

## Pulmonary Function Laboratory Personnel Qualifications

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The clinical pulmonary function laboratory is a vital area which provides physiologic data to assess the pulmonary status of those patients with pulmonary diseases. It is extremely important that the results of the physiologic tests reported from the clinical pulmonary function laboratory be accurate and timely. Each clinical pulmonary function laboratory must have a Medical Director who is responsible for the training of the personnel, the quality and functional status of the equipment, as well as for the accuracy and interpretation of the results, which must be provided in a timely fashion to the clinicians who order the tests. The Medical Director must possess expertise in pulmonary physiology, possess a detailed knowledge of pulmonary function equipment, and be able to interpret pulmonary function test results within the context of the clinical setting (1). The ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories wishes to reaffirm the strong position the ATS has taken previously concerning the qualifications and responsibilities of the Medical Director of the pulmonary function laboratory (1).

The ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories has reviewed the existing information on personnel qualifications for those who work in the clinical pulmonary function laboratory (2-7). There are no data specifying the educational level necessary to initiate training of the technical staff. A recent survey of pulmonary function personnel found that 25% possessed a bachelor's degree, 63% had attained at least one year of education above high school, and 85% had received at least a high school education (2). Although the specific educational background of the remaining 15% was not determined, it was felt that virtually all were high school graduates or the equivalent (2). Data do not exist stating the time necessary for the technical staff to become competent to run the tests or successfully troubleshoot the equipment. Also, no data have been gathered to determine the educational background, training period, and experience necessary to become a competent supervisor or chief pulmonary function technologist (or technical director). Thus, the Personnel Qualifications for the Pulmonary Function Laboratory Technical Staff (table 1), Supervisory Staff (table 2), and Chief Pulmonary Function Technologist (or Technical Director) (table 3) have been developed from information supplied by physicians, pulmonary technologists, and respiratory care personnel who direct or supervise the operations of the clinical pulmonary func-

TABLE 1. PERSONNEL QUALIFICATIONS: TECHNICAL STAFF

	Minimal Educational Background to Initiate Training*	Suggested Time of Laboratory Training† (1)	Suggested Training Time for Trouble-Shooting (1)
1. ABG	High School (HS)	6 mos.	1½ yrs.
2. Spirometry	H.S.	6 mos.	1 yr.
3. Flow volume studies	H.S.	6 mos.	1 yr.
4. Lung volumes (dilutional techniques)	H.S.	6 mos.	1 yr.
5. Plethysmography	H.S.	6 mos.	1½ yrs.
6. DLCO <sub>SB</sub>	H.S.	9 mos.	1½ yrs.
7. DLCO <sub>SS</sub>	H.S.	12 mos.	2 yrs.
8. Exercise Testing	H.S.	12 mos.	2 yrs.

\* A strong background in mathematics is recommended for the high school graduate; one year or more of college in the physical and biologic sciences preferred.

† Under the direction and responsibility of the Medical Director of the pulmonary function laboratory (1). Training is concurrent for each test.

TABLE 2. PERSONNEL QUALIFICATIONS: SUPERVISORY STAFF

	Minimal Educational Background*	Pulmonary Function Laboratory Training and Experience† (1)	Credential‡
1. ABG	Pulmonary function technology; Respiratory therapy education; or 2 yrs. of college in biological sciences and mathematics	2 yrs.	Strongly recommended
2. Spirometry	"	2 yrs.	Strongly recommended
3. Flow volume studies	"	2 yrs.	Strongly recommended
4. Lung volumes (dilutional techniques)	"	2 yrs.	Strongly recommended
5. Plethysmography	"	3 yrs.	Strongly recommended
6. DLCO <sub>SB</sub>	"	2 yrs.	Strongly recommended
7. DLCO <sub>SS</sub>	"	3 yrs.	Strongly recommended
8. Exercise Testing	"	3 yrs.	Strongly recommended

\* B.S. or higher degree in the sciences or substantial experience in pulmonary function technology.

† Under the direction and responsibility of the Medical Director of the pulmonary function laboratory (1). Training is concurrent for each test.

‡ Credentials that are based on appropriate examinations in pulmonary function technology and are granted by relevant professional bodies.

tion laboratory. These guidelines usually represent neither the highest nor the lowest qualifications in each category, but are somewhere in between.

The recommended qualifications for the technical staff of the clinical pulmonary function laboratory are shown in table 1. It is a consensus that a high school education with a strong mathematical background should be the minimum education for the technical staff, although more preferable is one year or more of mathematics and the physical and biological sciences at a college level. The duration of training required before an individual becomes competent to perform each pulmonary function test with minimal supervision will vary according to the individual's background, intelligence, aggressiveness, and the number of tests he or she has performed under supervision. The suggested length of laboratory training for the tests listed in ta-

ble 1 was developed with the consideration that training for all tests performed in any pulmonary function laboratory would be concurrent. Certainly, if the laboratory only performed arterial blood gases and/or simple spirometry, the training period necessary for the technical staff to become competent would be reduced considerably. The training period necessary to reach competency in pulmonary function testing will be shortened also if the individual is a graduate in pulmonary function technology independent of, or within, a respiratory therapy program. The training period necessary may be shortened if the individual has graduated from a professional nursing program, or has accumulated a substantial college background in mathematics and the physical and biological sciences. The

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TABLE 3. PERSONNEL QUALIFICATIONS: CHIEF PULMONARY FUNCTION TECHNOLOGIST (OR TECHNICAL DIRECTOR)

	Minimal Educational Background*	PF Laboratory Training and Experience†	Credential‡	Supervisory Experience
1. Lab performing spirometry and/or ABGs	Pulmonary function technology; Respiratory therapy education; or 2 yrs. of college in biological sciences and mathematics	3 yrs.	Strongly recommended	2 yrs. Strongly recommended
2. Lab performing #1-4	"	4 yrs.	Strongly recommended	2 yrs. Strongly recommended
3. Lab performing #1-5, #1-6 or #1-7, or #1-8	"	4 yrs.	Strongly recommended	2 yrs. Strongly recommended

\* B.S. or higher degree in the sciences or substantial experience in pulmonary function technology.

† Under the direction and responsibility of the Medical Director of the pulmonary function laboratory.

‡ Credentials that are based on appropriate examinations in pulmonary function technology and are granted by relevant professional bodies.

same statements apply to the training time required to become competent to troubleshoot pulmonary function equipment (table 1). The technical staff working in a pediatric pulmonary function laboratory will need special training to instruct and test pediatric patients.

Separate training in pulmonary function testing may of necessity be acquired outside of the individual's laboratory if no physician or qualified technologist is present to supervise the training. As one progresses through training in the pulmonary function laboratory, it is desirable that the individual enhance his background knowledge by acquiring college credits, particularly in algebra, statistics, electronics, and physiology.

The personnel qualifications for a supervisor working in the pulmonary function laboratory are listed in table 2. A supervisor in a large pulmonary function laboratory should have at least one of the following qualifications: (1) an educational background in pulmonary function technology or respiratory therapy, (2) substantial experience in pulmonary function testing, (3) at least two years of college education in mathematics and the physical and biological sciences. An individual possessing a Bachelor of Science degree would be preferable. Before becoming a supervisor, an individual should have at least two years of training and experience performing tests if only arterial blood gases, spirometry, and dilutional lung volumes are performed. If more sophisticated tests are performed, the supervisor should have up to four years experience (table 2). A supervisor should be able to supervise the laboratory operations independently and follow the protocols established by the Medical Director and the chief pulmonary function technologist (or technical director). It is strongly recommended that

a supervisor acquire a credential which is based on appropriate examinations that include pulmonary function technology and which is granted by a relevant professional body. Regardless of whether or not a credential has been attained, continuing education is essential.

The personnel qualifications for the chief pulmonary function technologist (or technical director) are listed in table 3. The educational background of the chief pulmonary function technologist should be broader than that of a supervisor and, preferably, the individual should possess a Bachelor of Science degree. The chief pulmonary function technologist (or technical director) should have at least two years of supervisory experience in addition to the training and experience necessary to become a supervisor. It is strongly recommended that a chief technologist (or technical director) acquire a credential which is based on appropriate examinations that include pulmonary function technology which is granted by a relevant professional body. Regardless of whether or not a credential has been attained, continuing education is essential. Under the aegis of the Medical Director, a chief pulmonary function technologist (or technical director) should be able to write quality control protocols and assume responsibility for meeting federal, state, and the Joint Commission on Accreditation of Hospitals (JCAH) laboratory requirements. Although the Medical Director is responsible for quality control within the laboratory, for statistical analysis as applied to the quality control and operation of the laboratory, and for complying with the laboratory regulations of state, federal, or national regulatory agencies, the Medical Director may share this responsibility with the chief pulmonary function tech-

nologist (or technical director), or with another individual so identified.

The Medical Director is responsible for the decisions concerning the specific pulmonary function tests offered by the laboratory (tables 1 and 2) as well as the number of personnel available to perform these tests. Those tests offered should meet the needs of the physicians involved in patient care in the area served by the laboratory. The majority of pulmonary function laboratories offer spirometry, arterial blood gases, and dilutional lung volumes, although the number of studies performed on a monthly basis may be small (7). Not every laboratory will need supervisory personnel or a chief pulmonary function technologist (or technical director). Even though the majority of pulmonary function laboratories require few personnel (2, 7), these personnel must be competent to provide accurate results.

It is our intent that these qualifications will apply to small and large clinical pulmonary function laboratories, whether located in the clinic, in a community hospital, or within a university medical center. Revision of these personnel qualifications will occur as more data become available.

This position paper was prepared by the Committee on Proficiency Standards for Clinical Pulmonary Laboratories. Members of the Committee are:

REED M. GARDNER, PH.D., *Chairman*  
 JACK L. CLAUSEN, M.D.  
 GARY EPLER, M.D.  
 JOHN L. HANKINSON, PH.D.  
 SOLBERT PERMUTT, M.D.  
 ALAN L. PLUMMER, M.D.

## References

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