CHEST

Interventional Pulmonology Fellowship Accreditation Standards

Executive Summary of the Multisociety Interventional Pulmonology Fellowship Accreditation Committee

John J. Mullon, MD, FCCP; Kristin M. Burkart, MD, FCCP; Gerard Silvestri, MD, FCCP; D. Kyle Hogarth, MD, FCCP; Francisco Almeida, MD, FCCP; David Berkowitz, MD; George A. Eapen, MBBS, FCCP; David Feller-Kopman, MD, FCCP; Henry E. Fessler, MD, FCCP; Erik Folch, MD; Colin Gillespie, MD; Andrew Haas, MD, FCCP; Shaheen U. Islam, MBBS, MPH, FCCP; Carla Lamb, MD, FCCP; Stephanie M. Levine, MD, FCCP; Adnan Majid, MD, FCCP; Fabien Maldonado, MD, FCCP; Ali I. Musani, MD, FCCP; Craig Piquette, MD, FCCP; Cynthia Ray, MD, FCCP; Chakravarthy B. Reddy, MBBS, FCCP; Otis Rickman, DO, FCCP; Michael Simoff, MD, FCCP; Momen M. Wahidi, MD, FCCP; and Hans Lee, MD, FCCP

Interventional pulmonology (IP) is a rapidly evolving subspecialty of pulmonary medicine. In the last 10 years, formal IP fellowships have increased substantially in number from five to now > 30. The vast majority of IP fellowship trainees are selected through the National Resident Matching Program, and validated in-service and certification examinations for IP exist. Practice standards and training guidelines for IP fellowship programs have been published; however, considerable variability in the environment, curriculum, and experience offered by the various fellowship programs remains, and there is currently no formal accreditation process in place to standardize IP fellowship training. Recognizing the need for more uniform training across the various fellowship programs, a multisociety accreditation committee was formed with the intent to establish common accreditation standards for all IP fellowship programs in the United States. This article provides a summary of those standards and can serve as an accreditation template for training programs and their offices of graduate medical education as they move through the accreditation process.

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ABBREVIATIONS: AABIP = American Association for Bronchology and Interventional Pulmonology; ABIM = American Board of Internal Medicine; ACGME = Accreditation Council for Graduate Medical Education; AIPPD = Association of Interventional Pulmonary Program Directors; APCCMPD = Association of Pulmonary and Critical Care Medicine Program Directors; ATS = American Thoracic Society; CHEST = American College of Chest Physicians; IP = interventional pulmonology; KCF = key clinical faculty

AFFILIATIONS: From the Mayo Clinic (Dr Mullon), Rochester, MN; Columbia University Medical Center (Dr Burkart), New York, NY; Medical University of South Carolina (Dr Silvestri), Charleston, SC; University of Chicago Medical Center (Dr Hogarth), Chicago, IL; Cleveland Clinic Foundation (Dr Almeida), Cleveland, OH; Emory University (Dr Berkowitz), Atlanta, GA; University of Texas MD Anderson Cancer Center (Mr Eapen), Houston, TX; Johns Hopkins University (Drs Feller-Kopman, Fessler, and Lee), Baltimore, MD; Massachusetts General Hospital (Dr Folch), Harvard Medical School, Boston, MA; Northwestern University (Dr Gillespie), Evanston, IL; University of Pennsylvania (Dr Haas), Philadelphia, PA; The Ohio State University (Mr Islam), Columbus, OH; Lahey Hospital and Medical Center (Dr Lamb), Burlington, MA; University of Texas Health Science Center-San Antonio (Dr Levine), San Antonio, TX; Beth Israel Deaconess Medical Center (Dr Majid), Boston, MA; Vanderbilt University (Drs Maldonado and Rickman), Nashville, TN; Medical University of Wisconsin (Dr Musani), Milwaukee, WI; University of Nebraska (Dr Piquette), Omaha, NE; Henry Ford Hospital (Drs Simoff and Ray), Detroit, MI; University of Utah (Mr Reddy), Salt Lake City, UT; and Duke University (Dr Wahidi), Durham, NC.

CORRESPONDENCE TO: John J. Mullon, MD, FCCP, Division of Pulmonary and Critical Care Medicine, Mayo Clinic, Gonda Building 18S, 200 First St SW, Rochester, MN 55905; e-mail: mullon.john@mayo.edu

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Interventional pulmonology (IP) is a rapidly evolving subspecialty of pulmonary medicine. IP focuses on the evaluation and management of thoracic diseases primarily involving the airways, lung parenchyma, and pleural space, while emphasizing minimally invasive diagnostic and therapeutic procedures. Although IP techniques such as rigid bronchoscopy and pleuroscopy have been practiced for more than a century, the last 20 years have seen a rapid and marked growth in available IP techniques and equipment. During this same time, professional organizations in both North America and Europe have recognized the unique skill set germane to IP and have taken steps to further define its indications, desired outcomes, and training requirements.[1,2] Survey data indicate that pulmonary procedures and the management of complex pleural and airway diseases are not uniformly emphasized in contemporary pulmonary medicine training[3,4]; however, other studies confirm that the knowledge and skill to practice IP are measurably enhanced by additional, concentrated training and mentorship beyond that offered within a standard pulmonary medicine curriculum.[5]

As a result, there has been rapid growth of dedicated 12-month IP fellowship training programs intended to solidify advanced pulmonary procedural knowledge and skill and to prepare trainees to become leaders in pulmonary procedural practice, education, and research. In 2007, five dedicated IP fellowship programs existed; in the last 8 years, that number has grown to > 30 such programs in the United States and Canada. To help facilitate quality training, the Association of Interventional Pulmonology Program Directors (AIPPD) was established in 2010, and now the majority of IP fellowship programs select their trainees through the National Resident Matching Program.[6] Validated IP in-service and board certification examinations also now exist, with > 180 interventional pulmonologists across the United States and Canada certified by the American Association for Bronchology and Interventional Pulmonology (AABIP).[5] A survey of graduates found that 89% of IP fellowship graduates work directly in IP, with most (75%) holding academic appointments.[7]

Despite practice guidelines outlining the desired objectives, structure, and curriculum of IP fellowship programs, there is still considerable variability between IP training programs,[8,9] and to date, there has been no recognized fellowship accreditation process. To address this situation, the AABIP and the AIPPD established the Joint Interventional Pulmonology Fellowship Accreditation Committee with the mandate to construct a uniform accreditation standard for IP fellowship programs in the United States. This standard has now been reviewed and edited and was approved in June 2016 by the AABIP and AIPPD as well as by the American College of Chest Physicians (CHEST), the American Thoracic Society (ATS), and the Association of Pulmonary and Critical Care Medicine Program Directors (APCCMPD). It is published in full (e-Appendix 1, www.aabronchology.org, www.aippd.org), and the present article serves as an executive summary.

It is important to note that the accreditation standard as summarized here or in its full length is intended solely for the standardization of IP fellowship programs within the United States, with the intent to ensure that all IP fellowship training programs have the resources, expertise, facilities, curriculum, and caseload for adequate training. It is not intended to limit the current or future practice of pulmonologists who have not participated in IP fellowship training, nor is it intended to limit patient access to necessary procedures in the absence of a fellowship-trained interventional pulmonologist should those procedures be available through another competent provider. As such, the accreditation standard is intended to have no bearing on current or future reimbursement schedules for the procedures outlined, nor is it to be used in any way to limit reimbursement to physicians credentialed to perform those procedures even in the absence of formal IP fellowship training.

Methods

In 2014, the AABIP and AIPPD created a committee with the mandate to establish accreditation standards for IP fellowship programs in the United States. The initial framework of the accreditation document was constructed by using existing Accreditation Council for Graduate Medical Education (ACGME) accreditation standards for medicine subspecialty fellowships, anesthesia, and thoracic surgery. This also included but was not limited to examining educational standards, faculty/institution requirements, fellowship appointment, and evaluations. Deliberation and voting were conducted by using Delphi methods. The draft accreditation standard was reviewed and

revised by the CHEST, ATS, and APCCMPD; input was also received from the CHEST Training and Transitions Committee and the Interventional Chest/Diagnostic Procedures NetWork Steering Committee. The final multisociety accreditation standard was approved in June 2016 by the AABIP, CHEST, AIPPD, APCCMPD, and ATS.

Results

The training and practice of IP build on the fundamental knowledge and procedural skill acquired during pulmonary and critical care medicine training, and encompass both cognitive and psychomotor domains. The final document outlines the minimum requirements for accreditation of a fellowship program and is intended to ensure that all accredited programs have adequate resources, facilities, expertise, curriculum, and procedural volumes with which to train a fellow in IP. The standard, as a whole or in part, is not intended to ascribe any specific level of competence to the individual IP fellowship graduate or other practitioners but rather to ensure the existence of an environment in which competence can be achieved. The determination of competence to practice independently as an interventional pulmonologist remains the responsibility of the IP fellowship program director and faculty, IP board certification process, and institutional credentialing committees. The following is a summary of program attributes needed to satisfy accreditation requirements. The attributes outlined here represent the consensus of all five contributing societies. The actual accreditation process and adjudication to include the decision to grant full accreditation, accreditation with warning, or withhold accreditation entirely will be the responsibility of the AABIP and AIPPD via a Joint Accreditation Committee.

Duration of Training

All accredited IP fellowship programs must be no less than 12 months in duration. The 12-month curriculum must include ample instruction in the practice of IP, associated clinical specialties such as thoracic surgery and otolaryngology, and research. At a minimum, 9 months must be devoted to direct IP clinical training.

Sponsoring Institution and Participating Sites

The sponsoring institution is the primary clinical site of the IP fellowship program and must also sponsor or be a participating site for an ACGME-accredited pulmonary or pulmonary and critical care medicine fellowship program. The sponsoring institution is responsible for providing the personnel and other resources necessary for the administrative functioning of the fellowship and is required to support no less than 10% of the program director's salary or equivalent protected time. The sponsoring institution assumes ultimate responsibility for the fellowship program, which includes responsibility for the resourcing, conduct, function, and curriculum of fellow assignments at all participating sites. As such, the sponsoring institution is responsible for adequate work and call facilities for fellows, electronic medical records, electronic medical literature databases and library facilities, and adequate clinical support services such as diagnostic radiology, critical care services, and pathology.

Participating sites are facilities separate from the sponsoring institution where fellows may receive portions of their clinical experience. All participating sites function within the confines of a program letter of agreement with the sponsoring institution that clearly outlines the educational and supervisory responsibilities as well as the content of the educational experience.

Fellowship Program Director, Key Clinical Faculty, and Faculty

Each accredited IP fellowship is required to have a single fellowship program director appointed by the sponsoring institution's Graduate Medical Education Committee. Program directors must be board-certified in IP and must have served as faculty within an ACGME-accredited pulmonary or pulmonary and critical care fellowship for at least 5 years before assuming the position of program director. The program director has overall responsibility for the curricular and administrative structure and function of the fellowship and must devote a minimum of 50% of his or her clinical, research, administrative, and/or educational effort to the practice of IP.

In addition to the program director, each IP fellowship program must have a minimum of one key clinical faculty (KCF) at the sponsoring institution for fellowships selecting up to two fellows per academic year. If more than two fellows are selected per academic year, additional KCFs are then required to satisfy at least one KCF per every 1.5 fellows. In addition, for programs with fellows rotating both at the sponsoring institution and at participating sites, a KCF is required for each participating site. KCFs are practicing IP

attending physicians who devote additional time and effort to the IP fellowship in the form of planning, implementation, monitoring, and evaluation of the fellows' clinical and research education. They are required to be board-certified in IP and devote a minimum of 33% of their clinical, administrative, research, and/or educational time to IP. In addition, KCFs are expected to act as and on behalf of the program director in the event of an unexpected prolonged absence of the program director.

In addition to the program director and KCFs, every IP fellowship is required to have a sufficient number of faculty to instruct and supervise all fellows in IP as well as in associated specialties. These physicians are required to maintain board certification within their primary subspecialty and are not required to obtain board certification in IP. As faculty, these physicians have regular contact with the IP fellows and are actively engaged in the instruction, supervision, and evaluation of trainees.

Fellow Appointments

Each selected fellow must first successfully complete an ACGME-accredited pulmonary or pulmonary/critical care fellowship program, or a Royal College of Physicians and Surgeons of Canada-accredited pulmonary or pulmonary/critical care fellowship program. The program's educational resources must be sufficient to support adequate patient and procedural exposure for each of the fellows appointed to the program.

Educational Program

IP involves the care of patients with both nonmalignant and malignant airway, pleural, mediastinal, and parenchymal lung diseases. Accredited training programs in IP must provide a broad exposure to patients experiencing both malignant and nonmalignant diseases of the thorax. Fellows must participate in weekly clinical case conferences, journal clubs, research conferences, and morbidity and mortality or quality improvement conferences. Fellows must also attend an outpatient clinic to provide pre-procedural evaluation and follow-up care for patients. A minimum of 44 half-day clinics must be completed during a 12-month fellowship. Each program must also provide an opportunity for fellows to participate in research or other scholarly activities. The program director and fellowship program must administer and maintain an educational environment conducive to educating the fellows in each of the ACGME competency areas as they pertain to the practice of IP. ACGME competency areas include medical knowledge, patient care, communication and interpersonal skills, professionalism, practice-based learning and improvement, and systems-based practice.

Medical Knowledge

Fellows must demonstrate in-depth knowledge of IP-related disease processes as well as established and evolving biomedical, clinical, epidemiologic, and social-behavioral sciences and demonstrate the ability to apply this knowledge to patient care. A didactic lecture series is required with a minimum of once monthly lectures delivered by faculty. Although not exhaustive, Table 1 illustrates the current disease and practice-specific topics required within the fellowship core curriculum. This list reflects the knowledge base currently expected of a practicing interventional pulmonologist and represents the core topics tested on the IP board certification examination. The topics listed are subject to change as the practice of IP evolves.

Patient Care

Fundamentally, IP is a procedural specialty, and fellows must be able to competently perform all medical, diagnostic, and surgical procedures considered essential for the practice of IP. The program director is responsible for determining fellow procedural competence based on a combination of case presentations and procedural planning, direct procedural observation, faculty evaluations, outcomes and complications tracking, and procedural exposure accumulated during previous training. When available, validated assessment tools should be further utilized and documented in assessing procedural competence. Procedural simulation using cadaveric, animal, and/or manufactured simulation models is required. To maintain staff and faculty expertise and adequate fellow exposure to relevant patient factors and complications, minimum institutional procedural volumes (not individual fellow procedural volumes) are required to accredit IP fellowship programs (Table 2). Although all procedures listed are considered core IP procedures, competence in some of these procedures may be acquired during a prior pulmonary or pulmonary and critical care medicine fellowship.

Specific required procedural numbers were selected based on published expert opinion and IP fellowship

TABLE 1] Disease- and Practice-Specific Core Curriculum Topics

Scientific method and evidence-based decision-making, to include:
Study design
Research ethics
Medical biostatistics
Anatomic, physiologic, and physical properties as they pertain to IP, to include:
Tracheal, bronchial, vascular, lymphatic, pulmonary, and cardiac anatomy, physiology, and pathophysiology
Pathophysiology of central airway obstruction
Wound healing and host factor responses to injury
Properties of endobronchial thermal and ablative treatment technologies, to include:
I. Laser therapy (eg, Nd:YAG, KTP, CO_2, YAP)
II. Electrocautery
III. Argon plasma coagulation
IV. Cryotherapy
V. Photodynamic therapy
Principles and physical properties of airway stents
Principles of advanced airway, mediastinal, and lung parenchymal imaging enhancement techniques, to include:
I. Autofluorescence
II. Narrow band imaging
III. Confocal bronchoscopy
IV. Optical coherence tomography
V. Endoscopic radial and convex ultrasound
VI. Transthoracic ultrasound
VII. CT scan
VIII. MRI scan
IX. PET scan
Pathophysiology and natural history of tracheal stenosis, tracheobronchomalacia, and excessive dynamic airway collapse
Diagnosis, staging, and natural history of thoracic malignancies, to include but not limited to:
I. Lung cancer
II. Malignant mesothelioma
III. Thymoma
Basic principles of radiotherapy to include brachytherapy
Basic principles of chemotherapy as they apply to thoracic malignancies
Administering, monitoring, and managing moderate sedation
Prevention, evaluation, and management of patients with specific disease entities pertinent to the practice of IP, including:
Malignant airway obstruction, secondary to:
I. Intrinsic/endoluminal tumor
II. Extrinsic/extraluminal compression by tumor
III. Mixed intrinsic and extrinsic obstructing tumor
Nonmalignant airway obstruction secondary to, but not limited to:
I. Foreign body
II. Vocal cord disorders
III. Granulomatosis with polyangiitis
IV. Postintubation/tracheostomy
V. TB
VI. Sarcoidosis

(Continued)

TABLE 1] *(Continued)*

VII. Amyloidosis
VIII. Respiratory papillomatosis
IX. Broncholithiasis
X. Tracheal/bronchial malacia/excessive dynamic airway collapse (relapsing polychondritis, Mounier-Kuhn syndrome)
XI. Airway complications following airway surgery/lung transplant to include anastomotic strictures/granulation
XII. Airway stent-associated granulation tissue
XIII. Extrinsic compression from, for example, goiter, mediastinal cyst, lymphadenopathy
Loss of airway integrity secondary to, but not limited to:
I. Anastomotic dehiscence
II. Tracheo/bronchial-esophageal fistula
III. Bronchopleural/alveolar-pleural fistula
Premalignant and early-stage malignant airway disease
The guidelines, principles, and practice of thoracic malignancy screening
Undiagnosed mediastinal and hilar lymphadenopathy
Massive hemoptysis
Solitary pulmonary nodules
Evaluation, diagnosis, and management of pleural disease, to include:
I. Malignant pleural effusion
II. Recurrent nonmalignant pleural effusion and pleuritis
III. Pneumothorax
IV. Pleural space infection
V. The undiagnosed pleural effusion
VI. Chylothorax
VII. Hepatic hydrothorax/effusions due to refractory congestive heart failure
Prevention and management of mechanical complications of interventional pulmonary procedures, which may include
Simple and tension pneumothorax, hemothorax
Airway disruption, perforation, tear
Massive hemoptysis
Refractory hypoxia/respiratory failure
Injury to adjacent organs (eg, esophageal perforation during percutaneous dilational tracheostomy placement)
Airway fire
Secondary tracheal stenosis (posttracheostomy)
Secondary bronchial/tracheal strictures from laser/electrocautery/mechanical trauma/anastomotic complications
Safety, administrative, and business aspects pertinent to the practice of IP, to include
Procedural quality control management
Equipment maintenance and procedural suite design
Occupational Safety and Health Administration regulations and policies
Infection control policies and procedures
Radiation physics, biology, and safety related to the use of radiograph imaging equipment
Laser physics and safety

These requirements assume basic disease-specific knowledge of general pulmonary and critical care training as a baseline. Required items are subject to change as the practice of interventional pulmonology (IP) evolves. KTP = potassium titanyl phosphate.

program self-reporting in an effort to structure a fellowship experience that is robust and meets the needs of trainees while simultaneously setting a standard that is achievable.[1,2,9] There is no expectation that individual fellows need to meet or exceed those institutional procedural volumes for any single procedure, nor do those volumes represent metrics for an individual's competency for any given procedure. Where designated, procedures must be performed by or under the direction of designated fellowship faculty.

TABLE 2] Minimum Institutional Volumes Necessary for Accreditation of an IP Fellowship Program

Procedure Type	Requisite Annual Institutional Case Volume
Demonstration of competence is mandatory for IP fellows	
Rigid bronchoscopy	50
Endobronchial stenting	20
Thoracoscopy	20
Bronchoscopic navigation	20
Endobronchial ablation	50
Endobronchial ultrasound	100
Image-guided thoracostomy tube placement	20
Tunneled pleural catheter placement	20
Training to competence may be offered during IP fellowship[a]	
Percutaneous dilational tracheostomy	20
Percutaneous endoscopic gastrostomy	20
Bronchial thermoplasty	6
Endobronchial management of bronchopleural fistula	5
Endoscopic ultrasound	30
Transtracheal oxygen catheter	5
Image-guided percutaneous needle biopsy	5

[a]If graduates are to be certified as competent in these procedures during interventional pulmonology (IP) training, the minimum institutional volumes must be available to assure sufficient opportunity for hands-on training.

Communication and Interpersonal Skills, Professionalism, Practice-based Learning and Improvement, and Systems-based Practice

During the course of their fellowship, all trainees are required to behave professionally, and all training programs are required to establish a system of remediation to address lapses in professional behavior. All programs are required to establish and maintain curriculum that instructs and evaluates the fellows' ability to communicate effectively and emphasizes practice-based learning and systems-based practice.

Program Administration

Every program is required to establish a Clinical Competency Committee and Program Evaluation Committee whose responsibilities include assessing fellow competency and monitoring program, faculty, and curriculum quality. All accredited programs must adhere to published ACGME duty hour requirements.

Discussion

The medical profession in the United States has the responsibility for self-regulation. Two primary mechanisms are used to ensure patient safety, as well as quality and uniformity of care. First, accreditation standards define the training, skills, knowledge, and competencies specific to a medical specialty or subspecialty. Second, certification boards administer independent assessments of individual practitioner knowledge and skill within that specialty or subspecialty. Since 2014, the AABIP has conducted an IP board certification examination with a dual track eligibility process that permits both IP fellowship graduates and practicing interventional pulmonologists to qualify for the examination. Beginning in 2017, only IP fellowship graduates will be eligible for board certification, with an estimated 30 to 40 new matriculates per year depending on the number of accredited fellowships.

Even as the number of IP fellowships grows each year, a uniform accreditation standard outlining the required curriculum and fellowship environment has not existed. This document summarizes just such a standard with the full accreditation standard available online at the AABIP and AIPPD websites and in e-Appendix 1 and e-Table. The standard has been constructed by using existing literature and guidelines and through a formal process with representation from the major professional organizations representing IP and pulmonary medicine in the United States. The intent of this multiyear and multisociety endeavor is to more specifically define the training of IP practitioners in the United States and thereby better assure quality of care and standardization of the IP skill set. A formal accreditation process will further safeguard the expectations of fellowship applicants, patients, and potential employers.

It should be clearly stated that the goal of this accreditation standard was not to exclude fellowship programs but to raise the quality of all programs to a common level of excellence, and it is the stated intent of the AABIP and AIPPD to make every effort to assist programs in their pursuit of accreditation. Furthermore, because IP is an evolving subspecialty of pulmonary medicine, there remain many pulmonary practitioners who perform various procedures and techniques outlined in this standard as core IP procedures. The intent is in no way to limit the practice of or access to

these practitioners, redefine or limit the future training of pulmonary or pulmonary and critical care fellows, nor to have any bearing on current or future reimbursement for the procedures outlined herein.

Future Steps

This accreditation standard is the product of a joint multisociety effort. The document and standard itself will, by design, evolve as the practice of IP evolves. Any additions, deletions, or edits to the current accreditation standard will likewise be the action of a joint multisociety effort. The actual process of accreditation, however, will remain the responsibility of the AABIP and AIPPD via the assessments and recommendations of a Joint Fellowship Accreditation Committee.

There are still challenges facing this field, which is in its infancy. Within academic circles, it is unclear how practitioners of IP hired with the expectation of carrying a heavy clinical load can advance in the traditional academic setting. Furthermore, because IP training programs are structured largely based on providing fellows with a clinical exposure and limited dedicated research time, it is unclear how they will develop the research skills to elevate the profession and prepare a portion of those interested in pursuing an academic career. Some programs have already recognized this concern and have instituted a second year of fellowship training to incorporate a more robust research exposure into the IP fellowship.

Priority must be given to research regarding competency to perform the procedures germane to this field. Traditional metrics such as individual procedural volume have largely been opinion-based and do not account for the intangibles such as an understanding of the indications, contraindications, risks and benefits to the patient, and alternative treatment options. In addition, there is variation in learners' psychomotor coordination such that reaching a target volume for some will not ensure competency while others may master that same procedure much more efficiently. Finally, how new procedures will be introduced into the field has largely been a haphazard exercise. New technologies may be costly, can incur patient risk, and at times do not contribute meaningfully to patient care. IP practitioners must take a leadership role in the evaluation of new technologies and the incorporation of new technology, when appropriate, into the pulmonary practitioner's armamentarium.

However, standardizing fellowship training requirements so that there is uniform training in IP is an important first step in the continuing evolution of this specialty within a specialty. This document should be considered a starting point that will evolve over time and result in better training for practitioners and better care for the patients.

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Additional information: The e-Appendix and e-Table can be found in the Supplemental Materials section of the online article.

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