. Hodnett PA ND. A practical high-resolution computed tomography-based approach to diagnosis and management and a review of the literature. American journal of respiratory and critical care medicine 2013:141-49.
11. Honda O TD, Matsuki M, et al;. Image quality of 320-detector row wide-volume computed tomography with diffuse lung diseases: comparison with 64-detector row helical CT. . J Comput Assist Tomogr. 2012;36 (5):505-11.

12. Schoepf UJ BR, Hong C, et al;. Multislice helical CT of focal and diffuse lung disease: comprehensive diagnosis with reconstruction of contiguous and high-resolution CT sections from a single thin-collimation scan. . AJR. American journal of roentgenology 2001;177 (1):179-84.
13. Prosch H, Schaefer-Prokop CM, Eisenhuber E, Kienzl D, Herold CJ. CT protocols in interstitial lung diseases--a survey among members of the European Society of Thoracic Imaging and a review of the literature. European radiology 2013;23:1553-63.
14. Studler U, Gluecker T, Bongartz G, Roth J, Steinbrich W. Image quality from high-resolution CT of the lung: comparison of axial scans and of sections reconstructed from volumetric data acquired using MDCT. AJR. American journal of roentgenology 2005;185:602-7.
15. Chen-Mayer HH, Fuld MK, Hoppel B, et al. Standardizing CT lung density measure across scanner manufacturers. Med Phys 2017;44:974-85.
16. Arakawa H, Webb WR. Expiratory high-resolution CT scan. Radiologic clinics of North America 1998;36:189-209.
17. Padley S, Gleeson F, Flower CD. Review article: current indications for high resolution computed tomography scanning of the lungs. The British journal of radiology 1995;68:105-9.
18. Brown KK. Chronic cough due to nonbronchiectatic suppurative airway disease (bronchiolitis): ACCP evidence-based clinical practice guidelines. Chest 2006;129:132S-37S.
19. Hackx M, Bankier AA, Gevenois PA. Chronic obstructive pulmonary disease: CT quantification of airways disease. Radiology 2012;265:34-48.
20. Litmanovich DE, Hartwick K, Silva M, Bankier AA. Multidetector computed tomographic imaging in chronic obstructive pulmonary disease: emphysema and airways assessment. Radiologic clinics of North America 2014;52:137-54.
21. Silva CI, Muller NL, Lynch DA, et al. Chronic hypersensitivity pneumonitis: differentiation from idiopathic pulmonary fibrosis and nonspecific interstitial pneumonia by using thin-section CT. Radiology 2008;246:288-97.
22. Silva CI, Churg A, Muller NL. Hypersensitivity pneumonitis: spectrum of high-resolution CT and pathologic findings. AJR. American journal of roentgenology 2007;188:334-44.
23. Saavedra MT, Lynch DA. Emerging roles for CT imaging in cystic fibrosis. Radiology 2009;252:327-9.
24. Walsh SL, Hansell DM. High-Resolution CT of Interstitial Lung Disease: A Continuous Evolution. Seminars in respiratory and critical care medicine 2014;35:129-44.
25. Gotway MB, Reddy GP, Webb WR, Elicker BM, Leung JW. High-resolution CT of the lung: patterns of disease and differential diagnoses. Radiologic clinics of North America 2005;43:513-42, viii.
26. American College of Radiology. ACR–SPR Practice Parameter for Imaging Pregnant or Potentially Pregnant Patients with Ionizing Radiation. Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Pregnant-Pts.pdf. Accessed January 29, 2019.
27. American College of Radiology. ACR-ASER-SCBT-MR-SPR Practice Parameter for the Performance of Pediatric Computed Tomography (CT). Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CT-Ped.pdf. Accessed January 29, 2019.
28. American College of Radiology. ACR Practice Parameter for Performing and Interpreting Diagnostic Computed Tomography (CT). Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CT-Perf-Interpret.pdf. Accessed January 29, 2019.
29. Bankier AA, Fleischmann D, Mallek R, et al. Bronchial wall thickness: appropriate window settings for thin-section CT and radiologic-anatomic correlation. Radiology 1996;199:831-6.
30. Mayo JR. CT evaluation of diffuse infiltrative lung disease: dose considerations and optimal technique. Journal of thoracic imaging 2009;24:252-9.
31. Christe A, Charimo-Torrente J, Roychoudhury K, Vock P, Roos JE. Accuracy of low-dose computed tomography (CT) for detecting and characterizing the most common CT-patterns of pulmonary disease. European journal of radiology 2013;82:e142-50.
32. American College of Radiology. ACR–AAPM–SPR Practice Parameter for Diagnostic Reference Levels and Achievable Doses in Medical X-Ray Imaging. Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Diag-Ref-Levels.pdf?la=en. Accessed September 11, 2019.
33. Pontana F, Billard A-S, Duhamel A, et al. Effect of Iterative Reconstruction on the Detection of Systemic Sclerosis–related Interstitial Lung Disease: Clinical Experience in 55 Patients. Radiology 2016;279:297-305.
34. Winslow J, Zhang Y, Samei E. A method for characterizing and matching CT image quality across CT scanners

from different manufacturers. Medical Physics 2017;44:5705-17.
35. American College of Radiology. ACR-SCBT-MR-SPR Practice Parameter for the Performance of Thoracic Computed Tomography. Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CT-Thoracic.pdf. Accessed January 29, 2019.
36. American College of Radiology. ACR Practice Parameter for Communication of Diagnostic Imaging Findings. Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CommunicationDiag.pdf. Accessed April 1, 2019.
37. Hansell DM, Bankier AA, MacMahon H, McLoud TC, Muller NL, Remy J. Fleischner Society: glossary of terms for thoracic imaging. Radiology 2008;246:697-722.
38. American College of Radiology. ACR–AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Computed Tomography (CT) Equipment. Available at: https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CT-Equip.pdf. Accessed April 1, 2019.

*Practice parameters and technical standards are published annually with an effective date of October 1 in the year in which amended, revised, or approved by the ACR Council. For practice parameters and technical standards published before 1999, the effective date was January 1 following the year in which the practice parameter or technical standard was amended, revised, or approved by the ACR Council.

Development Chronology for this Practice Parameter

2000 (Resolution 10)

Revised 2005 (Resolution 28)

Amended 2006 (Resolution 17, 35)

Revised 2010 (Resolution 43)

Amended 2014 (Resolution 39)

Revised 2015 (Resolution 17)

Revised 2020 (Resolution 33)

Amended 2023 (Resolution 2c, 2d)