

Field Workers Forum

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LABORATORY SERVICES AT PRIMARY HEALTH CARE LEVEL

WHO's programme of health technology relating to primary health care and rural development* includes collaboration with national health authorities in establishing laboratory services that are appropriate, inexpensive, acceptable and easily performed by laboratory personnel at the peripheral level. In that connexion, WHO has prepared a 20-page document 'Laboratory Services at Primary Health Care Level'† which is summarized below.

In many developing countries, primary health care is organized on four levels.

- (1) At village level, health care is provided by a village health worker, often monitored by a village health committee, and technically supported by the next higher echelon of the health care system. Activities include the recognition, control and, where possible, treatment of communicable diseases, child and maternal welfare, nutrition and hygiene.
- (2) Health work in a dispensary or subhealth centre, health post or clinic which may serve several villages and be staffed by a team of two or three health workers.
- (3) A health centre providing support services and forming part of the referral system for the village and dispensary health workers. It might serve a population of 5,000 to 10,000 (or even much more) and be staffed by a team of four or more.
- (4) The primary level hospital receives patients referred to it for medical attention including minor surgery and obstretrical surveillance, and provides technical and logistic support to the health centre team. It may also provide training for workers at lower levels. In some countries it is more developed and is considered as being at intermediate level.

In most developing countries, a laboratory service will usually exist only at

*See also resolution WHA29.74 in the *Handbook of Resolutions and Decisions*, Vol. II (3rd ed.), 1979, pp. 32–3.

†Copies of this document (LAB/79.1) are available in limited quantities. Requests should be sent to Health Laboratory Technology, World Health Organization, 1211 Geneva 27, Switzerland.

the primary level hospital. This is in accordance with the general policy of the majority of such countries, which is to develop health services at the central level and rarely at the periphery. Only recently have some countries such as Indonesia, Malaysia, the Sudan and the United Republic of Cameroon begun to establish laboratories in health centres.

Peripheral laboratories are generally manned by persons who have had only a short period of training. Technical supervision and guidance, quality control, proficiency testing, and provision of reagents and equipment should be the responsibility of the central or regional health laboratory. Quality control is essential for achieving consistently reliable laboratory results. At primary health care level its methodology should be very simple and adapted to local possibilities and resources. Direct supervision through periodical visits by senior laboratory staff is the most efficient method of supervision.

The primary level hospital laboratory might also participate in a more elaborate programme of quality control organized by the central laboratory. Apart from internal quality control based on good general laboratory practice with regular checkings of apparatus and reagents, the provision of control specimens by the central laboratory as part of a countrywide quality control programme would be something to aim at.

The health centre laboratory

The main functions of a health centre are to serve as a facility for patients referred from the dispensaries or the village health workers for screening purposes, for the delivery of preventive services and for antenatal and postnatal care including family planning, nutritional advice and health education. Administratively it is linked to the primary level hospital. It is staffed by a team including a medical assistant, a fully-qualified nurse, a midwife and two or three auxiliary personnel. It may have a few beds for observation of patients until referral to the hospital, if necessary.

The establishment of a laboratory in a health centre is justified because it can improve the quality and efficiency of primary health care. It can provide support to the health worker when the disease is difficult to diagnose clinically. A correct and early diagnosis will ensure the most suitable treatment for the patient, and in many cases the need for future hospitalization may be avoided, thus reducing the cost of health care delivery. Laboratory support can also help in the decision whether to refer a patient to the hospital.

The health centre laboratory will be of the type of an integrated laboratory performing both clinical and public health activities, although at a very simple level. It can nevertheless play a determinant role in the diagnosis of many common diseases in developing countries such as the following:

1. Parasitic diseases diagnosed by direct microscopic examination or after staining: malaria, filariasis (including onchocerciasis), trypanosomiasis, schistosomiasis, vaginal trichomoniasis, and amoebiasis, ancylostomiasis and other parasites diagnosed in stools.
2. Bacterial disease diagnosed by microscopic examination after staining: tuberculosis, leprosy, gonococcal infections, and meningococcal and pneumococcal meningitis.
3. Other conditions such as anaemia, diabetes and eclampsia.

According to the UNICEF Price List (UNIPAC) for 1978, the estimate of investment cost in equipment for this category of laboratory ranges from US \$650 to US \$750. The annual operational cost involved with provision of reagents and glassware is approximately US \$100 to US \$150 on the basis of 500–800 tests per month. As a laboratory assistant's skill will be sufficient at this level, the salary cost will be comparatively low; it is estimated that one laboratory assistant per 600–800 tests per month is necessary.

From the above, it can be seen that the cost of the establishment of a laboratory in a health centre is modest when related to the large benefits it can provide.

The health centre laboratory should be staffed by a trained laboratory assistant who should be part of the health centre team and be able to assist in other health activities when there is insufficient laboratory work. He should receive technical and logistic support and supervision from the nearest laboratory of higher level.

The main functions of this laboratory assistant are:

- (a) to perform all simple routine analyses and direct microscopy in parasitology, bacteriology, haematology and chemistry (urine and spinal fluid) following written instructions;
- (b) to collect and dispatch biological samples;
- (c) to keep a record of expended material, chemical reagents and others and to order a new stock: and
- (d) to prepare a monthly report of activities.

Essential laboratory tests for use in the health centre

Table 1 gives a list of essential tests which are the minimum that a laboratory should perform at the health centre level; these tests require very simple equipment and reagents.

In some countries, reagent test strips and kits are being used, e.g., in urinalysis. Because of their cost and the problems related to their use in conditions of high temperature and humidity, a careful study should be made before introducing them in the laboratory.

Table 1. Essential tests and their methods suitable for a health centre laboratory

Essential tests	Method
<i>Blood</i>	
Haemoglobin	Comparator
White cell count	Counting chamber
Examination of a film for cell morphology	Stained film
Erythrocyte sedimentation rate	Westergren method
Parasites	Direct and Romanowsky stained preparations
<i>Urine</i>	
Protein	Sulphosalicylic acid method
Glucose	Benedict's method
Sediment for cells, casts, parasites	Direct microscopy
<i>Sputum</i>	
Identification of <i>Mycobacterium tuberculosis</i>	Ziehl-Neelsen stained smear
<i>Stools</i>	
Protozoa and ova	Direct saline and iodine preparation
<i>Skin</i>	
Identification of <i>Mycobacterium leprae</i>	Modified Ziehl-Neelsen stained smears
Test for <i>Onchocerciasis volvulus</i> microfilariae	Direct wet preparation
<i>Pus and exudates</i>	
Bacteria	Gram-stained smear, especially for gonococci

Laboratory services in a primary level hospital

In many countries, the primary level hospital corresponds to a district hospital. It generally has between 30 and 150 beds and covers a population of between 30,000 and 100,000. These figures may be widely modified by geographical conditions and concentrations of the population served. It is designed to deal with major health problems and serves as a referral centre for the peripheral health services. It should in turn refer very complicated cases and those requiring more precise diagnosis to a higher service echelon.

The primary level hospital will comprise an outpatient and an inpatient department. The former has similar functions to those of the health centre, while the latter has activities in general medicine, general surgery including surgical emergencies, and obstetrics including surgery for the prevention and treatment of complications. A laboratory and an elementary X-ray unit will be needed to support these activities.

The laboratory of the primary level hospital should have at least one qualified laboratory technician, and two or, if possible, more assistants.

The basic functions of the laboratory technician will be:

- (a) to perform all routine and some special laboratory procedures as might be required by the hospital staff;
- (b) to collect and dispatch specimens;
- (c) to assist in the training and technical supervision of laboratory assistants and any other subordinate personnel; .
- (d) to prepare and list reagents; .
- (e) to maintain the laboratory equipment; and
- (f) to prepare a monthly report of activities.

This laboratory should be part of the laboratory service network and be closely linked to the nearest regional or provincial hospital, i.e., higher level laboratory. From this level, it will receive technical advice and supervision and necessary laboratory supplies, including reagents which are ready for use. It will concentrate on individual tests and analyses to assist in the diagnosis and treatment of patients, but it should also be used as a public health laboratory for epidemiological control. The range of tests to be undertaken will include all those recommended for the health centre laboratory plus some basic tests in clinical chemistry, haematology, bacteriology and parasitology which are important for clinical and public health purposes at the peripheral level. Examples of tests of public health importance that are not directly related to hospital patient care are water testing (for chlorine and nitrate, which may be done by the sanitarian and not by the laboratory worker himself) and microbiological tests needed in controlling epidemics.

In many developing countries, bacteriological culture is not yet included in the duties of the primary level hospital laboratory. This omission is due partly to the cost and difficulty of obtaining equipment and reagents and partly to the technical difficulties. However, in view of the importance of communicable diseases at this level, every effort should be made to establish some basic culturing facilities, including those for performing coliform tests in water. If culture media, already prepared for use in simplified techniques,* are regularly supplied by the central laboratory, many of the technical difficulties can be overcome.

The WHO document ('Laboratory services at primary health care level', section 2.1, pages 8–9) lists 42 tests that should be performed at the primary level hospital laboratory. Lists of the equipment and reagents required respectively for health centre laboratories and for primary level hospital laboratories are given in Annexes I and II to that document, while Annex III

*An example of such simplified technology is given in a WHO document (BAC/78.2, LAB/78.2), 'Simplified procedures for the isolation and identification of enteric pathogenic bacteria', a revised edition of which will shortly be available from Health Laboratory Technology.

lists supplementary tests, equipment and reagents that may be needed at both levels to meet priority health needs of the community.

Collection and dispatch of laboratory specimens

In order that the benefits of more extensive laboratory facilities may be made available to the rural population, a reliable system of collection and transport of specimens must be established. This is primarily the responsibility of the laboratory worker, but where the system is extended to the dispensary or even to the village levels, other health workers could collect and dispatch specimens if specifically trained to do so.

It is the responsibility of the referral laboratory to supply the necessary containers to be used, as well as pertinent information on collection methods. In some countries these are directly provided from the central laboratory as part of a general programme of standardization of laboratory technology.

Training of laboratory workers

Laboratory workers at the primary health care level should receive an adequate training that enables them to perform their duties with a sense of responsibility. This implies not only practical competence but also a basic understanding of the clinical purpose of the tests performed and an appreciation of the role of the laboratory in the health service. They are part of the health team, and must collaborate harmoniously with the other members of the team.

They must be able to perform a range of tests in the fields of haematology, biochemistry and microbiology. In establishing a syllabus for training laboratory workers, attention should be given to actual health needs and available resources in the country, and to the definition of educational objectives. An indiscriminate adoption of syllabuses as used in developed countries should be avoided.

The health centre laboratory assistant should if possible come from the region in which he is to work. He should have from six to eight years of general education and a training of 6–12 months in the nearest district or regional hospital where facilities are available.* His training should be given by senior laboratory technicians with experience in teaching and the use of audiovisual material. As part of his formal course, the laboratory assistant should receive

*WHO is publishing a 'Manual of basic techniques for a health laboratory' giving detailed descriptions of most of the laboratory techniques that a laboratory assistant should know. WHO Technical Report Series, No. 345, 1966, & No 491, 1972, give more detailed information on the training of laboratory staff.

in-service training under supervision, and his supervisor should visit the place where he is to work in order to evaluate the facilities available. His supervisor should also visit the health centre regularly to give technical help and support to the laboratory assistant in his work.

The training of hospital laboratory technicians should be of two to three years' duration according to the general education of the student, which should preferably be 10–12 years of total schooling. The training should cover the most important laboratory techniques with a strong emphasis on practical work, and should take place in an organized institution. It should also include enough theoretical knowledge to enable the student to understand the basic principles of laboratory technology. In the final year of his training, the laboratory technician should spend at least three months in in-service training. He may also spend some time in a health centre laboratory to become acquainted with conditions in rural areas. This would also help to maintain the standard of work at the health centre, and provide the technician with some experience of work supervision at that level.

The laboratory technician should realize that he is a member of the hospital team with responsibility for integrating his work into the total activity of the hospital.