

# The Office Laboratory in Family Practice Residency Programs

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A survey of family practice residency programs explored several aspects of the educational and clinical work of the office laboratories in residency centers. Many residency laboratories were found to have limited equipment and undertook only a few of the common procedures. Only 56 percent of residency programs had identified a specific educator for laboratory teaching. Only 15 percent of programs had established a formal curriculum in laboratory medicine. Curricula were poorly developed in the areas of quality control, equipment purchase, laboratory design, and the training of laboratory personnel. Recommendations are made for improving residency laboratories and resident education in laboratory medicine.

The office laboratory is an increasingly important component of the primary care health delivery system. The use of ambulatory clinical laboratory testing has been shown to be increasing at a rate of 22 percent per year.<sup>1</sup> Ninety-seven percent of family practice offices now provide some office laboratory testing.<sup>2</sup> Such testing is used to confirm suspected disease, follow the prolonged course of a chronic disease, document the effects of therapy, and to screen for disease as a part of a health maintenance examination. The advantages to a clinician for establishing an office laboratory include convenience in obtaining results, quality control of the procedures, rapid and direct correlation of the clinical and laboratory data, revenue generation, and expanded patient services within the office.

Despite its importance, the office laboratory has received little attention either in medical training or in the medical literature.<sup>3</sup> In particular,

there have been no previous reports documenting the laboratory medicine curriculum in residency programs. The Family Practice Residency Assistance Program has acknowledged the need for such training in its guidelines for family medicine residencies, but specific curriculum design has been left to individual residency programs.<sup>4</sup>

A survey questionnaire was designed to examine the laboratory medicine experience in family medicine residency programs. The questionnaire sought to document the extent of laboratory services provided in the residency clinic, the administrative structures of these laboratories, and the exposure of residents to education in laboratory medicine.

## Method

A survey questionnaire was mailed to the program directors of all approved family medicine residency programs in the fall of 1980. A list of program directors was obtained from the Division of Education of the American Academy of Family Physicians. With a single mailing to 373 programs,

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**Table 1. Characteristics of Responding Residency Programs**

Program Type	Percent of Total	Percent of Respondents
University	17	16
Community with university affiliation	52	52
Community with university administration	13	14
Community with no affiliation	14	15
Military	4	2

242 responses were returned, representing a 65 percent return rate. The questionnaire data were key punched and processed by a routine statistical program.

## Results

The distribution of respondents was representative of the types of residency programs in the country as shown in Table 1. The average number of years since residency approval was six. There was an average of three faculty members per program and six residents per year in each program.

The results showed that each residency laboratory had both an administrator and an individual responsible for the technical operation of the laboratory. The role of the laboratory administrator was taken by the residency director in 38 percent, by other physician faculty in 29 percent, a pathologist in 16 percent, and a medical technologist in 13 percent of the residency programs. In community hospital programs the administrator was usually the residency director, whereas in the university programs this role was delegated to another faculty person.

The technician's role in the laboratory was the responsibility of a nurse in 30 percent of the residencies, a certified medical technologist in 29 percent, a certified medical laboratory technician in 21 percent, and a resident or faculty member in 20 percent. University programs and community programs with university administration tended to employ medical technologists or medical labora-

**Table 2. Percent of Laboratories With Procedure**

Procedure	Percent
Urine microscopic examination	99
Vaginal wet preparation	98
Gram stain	95
Hematocrit	87
Throat culture	87
Pregnancy test	84
Urine culture	75
Mononucleosis test	68
Peripheral blood smear	66
Hemoglobin	66
Sedimentation rate	61
Serum glucose	59
White blood cell count	57
White blood cell differential	56
Platelet count	36
Reticulocyte count	34
Rheumatoid factor	27
Sickle cell test	26

tory technicians for the operation of the laboratory. The other programs used nurses more often in this role.

A wide variety of laboratory tests were undertaken in residency training laboratories (Table 2). The laboratory equipment used in these laboratories is outlined in Table 3.

A laboratory activity report was generated in only 38 percent of family practice teaching laboratories. The majority of these (62 percent) were reported on a monthly basis. These reports included a range of information about the laboratory activities: the number of tests performed (92 percent), the laboratory-generated income (70 percent), the tests ordered by each physician (55 percent), the equipment supply and costs (48 percent), and the tests done for each patient visit (41 percent).

A specific educator was identified in 56 percent of the residency laboratories. Forty-two percent of these individuals were either medical laboratory technicians or medical technologists. A family physician (33 percent) or a pathologist (24 percent) filled this role in other residency programs. University programs tended to use medical laboratory technicians as educators. There were no strong patterns for this educator position with the other types of residency programs.

**Table 3. Percent of Laboratories With Equipment**

Equipment	Percent
Microscope	98
Centrifuge	98
Incubator	90
Spirometer	58
Glucose apparatus	56
Two-headed microscope	42
Coulter counter	28
Electrolyte apparatus	12
Computer	7

**Table 4. Laboratory Medicine Curriculum**

Curriculum Area	Percent of Laboratory Curriculum Time
Performing tests	69
Interpreting tests	10
Quality control	6
Equipment	6
Laboratory design	5
Training personnel	4

Only 15 percent of residency programs had formal curriculum time in laboratory medicine. The mean number of hours of formal teaching in these programs is 17 hours per resident per year. Fifty-eight percent of residency programs had informal laboratory medicine curriculum time. The mean number of hours of such informal teaching was 16 hours per resident per year. Twenty-one percent of respondents to the questionnaire had neither formal nor informal laboratory medicine education for residents. Six percent of the returns had missing data on this item. The content of the laboratory medicine curriculum is outlined in Table 4. Community programs with no university affiliation had the greatest number of hours of curriculum time (56 hours per three years of residency). This was followed by community programs with university administration (52 hours), community with university affiliation (48 hours), university programs (39 hours), and military (15 hours). These figures represent both formal and informal curriculum time.

## Discussion

The education of family physicians in office laboratory medicine is a necessary and yet frequently overlooked area of residency training. Its importance is demonstrated by the presence of a laboratory in almost every family practice office, by the rapidly increasing number of commercially available tests designed specifically for the office setting, and by the growing use of laboratory testing in clinical medicine. The Residency Assistance Program has recommended a laboratory medicine curriculum in each approved residency.<sup>4</sup> The federal government has also shown an interest in the office laboratory in several of the proposed versions of the Clinical Laboratory Improvement Act.<sup>5</sup> The laboratory medicine curriculum in family practice residencies, however, has been neglected.

The first step in the improvement of laboratory medicine education is to assure that each residency program has an "ideal" office laboratory. Other authors have described their ideas about such an ideal office laboratory.<sup>6,7</sup> The residency laboratory should be a model to residents so that their laboratory experience is directly applicable to their future office laboratory needs. Laboratory organization should incorporate both an administrative and a technical role. As has been shown, residency programs now use people with a variety of backgrounds in these two roles. In the practice setting the physician is usually the laboratory administrator, while a nurse, medical technologist, or medical laboratory technician assumes the operational responsibilities. A recent study has shown that 43 percent of residency trained family physicians hire a medical technologist or medical laboratory technician for their office laboratory.<sup>2</sup> Such individuals are therefore ideal additions to family medicine residency programs.

The residency laboratory should perform all tests that are commonly found in an office laboratory. These tests should be easy to perform, economical, and routinely needed for ambulatory care. The procedures listed in Table 2 are considered to be both essential and sufficient. It should be noted that only 56 percent of residency laboratories provide residents with the opportunity to perform a common procedure such as a white blood cell differential count. Other common procedures are also neglected, as indicated in Table 2. The residency laboratory should not attempt to

provide many elaborate tests that require expensive equipment, considerable time, or complicated quality control. Such testing is usually referred to a reference laboratory by most practicing physicians. A recent study has shown that only 10 percent of practicing physicians perform serum electrolyte tests in their office laboratories.<sup>2</sup> Such testing is sent to a reference laboratory by most physicians and should be handled similarly in the residency setting.

The second step to improved laboratory education is the hiring of a laboratory educator. A variety of individuals are used as educators in residency programs, including family physicians, pathologists, medical technologists, and medical laboratory technicians. Any of these individuals can serve as a laboratory educator, but each has disadvantages. Family medicine training has largely failed to prepare its residency graduates in the area of laboratory medicine, so family medicine faculty often have little expertise in the laboratory. Pathologists' training in laboratory tests is usually interpretive rather than procedural. Medical technologists and medical laboratory technicians are trained primarily for hospital laboratories and have had little experience with common office laboratory procedures such as the vaginal wet preparation examination. Experience shows that an inquisitive medical technologist or medical laboratory technician with an interest in teaching makes an excellent laboratory medicine educator.

A laboratory activity report is essential to the operation of a residency laboratory but was found in only 38 percent of residency programs. This report should include information about the test performed, laboratory generated income, and expenses. This information is helpful in teaching residents about the administrative aspects of the office laboratory.

A laboratory manual was reported in only 16 percent of residency laboratories. Such a manual is helpful in procedure instructions and quality control. It can serve as an example for residents of the type of laboratory manual needed in their office laboratory. There is currently no published manual designed for the office laboratory, but the authors have such a manual in preparation.

The final area of laboratory education is the development of a formal curriculum for each year of the residency program. Only 15 percent of programs were found to provide such curriculum at this writing. The family physician's role in the

office laboratory includes that of architect, technician, administrator, and pathologist. All of these areas should therefore be considered in the design of a laboratory medicine curriculum. As indicated in Table 4, performing tests and interpreting test results are curriculum areas that were shown to take the majority of existing laboratory curriculum time. The areas of quality control, equipment purchase, laboratory design, and the training of laboratory personnel have received little attention. These are important subjects that require increased curriculum time to prepare residents adequately for managing a clinical laboratory in their office practices.

Family medicine is the first medical specialty to clearly tie educational goals with the realistic needs of the practicing physician. Training in laboratory medicine has been appropriately identified as one of these educational goals. Residency programs have just begun to develop this area of training. This study suggests that there remains a great deal to accomplish.

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