Multisociety Task Force Recommendations of Competencies in Pulmonary and Critical Care Medicine

John D. Buckley[1], Doreen J. Addrizzo-Harris[2], Alison S. Clay[3], J. Randall Curtis[4], Robert M. Kotloff[5], Scott M. Lorin[6], Susan Murin[7], Curtis N. Sessler[8], Paul L. Rogers[9], Mark J. Rosen[10], Antoinette Spevetz[11], Talmadge E. King, Jr.[12], Atul Malhotra[13], and Polly E. Parsons[14]

[1]Henry Ford Hospital, Indiana University School of Medicine, Indianapolis, Indiana; [2]New York University School of Medicine, New York; [3]Departments of Medicine and Surgery, Duke University, Durham, North Carolina; [4]Division of Pulmonary and Critical Care, University of Washington, Seattle, Washington; [5]University of Pennsylvania, Philadelphia, Pennsylvania; [6]Mount Sinai School of Medicine, New York; [7]University of California at Davis, Davis, California; [8]Virginia Commonwealth University Health System Medical College of Virginia Physicians and Hospitals, Richmond, Virginia; [9]University of Pittsburgh, Pittsburgh, Pennsylvania; [10]North Shore University Hospital and Long Island Jewish Health System, Long Island, New York; [11]Cooper University Hospital, Camden, New Jersey; [12]University of California at San Francisco, San Francisco, California; [13]Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts; and [14]University of Vermont School of Medicine, Burlington, Vermont

Rationale: **Numerous accrediting organizations are calling for competency-based medical education that would help define specific specialties and serve as a foundation for ongoing assessment throughout a practitioner's career. Pulmonary Medicine and Critical Care Medicine are two distinct subspecialties, yet many individual physicians have expertise in both because of overlapping content. Establishing specific competencies for these subspecialties identifies educational goals for trainees and guides practitioners through their lifelong learning.**

Objectives: **To define specific competencies for graduates of fellowships in Pulmonary Medicine and Internal Medicine-based Critical Care.**

Methods: **A Task Force composed of representatives from key stakeholder societies convened to identify and define specific competencies for both disciplines. Beginning with a detailed list of existing competencies from diverse sources, the Task Force categorized each item into one of six core competency headings. Each individual item was reviewed by committee members individually, in group meetings, and conference calls. Nominal group methods were used for most items to retain the views and opinions of the minority perspective. Controversial items underwent additional whole group discussions with iterative modified-Delphi techniques. Consensus was ultimately determined by a simple majority vote.**

Measurements and Main Results: **The Task Force identified and defined 327 specific competencies for Internal Medicine-based Critical Care and 276 for Pulmonary Medicine, each with a designation as either: (*1*) relevant, but competency is not essential or (*2*) competency essential to the specialty.**

Conclusions: **Specific competencies in Pulmonary and Critical Care Medicine can be identified and defined using a multisociety collaborative approach. These recommendations serve as a starting point and set the stage for future modification to facilitate maximum quality of care as the specialties evolve.**

Keywords: clinical competence fellowships and scholarships education; professional curriculum

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Correspondence and requests for reprints should be addressed to John D. Buckley, M.D., M.P.H., Indiana University School of Medicine, Emerson Hall 317, 545 Barnhill Drive, Indianapolis, IN 46220. E-mail: johnbuck@iupui.edu

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BACKGROUND

For nearly 15 years, educational organizations including the Council on Graduate Medical Education, Pew Health Professions Commission, Association of American Medical Colleges, Federated Council of Internal Medicine, Association of Program Directors of Surgery, and Royal College of Physicians and Surgeons of Canada have all called for improvement in the knowledge and skills of specialist physicians (1). With support from the Robert Wood Johnson Foundation, the Accreditation Council for Graduate Medical Education (ACGME) began its development of their six core competencies for residents and fellows (2). Concurrently, the American Board of Medical Specialties had begun developing competencies for practicing physicians. Soon thereafter, these two leading organizations agreed upon six core competencies, setting the stage for an organized continuum of competencies from the training level to lifelong physician development (1).

In his inaugural column in the May 2008 ACGME Bulletin, their new Chief Executive Officer shared the next steps in developing agreement on the specific competencies for each discipline, which they refer to as "Milestones." Following the identification of these competencies, efforts would be directed at implementing common assessment tools to document achievement of the Milestones (3). Based on the Dreyfus model of knowledge development, the ACGME recognizes the *competent* stage of development takes place during residency and fellowship training, and the *proficient* stage occurs early in independent practice (1). As part of their efforts to define the Milestones for individual disciplines, the ACGME is soliciting input from specialty societies and educational communities to define specific Milestones.

However, there are concerns that defined sets of decontextualized specific skills, although tangible and practical, may also fail to measure, or may even interfere with, achieving the greater goal of personal and professional development and socialization into a profession (4). The ACGME acknowledged these concerns, but does not support a minimalist approach to competency assessment, arguing that the professional development of competent or proficient physicians relies on specific and formative feedback on an individual's performance in meaningful competencies. The ACGME's Milestones are intended to be important markers of abilities and are designed to ensure trainees, professional communities, and the public that basic measures of educational processes are achieved (5).

TASK FORCE DEVELOPMENT AND CHARGE

In the fall of 2006, John Heffner, then President of American Thoracic Society, called for a task force to define specific competencies for Pulmonary and Critical Care Medicine. Representatives from the American Board of Internal Medicine (ABIM), American College of Chest Physicians (ACCP), Association of Pulmonary and Critical Care Medicine Program Directors (APCCMPD), American Thoracic Society (ATS), and the Society of Critical Care Medicine (SCCM) convened and were charged with identifying and defining the competencies for Pulmonary Medicine and for Internal Medicine-based Critical Care that trainees should attain during their formal training and that should be retained through lifelong learning during practice. The goal did not encompass developing an entire curriculum inclusive of teaching techniques and assessment methods but focused on identifying educational outcomes based on the ACGME general competencies both for trainees and independent practitioners.

The Task Force approached its charge in two phases. First, it focused on defining specific competencies for Critical Care Medicine. Critical Care Medicine is recognized as distinctly different from Surgical Critical Care and Anesthesia Critical Care by the ACGME and ABIM, although considerable overlap is acknowledged. Second, the Task Force developed specific competencies for Pulmonary Medicine. The Task Force made every effort to align these competencies with the ACGME Milestones that should be achieved by the end of formal fellowship training for internists in Critical Care Medicine or Pulmonary Medicine, with the understanding that individuals trained in combined Pulmonary–Critical Care Medicine programs would meet the competencies for both.

METHODS

Identification of Task Force Members

The Chairperson of the Task Force (P.E.P.) worked with leadership from the ABIM, ACCP, APCCMPD, ATS, and SCCM to identify and include a group of participants with diverse interests in clinical medicine, education, and research, but who were all involved in training fellows in one or both of these disciplines.

Literature Review and Identification of Core Competencies

In December of 2006, a member of the Task Force (J.D.B.) collated into one document the lists of existing competencies from the websites of the ACGME (Pulmonary/Critical Care Medicine Program Requirements) (6), Harmonized Education in Respiratory Medicine for European Specialists (HERMES) (7), Competency-Based Training in Intensive Care Medicine in Europe (CoBaTrICE) (8), the ABIM (Subspecialty in Pulmonary/Critical Care Medicine) (9), and the Alliance for Academic Internal Medicine (AAIM) Education Redesign Task Force draft documents for the "Core" of Internal Medicine (10). Many of the competencies identified by these groups were similar if not identical. Task Force members were encouraged to list additional competencies during several brainstorming sessions. In a systematic manner using a modified Delphi approach (11), each specific competency was categorized into one of the six core competency headings outlined by the ACGME. These core competencies are:

1. Communication and Interpersonal Skills
2. Medical Knowledge
3. Patient Care
4. Practice-based Learning and Improvement
5. Professionalism
6. Systems-based Practice

When specific competencies could fit under multiple core competency headings, they were assigned to the single most appropriate core competency to minimize redundancy. Competencies mandated by the ABIM and ACGME (released in 2006) were marked with an asterisk to guide the Task Force by acknowledging current training requirements in the United States. The compilation was entered into a database and submitted to the Task Force for review.

Task Force Review Process

The Task Force worked via conference calls, e-mail exchanges, and in person on multiple occasions during 2007 and 2008. While developing this document, the Task Force considered the unintended consequences of these recommendations including their use by credentialing and certifying organizations that could impact current training program requirements, maintenance of certification, medical licensing, and hospital credentialing.

There was early emphasis on acknowledging that the competencies in Pulmonary Medicine and Critical Care Medicine overlapped, but that there were distinct differences. With approximately 90% of Critical Care physicians in the United States having backgrounds in Internal Medicine (12), the Task Force focused on Internal Medicine-based Critical Care Medicine. Future efforts will identify explicit commonalities and differences that may exist between Critical Care Medicine physicians and those Critical Care physicians who enter practice from training pathways in Surgery and Anesthesiology.

The initial compilation from the process outlined above was used as a starting point for developing a final, multisociety summary of specific competencies for both Critical Care Medicine and Pulmonary Medicine. Modifications, additions, and deletions were conducted using several techniques:

1. Individual member review of each item in the initial compilation;
2. Brainstorming at in-person meetings and by conference call;
3. Nominal group methods for most items to retain the view and opinions of the minority perspective;
4. Whole group discussions and voting on controversial dichotomous issues with decisions determined by a simple majority vote;
5. Iterative, modified Delphi techniques including distribution of the competencies a minimum of three times to achieve consensus on the final list of competencies.

Each item in the document was scored individually using the following classification system based on the CoBaTrICE model (8):

0: No additional knowledge and experience beyond that obtained in Internal Medicine training OR not relevant to the discipline being considered (Critical Care Medicine or Pulmonary Medicine).

1: Knowledge/behavior/procedural skill relevant to the practice of the discipline but primary expertise/proficiency is within the purview of another specialty such that consultation or further in-depth literature review is typically required;

2: Knowledge/behavior/procedural skill fundamental to the practice of the discipline. Expertise/proficiency in this area is expected.

Finally, the competencies and scoring were distributed to the executive leadership of the ACCP, APCCMPD, ATS, and SCCM for review and feedback. This step served to obtain official approval from each organization and was a final step in validation of the results of the Task Force results.

TABLE 1. NUMBERS OF RECOMMENDED SPECIFIC COMPETENCIES

	Number of Specific Competencies	
Core Competency Heading	Critical Care Medicine	Pulmonary Medicine
Communication and Interpersonal Skills	16	16
Medical Knowledge	182	136
Patient Care	81	78
Practice-based Learning and Improvement	11	10
Professionalism	16	18
Systems-based Practice	21	18
Total	327	276

TABLE 2. EXAMPLES OF SPECIFIC COMPETENCIES IN MEDICAL KNOWLEDGE FOR CRITICAL CARE MEDICINE (PANEL A) AND PULMONARY MEDICINE (PANEL B)

PANEL A: CRITICAL CARE MEDICINE	Task Force SCORE
Evaluation and management of common respiratory signs and symptoms including dyspnea, cough, chest pain, wheezing, and hemoptysis	1.0
Respiratory diseases focusing on developmental predispositions and general pathophysiology	1.0
Respiratory diseases including management principles	
Pulmonary manifestations of systemic diseases including collagen vascular disease and diseases that are primary in other organs	1.0
Obstructive lung diseases:	
Asthma	1.0
Bronchitis	1.0
Emphysema	1.0
Bronchiolitis	1.0
Bronchiectasis	1.0
Respiratory failure due to obstructive lung disease	2.0
Diseases of the upper airway	
Structural defect of the airway including stenosis, malacia, tracheal tear, and fistula	2.0
Upper airway obstruction	2.0
Vocal cord dysfunction	1.0
Gastro-esophageal reflux disease	1.0
Pulmonary malignancy (primary and metastatic)	
Lung cancer	1.0
Mediastinal and chest wall tumors	
Paraneoplastic syndromes	2.0
Pulmonary infections	
Respiratory failure due to infections	2.0
Upper respiratory tract infections	1.0
Viral lower respiratory tract infections	2.0
Community-acquired and health-care associated pneumonias	2.0
Parapneumonic effusions and empyema	2.0
Lung abscess	1.0
Epidemic lung infections (e.g., influenza, SARS, avian influenza, anthrax)	2.0
Tuberculosis including latent, active, pulmonary, extra-pulmonary	1.0
Nontuberculous mycobacterial disease	1.0
Fungal	1.0
In the immunocompromised host	1.0
PANEL B: PULMONARY MEDICINE	
Evaluation and management of common respiratory signs and symptoms including dyspnea, cough, chest pain, wheezing, and hemoptysis	2.0
Respiratory diseases focusing on developmental predispositions and general pathophysiology	
Developmental biology	1.0
Biochemistry and physiology, including cell and molecular biology, and immunology, as they relate to pulmonary diseases	2.0
Genetics and molecular biology as they relate to pulmonary diseases	2.0
Pulmonary manifestations of systemic diseases, including collagen vascular disease and diseases that are primary in other organs	2.0
Genetic and developmental disorders of the respiratory system, including cystic fibrosis	2.0
Histopathologic patterns of respiratory inflammation and malignancy	2.0
Respiratory diseases including management principles	
Pulmonary manifestations of systemic diseases including collagen vascular disease and diseases that are primary in other organs	2.0
Obstructive lung diseases:	
Asthma	2.0
Bronchitis	2.0
Emphysema	2.0
Bronchiolitis	2.0
Bronchiectasis	2.0
Respiratory failure due to obstructive lung disease	2.0
Diseases of the upper airway	
Structural defect of the airway including stenosis, malacia, tracheal tear, and fistula	2.0
Upper airway disease	2.0
Vocal cord dysfunction	2.0
Gastroesophageal reflux disease	2.0
Pulmonary malignancy (primary and metastatic)	
Lung cancer	2.0
Metastatic cancer to the respiratory system	2.0
Mesothelioma	2.0
Benign respiratory tumors	2.0
Mediastinal and chest wall tumors	2.0
Paraneoplastic syndromes	2.0

(*Continued*)

TABLE 2. (CONTINUED)

PANEL B: PULMONARY MEDICINE (CONTINUED)	Task Force SCORE
Pulmonary infections	
Respiratory failure due to infections	2.0
Upper and lower respiratory tract infections	2.0
Viral lower respiratory tract infections	2.0
Community-acquired and healthcare–associated pneumonias	2.0
Parapneumonic effusions and empyema	2.0
Lung abscess	2.0
Epidemic lung infections (e.g., influenza, SARS, avian influenza, anthrax)	2.0
Tuberculosis including latent, active, pulmonary, extrapulmonary	2.0
Nontuberculous mycobacterial disease	2.0
Fungal	2.0
In the immunocompromised host	2.0

RESULTS

The Task Force identified, defined, and categorized 327 specific competencies for Internal Medicine-based Critical Care and 276 specific competencies for Pulmonary Medicine (*see* Table 1). Examples of selected Critical Care Medicine and Pulmonary Medicine specific competencies in medical knowledge and technical procedures (from Patient Care) are shown in Tables 2 and 3, respectively. This Task Force's full consensus recommendations of all specific competencies for Pulmonary Medicine and Critical Care Medicine are listed in Table E1 and Table E2 of the online supplement, respectively, and are also available in updated form on a joint society website at (www.apccmpd.org). Only those competencies that were awarded a final score of one or two are included. Definitions and scoring of the various competencies were not unanimous and reflected the diversity of current practice. However, all members of the task force approved the final competencies. To obtain a score of one or two, training programs should have specific curricula to distinguish this competency from general Internal Medicine. Specific knowledge, skills, and behaviors are included as competencies for Critical Care Medicine, Pulmonary Medicine, or both. The committee limited the competencies to those that reflect current practice rather than future goals. The results represent a consensus effort and should be viewed as live documents that are a starting point. The Task Force expects that these recommendations will evolve with increased input, changing practice patterns, and new scientific and treatment developments. The societies have agreed to ongoing support of a multisociety task force to maintain the competency documents and ensure that they can be reviewed and changed in a timely manner as needed.

Training Programs Dictate the Required Clinical Experiences

During the scoring of the individual competencies it became clear that there is a difference in the philosophy of individual training programs with regard to the required clinical experiences. This is most evident in the "nonmedical" aspects of critical care that are generally outside the purview of Intensivists from Internal Medicine backgrounds, such as the evaluation and management of abdominal compartment syndrome, intracranial hemorrhage, and increased intracranial pressure. Although some members of the committee considered these to be core knowledge (assigned a score of two), others did not (score of one). The origin of these philosophical differences may reside, in part, in the predominant patient population cared for by the Critical Care Medicine physician. Training programs based primarily in medical ICUs may perceive competencies differently than those based in multidisciplinary ICUs (i.e., combined Medical-Surgical ICUs).

Furthermore, several competencies reflect various discipline-specific perspectives of specific diseases. For example, a Pulmonary perspective of asthma may require competency in understanding the mechanisms and pathophysiology of asthma, but a Critical Care Medicine perspective may require a competency in understanding the physiology and management of respiratory failure caused by asthma. Another example would be the diagnosis and management of severe exacerbations of systemic lupus erythematosis (SLE). Whereas the perspectives and competencies for Rheumatology and Critical Care Medicine specialists will differ for SLE, these differences may be appropriate.

Where possible, the competencies were developed side-by-side with the perspective of other disciplines. For example, in deep-water diving injuries, a pulmonary specialist would be expected to screen subjects appropriately and to conduct a risk assessment, but a Critical Care Medicine specialist would be expected to manage the acute illness. Of course, many individual physicians may have training, experience, and competency in both.

Discussion and Future Direction

Leadership in Critical Care Medicine and in Pulmonary Medicine encompasses a broad array of clinical experts, credentialing and certifying organizations, and specialty societies. This multisociety Task Force is an initial, collaborative attempt to identify current, specific competencies in Critical Care Medicine and Pulmonary Medicine in tandem. Since this document was first developed, we have recognized that several items may need to be added, modified, or deleted, underscoring the need for continuous review and revision that reflects the ongoing acquisition of medical knowledge, changing clinical practice, and working knowledge of how to deliver the best possible care to patients.

Defining specific competencies is necessary to ensure effective training of clinicians. As medical schools and residencies outline their own specific competencies, we must coordinate our efforts in developing an efficient continuum of education that transcends formal training. This document represents a consensus recommendation of current, fundamental Critical Care Medicine and Pulmonary Medicine competencies. It is a starting point that will guide future educational goals and professional development. Consensus on the competencies sets the stage for other activities essential to educational development, including:

- Creation of curricula for specific competencies;
- Validating assessment methods;
- Identifying unique milestones for each competency that must be met before moving from one phase of education

TABLE 3. EXAMPLES OF SPECIFIC COMPETENCIES IN PROCEDURAL SKILLS (FROM PATIENT CARE) FOR CRITICAL CARE MEDICINE (PANEL A) AND PULMONARY MEDICINE (PANEL B)

PANEL A: CRITICAL CARE MEDICINE	Task Force SCORE
Interpretation of sputum, bronchopulmonary secretions, and pleural fluid	1.0
Arterial puncture for blood gas determination and arterial catheter placement	2.0
Principles, indications and limitations of pulse oximetry	2.0
Physical principles, indications and limitations of end tidal CO_2 monitoring	2.0
Pulmonary function testing to assess respiratory mechanics and gas exchange, including spirometry, flow volume studies, lung volumes, diffusing capacity	2.0
Arterial blood gas analysis	2.0
Airway management including endotracheal intubation	2.0
Management of the difficult airway	2.0
Modes and principles of mechanical ventilation—invasive and noninvasive	2.0
Modes and principles of oxygen supplementation	2.0
Tracheostomy tube management and decannulation	2.0
Percutaneous tracheostomy	1.0
Emergent cardioversion and defibrillation	2.0
Knowledge of the indications, contraindications, complications, and basic principles of intra-aortic counter pulsation balloon pump	2.0
Knowledge of the indications, contraindications, complications, and basic principles of right and left ventricular assist devices	1.0
Temporary transvenous pacemaker insertion	1.0
Lumbar puncture	2.0
Brain death determination in accordance with local laws and standards	2.0
Knowledge of the indications, contraindications, complications, and basic principles of intracranial pressure monitors	2.0
Manage an established epidural infusion	1.0
Diagnostic and therapeutic thoracentesis	2.0
Chest tube insertion and maintanence of the tube and drainage systems	2.0
Insertion of decompression needle for tension pneumothorax	2.0
Diagnostic and therapeutic paracentesis	2.0
Central venous catheter placement (subclavian, femoral, jugular) with/without ultrasound guidance	2.0
Set-up and operation of hemodynamic and respiratory monitoring systems	2.0
Interpretation of hemodynamic and oxygen delivery and extraction data	2.0
Principles of extracorporeal membrane oxygenation (ECMO)	1.0
Insertion and flotation of pulmonary artery catheter	2.0
Diagnostic bronchoscopy including airway examination and bronchoalveolar lavage	1.0
Therapeutic bronchoscopy through an artificial airway for secretion removal	2.0
Knowledge of wound vacuum management systems	1.0
Principles, indications, and limitations of intraabdominal pressure monitoring	2.0
Understands principles, techniquesand complication of insertion of gastrooesophageal balloon tamponade tube (e.g., Sengstaken-Blakemore)	2.0
Principles and application of therapeutic hypothermia	2.0
Principles and modes of nutritional support	2.0
Imaging techniques commonly employed in the evaluation of patients with critical illness and/or pulmonary disorders	1.0
Basic interpretation of chest radiograph	2.0
Other imaging techniques	1.0
PANEL B: PULMONARY MEDICINE	
Interpretation of sputum, bronchopulmonary secretions, and pleural fluid results	2.0
Interpretation of lung tissue for infectious agents, cytology, and histopathology	2.0
Arterial puncture for blood gas determination and arterial catheter placement	2.0
Principles, indications and limitations of pulse oximetry	2.0
Physical principles, indications and limitations of end tidal CO_2 monitoring	2.0
Pulmonary function testing to assess respiratory mechanics and gas exchange, including spirometry, flow volume studies, lung volumes, diffusing capacity, arterial blood gas analysis, inhalation challenges, and exercise studies	2.0
Arterial blood gas analysis	2.0
Inhalation challenges including methacholine	2.0
Exercise studies	2.0
Airway management including endotracheal intubation	2.0
Management of the difficult airway	2.0
Modes and principles of mechanical ventilation - invasive and non-invasive	2.0
Modes and principles of oxygen supplementation	2.0
Tracheostomy tube management and decannulation	2.0
Percutaneous tracheostomy	1.0
Emergent cardioversion and defibirllation	1.0
Knowledge of the indications, contraindications, complications, and basic principles of intraaortic counter pulsation balloon pump	2.0
Knowledge of the indications, contraindications, complications, and basic principles of right and left ventricular assist devices	1.0
Brain death determination in accordance with local laws and standards	1.0
Diagnostic and therapeutic thoracentesis	2.0
Chest tube insertion and maintanence of the tube and drainage systems	2.0
Insertion of decompression needle for tension pneumothorax	2.0
Diagnostic and therapeutic paracentesis	1.0
Central venous catheter placement (subclavian, femoral, jugular) with/without U.S. guidance	2.0
Set-up and operation of various monitoring systems	2.0
Interpretation of hemodynamic and oxygen delivery and extraction data	2.0

(*Continued*)

TABLE 3. (CONTINUED)

PANEL B: PULMONARY MEDICINE (CONTINUED)	Task Force SCORE
Principles of extracorporeal membrane oxygenation (ECMO)	1.0
Insertion and flotation of pulmonary artery catheter	1.0
Flexible bronchoscopy including airway examination, bronchoalveolar lavage, secretion removal, transbronchial fine needle aspiration, transbronchial biopsy, endobronchial biopsy (minimum of 50)	2.0
Diagnostic bronchoscopy including transbronchial fine needle aspiration, transbronchial biopsy, endobronchial biopsy	2.0
Therapeutic bronchoscopy through an artificial airway for secretion removal	2.0
Understand principles and techniques for sedation, analgesia, and delirium management	2.0
Critical review of polysomnographic reports	2.0
Polysomnographic recognition of various patterns of apnea and hypopnea	2.0
The utility and interpretation of cardiopulmonary monitoring in sleep-related disorders	2.0
Imaging techniques commonly employed in the evaluation of patients with critical illness and/or pulmonary disorders	1.0
Basic interpretation of chest radiograph	2.0
Other imaging techniques	1.0

to another (i.e., medical student, to resident, to fellow, to independent practitioner);

- Nurturing an individual's self-reflection in a continuous manner that fosters the cycle of experience, reflection, conceptualization, and further practice (13).

Many challenges remain, including faculty development, identifying and supporting dedicated teachers and program directors, and the need for additional valid methods of competency assessment. In an era of increasing financial uncertainty of the support for medical education, the consolidation of efforts and resources has the best chance for success. We already have strong agreement between the ACGME and ABMS on definitions of the core competencies (1). Engagement of all key stakeholders across the spectrum of training levels and medical societies is essential to facilitating a cohesive, effective mechanism for advancing the medical profession.

This Task Force's members and supporting societies hope that projects like this will continue to support collaborative interactions as the fields of Critical Care Medicine and Pulmonary Medicine evolve. Each discipline will evolve independently and also in conjunction with the other. Continued collaboration could result in a centralized review process for determining the relevance and priority of specific competencies, coordinating the development of teaching methods, researching assessment techniques, and identifying milestones. In contrast to a network of silos, a multisociety effort is more likely to help our profession move forward and integrate with credentialing and certifying organizations, residency and fellowship training programs, and medical schools.

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