

A Note on Laboratory and Clinical Medicine

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Introduction

A medical laboratory or clinical laboratory is a laboratory where tests are carried out on clinical specimens to obtain information about the health of a patient to aid in diagnosis, treatment, and prevention of disease. Clinical Medical laboratories are an example of applied science, as opposed to research laboratories that focus on basic science, such as found in some academic institutions.

Medical laboratories vary in size and complexity and so offer a variety of testing services. More comprehensive services can be found in acute-care hospitals and medical centers, where 70% of clinical decisions are based on laboratory testing. Doctors offices and clinics, as well as skilled nursing and long-term care facilities, may have laboratories that provide more basic testing services. Commercial medical laboratories operate as independent businesses and provide testing that is otherwise not provided in other settings due to low test volume or complexity. The United States has a documented shortage of working laboratory professionals. For example, as of 2016 vacancy rates for medical laboratory scientists ranged from 5% to 9% for various departments. The decline is primarily due to retirements, and to at-capacity educational programs that cannot expand which limits the number of new graduates. Professional organizations and some state educational systems are responding by developing ways to promote the lab professions in an effort to combat this shortage. The national center for workforce analysis has estimated that by 2025 there will be a 24% increase in demand for lab professionals. Highlighted by the COVID-19 pandemic, work is being done to address this shortage including bringing pathology and laboratory medicine into the conversation surrounding access to healthcare. In most developed countries, there are two main types of lab processing the majority of medical specimens. Hospital laboratories are attached to a hospital, and perform tests on their patients. Private (or community) laboratories receive samples from general practitioners, insurance

companies, clinical research sites and other health clinics for analysis. For extremely specialised tests, samples may go to a research laboratory. Some tests involve specimens sent between different labs for uncommon tests. For example, in some cases it may be more cost effective if a particular laboratory specializes in less common tests, receiving specimens (and payment) from other labs, while sending other specimens to other labs for those tests they do not perform. The large amount of information processed in laboratories is managed by a system of software programs, computers, and terminology standards that exchange data about patients, test requests, and test results known as a Laboratory information system or LIS. The LIS is often interfaced with the hospital information system, EHR and/or Laboratory instruments. Formats for terminologies for test processing and reporting are being standardized with systems such as Logical Observation Identifiers Names and Codes (LOINC) and Nomenclature for Properties and Units terminology (NPU terminology). Credibility of medical laboratories is paramount to the health and safety of the patients relying on the testing services provided by these labs. Credentialing agencies vary by country.

Clinical laboratories are healthcare facilities providing a wide range of laboratory procedures which aid the physicians in carrying out the diagnosis, treatment, and management of patients. These laboratories are manned by medical technologists (clinical laboratory scientists) who are trained to perform various tests to samples of biological specimens collected from its patients. Most of the clinical laboratories are situated within or near hospital facilities to provide access to both physicians and their patients. Classifications of clinical laboratories indicated below reveal that these facilities can provide quality laboratory tests that are significant for addressing medical and public health needs. The list below should not be used as a fixed guide for classifying clinical laboratories because of new areas continually arising in the field of laboratory medicine.