

CHAPTER 7

MEDICAL LABORATORY SERVICES**7-1. Purpose**

The function of medical laboratory services in HSS operations is to analyze body fluids and tissues, or to identify microorganisms as an adjunct in the diagnosis and treatment of patients and in the prevention of disease. Additionally, management of blood and blood components are critical tasks requiring medical laboratory and health service logistics assets. Refer to Chapter 8 for a detailed presentation of blood management planning. The scope of laboratory services is limited by the equipment and personnel available. As in many HSS functions, each successive echelon of care includes a new increment of medical laboratory capabilities which distinguishes it from the lower echelon of care.

7-2. Planning for Laboratory Services

a. During peace, in a world of advancing scientific technology, clinicians and laboratorians are dependent on ever-changing state-of-the-art equipment. During war, the HSS planner must assure that dependable, but limited laboratory support, is available to support the medical mission. The major problem will be for medical and paramedical personnel to transition rapidly from a high technology peacetime existence to a wartime environment.

b. Officer and enlisted laboratory personnel are a diverse group of individuals with a broad range of education and experience in a variety of laboratories ranging from small dispensary laboratories to sophisticated medical center clinical or research facilities. In addition to the active forces, many of the wartime laboratory personnel assets will come from the civilian sector (National Guard and Reserve forces). The planner

must consider the diversity of personnel qualifications and experiences when developing requirements for realistic laboratory training programs. The HSS planner must—

- Understand the current concepts for the allocation of medical laboratory assets.
- Define, in general terms, the capabilities of those assets.
- Examine the factors that may impact upon laboratory resources.
- Determine mechanisms to maintain responsive, effective, and efficient support of the HSS mission.

c. Paragraphs 7-3 through 7-6 describe the capabilities of medical laboratories that are organic to MTFs in the TO. These facilities are staffed and equipped to provide the laboratory procedures shown in Tables 7-1 through 7-5. Capabilities of the AML, TOE 08-657 L000, are discussed in paragraph 7-6. Personnel, supply, and maintenance support is obtained through the corps medical groups and through medical brigades in the COMMZ.

7-3. Echelon I Support

By doctrine, there is no Echelon I medical laboratory support. Blood or blood components are not administered at Echelon I. Given the anticipated nature of the modern battlefield, medical laboratory personnel or material resources are not available or needed at this level. On an area basis, medical laboratory support for personnel is available at Echelon H. Some laboratory information such as throat cultures and analysis results will be presented to physicians at this echelon.

Table 7-1. Medical Laboratory Procedures, Biochemistry

DESCRIPTION	AREA	SPT	SQUAD	MASH	CSH	FH	GH
PERFORM BLOOD GAS ANALYSIS				X	X	X	X
PERFORM ELECTROLYTE LEVELS (NA, K, CL, CO2)				X	X	X	X
DETERMINE TOTAL SERUM PROTEIN					X	X	X
DETERMINE SERUM CREATININE					X	X	X
DETERMINE SERUM AMYLASE					X	X	X
DETERMINE SERUM AST ACTIVITY					X	X	X
DETERMINE SERUM ALT ACTIVITY					X	X	X
DETERMINE SERUM CK ACTIVITY					X	X	X
DETERMINE SERUM GLUCOSE				X	X	X	X
DETERMINE SERUM UREA NITROGEN				X	X	X	X
DETERMINE SERUM T. BILIRUBIN					X	X	X
DETERMINE SERUM CALCIUM					X	X	X
DETERMINE CSF GLUCOSE					X	X	X
DETERMINE CSF PROTEIN					X	X	X
DETERMINE URINE PROTEIN						X	X
DETERMINE URINE GLUCOSE						X	X

Table 7-2. Medical Laboratory Procedures, Hematology/Urinalysis

DESCRIPTION	AREA	SPT	SQUAD	MASH	CSH	FH	GH
PERFORM WHITE CELL COUNT		X		X	X	X	X
PERFORM COMPLETE BLOOD COUNT (RBC, WBC, HGB, HCT)				X	X	X	X
DETERMINE HEMATOCRIT		X		X	X	X	X
DETERMINE WBC DIFFERENTIAL		X		X	X	X	X
DETERMINE PROTHROMBIN TIME					X	X	X
DETERMINE PARTIAL THROMBO- PLASTIN TIME (APTT)					X	X	X
PERFORM CSF CELL COUNT AND DIFFERENTIAL				X	X	X	X
PERFORM URINALYSIS (DIPSTICK)		X		X	X	X	X
PERFORM URINALYSIS (MICRO- SCOPIC)		X		X	X	X	X
PERFORM PLATELET ESTIMATE		X		X	X	X	X
PERFORM PLATELET COUNT				X	X	X	X
DETERMINE FIBRINOGEN LEVEL						X	X
DETERMINE FIBRIN SPLIT PRODUCTS						X	X

Table 7-3. Medical Laboratory Procedures, Microbiology /Serology

DESCRIPTION	AREA	SPT	SQUAD	MASH	CSH	FH	GH
PERFORM OCCULT BLOOD TEST		X			X	X	X
PERFORM THICK & THIN SMEARS FOR MALARIA		X			X	X	X
PERFORM GRAM STAINS		X		X	X	X	X
PERFORM RPR TESTS (SYPHILIS)					X	X	X
PERFORM IM TESTS (INFECTIOUS MONONUCLEOSIS)					X	X	X
EXAMINE FECES FOR OVA, CYSTS, AND PARASITES					X	X	X
PERFORM KOH PREPS				X	X	X	
PERFORM PREGNANCY TESTS					X	X	X
PERFORM URINE CULTURES (COLONY COUNTS & SUSCEPTIBILITY)					X*	X	X
PERFORM WOUND CULTURE SUSCEPTIBILITY					X*	X	X
PERFORM BLOOD CULTURE & SUSCEPTIBILITY						X	X
PERFORM SPUTUM CULTURE & SUSCEPTIBILITY						X	X
PERFORM STOOL CULTURE & SUSCEPTIBILITY						X	X
PERFORM CSF CULTURE & SUSCEPTIBILITY						X	X

Table 7-3. Medical Laboratory Procedures, Microbiology/Serology (Continued)

DESCRIPTION	AREA	SPT	SQUAD	MASH	CSH	FH	GH
PERFORM CULTURE & SUSCEPTIBILITY FOR GONORRHEA					X*	X	X
PERFORM THROAT CULTURES					X*	X	X
PERFORM MICROSCOPIC EXAMS FOR ACID-FAST BACTERIA						X	X
IDENTIFY ANAEROBES						X	X
*Requires Microbiology Augmentation Set							

Table 7-4. Medical Laboratory Procedures, Blood Bank

DESCRIPTION	AREA	SPT	SQUAD	MASH	CSH	FH	GH
PERFORM BLOOD GROUP AND TYPE (ABO, RH)				X	X	X	X
PERFORM BLOOD CROSSMATCHES					X	X	X
THAW FRESH FROZEN PLASMA					X	X	X
ISSUE PLATELET CONCENTRATE					X	X	X

Table 7-5. Medical Laboratory Procedures, Anatomic Pathology/Cytology

DESCRIPTION	FH	GH*	AML**
PERFORM BONE MARROW SPECIMEN ANALYSIS		X	X
PERFORM HISTOLOGICAL/SURGICAL EXAM		X	X
PERFORM FORENSIC AUTOPSIES			X
PERFORM GYNECOLOGIC CYTOLOGY EXAMS		X	X
PERFORM NON-GYN CYTOLOGY EXAMS		X	X

* Requires pathology augmentation team.

** Limited capability. Unit does not routinely provide support for direct individual patient care.

7-4. Echelon II Support

a. Echelon II medical laboratory support is the responsibility of personnel assigned to the treatment platoon of a medical company. A medical laboratory specialist in the area support squad performs limited laboratory procedures in DS of advanced trauma management (ATM) activities. These procedures include: hematocrit, white blood cell (WBC) count, WBC differential, platelet estimate, urinalysis, and gram stain. As the situation permits, additional tests such as occult blood determinations or malarial smears (thick and thin preps) may be performed.

b. At Echelon H, resources consist of medical laboratory specialists and field laboratory equipment organic to the following units:

(1) Medical companies in FSBs/MSBs assigned to the division support command.

(2) Medical companies in support squadrons of ACRs or separate maneuver brigades.

(3) Medical companies of area support medical battalions (corps or COMMZ).

c. Augmentation of laboratory capabilities at this echelon is not anticipated during combat operations. To increase available services, as the situation permits, diagnostic specimens may be collected and transported to higher echelon medical laboratories.

7-5. Echelon III Support

a. Personnel resources in the laboratory section of the MASH (30 bed) are extremely austere. In the CSH, a clinical laboratory officer, medical laboratory specialists, and NCO personnel are assigned. A variety of standardized manual and semiautomated laboratory equipment is found in Echelon III MTFs.

b. Although similar laboratory equipment and tests are available at each type of hospital in the CZ, laboratory methodology and staffing are

tailored to satisfy the unique missions of the CZ hospitals.

(1) Mobile army surgical hospital units primarily function within the rear area of the division or the forward edge of the corps. Movement of MASH units is expected to occur quickly and frequently. As the situation permits, part of the MASH may deploy in the brigade support area (BSA) collocating with a divisional medical company to provide an early emergency surgical capability. The MASH provides hospitalization for those patients who cannot tolerate or survive evacuation to the next level of hospitalization. At the MASH these patients receive surgical and resuscitative intervention to stabilize and prepare them for further evacuation to another MTF providing more definitive medical care. The intratheater evacuation policy (Chapter 4) for MASH units is expected to be short compared to the theater evacuation policy. The MASH is expected to surgically stabilize and prepare patients for movement to other CZ or COMMZ hospitals within a maximum 24 to 36 hours after surgery. The focus of laboratory activities at a MASH during active support of Army Operations is directed toward critical services required to support surgical and resuscitative intervention. Such services will normally be limited to provision of liquid blood (limited to Group O packed cells), performance of blood group and type procedures when required, WBC counts and differentials, hematocrits, blood gas analysis, electrolytes, and urinalysis (see Tables 7-1 through 7-4).

(2) Combat support hospital units function in the corps area and maybe required to move frequently. The patient capacity of the CSH is much larger than the MASH, but the CSH's work load requires much less surgical intensive care per capita than the MASH. The number of laboratory staff in the CSH is appropriately greater, and a larger variety of more technically demanding laboratory tests maybe performed (see Tables 7-1 through 7-4). At this level, blood group/

type and crosshatch procedures with issuance of group-specific packed cells are used; previously frozen blood maybe employed; platelet concentrates and fresh frozen plasma are available; a wider variety of clinical chemistry tests are performed; coagulation tests are performed; and additional parasitological, serological, or bacteriological procedures are supported. Once again, the extent of laboratory support available is dictated by the patient work load experienced and the degree of mobility expected.

(3) In summary, within CZ hospitals, the extent of medical laboratory services is influenced by—

- The tactical situation.
- Ž The mission of the hospital.
- The patient work load.
- Ž The types of patient conditions and injuries.
- Ž The units mobility requirements.

7-6. Echelon IV Support

a. The number, size, and mix of hospital units located in the COMMZ are influenced by—

- Ž The size and geographical location of the TO.
- The number of troops assigned to the theater.
- Ž The expected patient work load.
- Ž The expected duration and intensity of the conflict.

The overall medical threat will influence the scope of laboratory services required.

b. Echelon IV medical laboratory personnel resources include medical laboratory specialists and NCOs, clinical laboratory officers, and pathologists. At this echelon, a wider variety of laboratory equipment and tests are available than those found in the CZ.

c. In the FH, microbiological services are greatly expanded compared to CSH units. These hospitals provide reconditioning and rehabilitation of patients who can RTD within the theater evacuation policy. The majority of patients are in the convalescent care category. Although limited in staffing, a greater number and wider variety of laboratory tests are available than in the CSH or MASH (see appropriate Tables 7-1 through 7-4).

d. The laboratory in the GH is the most complex and sophisticated hospital laboratory in the theater. In addition to medical laboratory specialists and NCO personnel, a clinical laboratory officer, a microbiologist, and a biochemist are assigned to the unit. The GH may be augmented with additional staff, such as a medical team, pathology, and equipment to provide a greater range of medical laboratory services. (Chapter 5 discusses the medical team, pathology.) Laboratory personnel assigned to the GH may serve as consultants to personnel assigned to other hospitals in the CZ or COMMZ and may provide staff functions to higher headquarters in the TO.

e. The AML, once fielded, will be assigned to a MEDCOM or medical brigade on a one per theater basis. This high-technology, hospital-independent laboratory will be established in the field or military operations on urbanized terrain in proximity to the senior medical command element. Unlike laboratories organic to hospitals, the AML performs medical laboratory procedures for the evaluation of environmental issues and

functions with a broader scope related to the health of the TO armed forces as a whole.

(1) The AML may be task organized for deployment in the theater as required. The unit is composed of highly sophisticated technical equipment and highly trained personnel including doctoral scientists, pathologists, clinical laboratory officers, and medical laboratory NCOs and specialists. The AML will have the following sections:

- Ž Headquarters Section.
- Ž Biochemistry Section.
- Ž Anatomic Pathology Section.
- Microbiology Section.
- Ž Veterinary Laboratory Section.
- Ž Environmental Health Section.
- Ž Epidemiology Section.

(2) The AML will—

Ž Provide laboratory analysis and scientific assessment of battlefield health hazards to include NBC, DE, and endemic threats.

Ž Thoroughly integrate its analytical resources to assess the total battlefield health environment (individual patient care is not directly supported).

Ž Task organize a multi-disciplined team from within its own resources to support military contingency operations, civic action programs, and humanitarian support missions.

Ž Analyze samples to assist in treatment of biological and chemical casualties.

Ž Perform—

Ž Investigative biochemical and toxicological analyses.

Ž Microbiological identification and characterization.

Ž Serological testing related to diagnoses and prevention of disease.

Ž Analyses of food items suspected of contamination.

Ž Radiological health hazard analyses and assessments.

Ž Detection and diagnoses of zoonotic diseases.

Ž Gross and anatomic pathology support to include aerospace and forensic pathology studies.

Ž Epidemiological analyses and assessments.

Ž Entomological analyses and limited pesticide adequacy assessments.

Ž Evaluation of environmental samples and clinical specimens for NBC contamination.

(3) The AML will require high technology identification kits and monitoring devices. Organic equipment is highly sophisticated and will require significant logistical support for continued operation. The unit has the ability to send a small task-oriented team forward into the corps area for short periods to investigate unique command medical problems. Samples beyond the

analytical capabilities of the laboratory or samples requiring analytical confirmation by more sophisticated means will be forwarded to CONUS.

(4) The HSS planner must consider the following limitations of the AML:

Ž The unit is designed for a flexible response to the needs of the theater. It can be task-organized for 24-hour per day operations, but has very limited mobility. The assigned TOE organic vehicles will be required for task organization of teams and administration and logistical functions.

Ž The unit requires good lines of communication, both forward into the theater, and back to CONUS. The unit is dependent upon reagent quality water, electrical power, refrigeration, and responsive supplies.

Ž The unit must be accessible by air and ground transportation to receive samples and specimens from throughout the theater.

7-7. Theater Laboratory Support Procedures

a. Tables 7-1 through 7-5 depict the medical laboratory testing capabilities at various echelons of care.

b. The HSS planner must be prepared to respond to changes in tactical plans and operations. Increased patient work load caused by battlefield events, changes in evacuation policies, deteriorating environmental conditions, or outbreaks of disease, may drastically affect the laboratory support required.

c. The planner must maintain flexibility and respond to changing needs with the available medical resources. Echelon II laboratory support from the medical battalion, area support and

Echelon III laboratory support from CSH and MASH units may need to be adjusted for short

periods of time to concentrate personnel and equipment at the point of critical need in the HSS plan.