Computerized Laboratory Information Systems

Developing a computerized system

A computerized system for laboratory data is often called a laboratory information management system and is referred to by the acronym LIMS or LIS. The use of a computerized system is becoming more common in laboratories around the world. An appropriately designed and installed LIMS brings accuracy and accessibility to the flow of samples and data in the clinical laboratory.

There are a number of options available to those interested in developing a computerized laboratory information system. Some laboratories may elect to develop an in-house computer network, and use locally developed systems based on commercially available database software, such as Microsoft Access. Others may choose to purchase fully developed laboratory systems, which usually includes computers, software, and training.

One source of information that may be helpful for planning and implementing a LIMS is the Association for Public Health Laboratories *Guidebook for Implementation of Laboratory Information Systems in Resource Poor Settings.*[1]

Choosing a system

If the decisions about purchasing are made outside the laboratory, for example by the information system department, the laboratory director should provide information that will support selecting equipment that will best serve the needs of the laboratory. The most up-to-date hardware or software may not add to the functionality of the laboratory and can wind-up having to increase overhead, e.g., more data handling, in order to use LIMS systems that have been designed not for the laboratory but for the accounting or central supplies departments.

A LIMS with flexibility, adaptability, ease of evolution and support, and system speed will most benefit the laboratory. The speed issue is very critical as laboratorians will not use something that is slow or awkward, but if it saves time they will quickly "buy into" the project and aggressively move the process forward.

Advantages of computerized systems

A complete computerized information system will be able to handle all the basic information management needs. A computer system has the capacity to quickly and easily manage, analyze, and retrieve data. The computerized system offers some definite advantages over paper-based systems. Some of these advantages are listed below.

- Error reduction—A well planned computer system, with check systems for errors, will help to alert the user of inconsistencies, and reduce the number of errors. It will also provide information that is legible.

- Quality control management—It becomes easy to keep good quality control records, perform analysis on QC data, and generate statistics automatically.

- Provision of options for data searching—A variety of parameters can be used for data retrieval, e.g. it is usually possible to access data by name, by laboratory or patient number, and sometimes by test result or analysis performed. This kind of data

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[1] Information about this guidebook is available at URL:
http://www.aphl.org/aphlprograms/global/initiatives/Pages/lis.aspx

searching is almost impossible with paper-based systems.

- Access to patient information—Most computer systems allow access to all recent laboratory data for a patient. This is very useful in the process of checking the most recent results against previous data to look for changes, which is a good practice, and helps to detect errors. Some computer systems give enough information to determine the admitting diagnosis or access other useful information related to the illness.

- Generate reports—It is easy to generate detailed, legible reports quickly. A LIMS will provide standardized (or customized) reports.

- Ability to track reports—A computer system makes it much easier to track reports; to know when work was finished, who performed the work, when the data was reviewed, and when the report was sent.

- Ability to track and analyze trends—The computer and its data bases provide very strong search capabilities, and with careful design it will be possible to retrieve and use large amounts of data effectively to track and analyze trends of various kinds.

- Improved capability for maintaining patient confidentiality—It is often easier to maintain confidentiality of laboratory data when using a computer than when dealing with a hand-written report form by establishing computer user codes that control access to the data.

- Financial management—Some systems will allow for financial management, for example, patient billing.

- Integration with sites outside the laboratory—A LIMS can be set up so that data comes into the laboratory system directly from a patient or client registration point. Data can be transmitted to many sites or interfaces as needed. Results can be provided directly to computers accessible to the health care provider or public health official. Computers can handle data entry into a national laboratory data base, and almost any other data application that is needed.

- Manufacturer-provided training—Purchased laboratory information systems often include on-site training for staff. To make the full use of the system, it is essential that either on-site training of all staff or training at the manufacturer's headquarters is provided.

Disadvantages It is important to remember that in spite of all of the advantages, computers do have disadvantages. Some of these are as follows.

- Training—Personnel training is required, and because of the complexity of LIMS, this training can be time consuming and expensive.

- Time to adapt to a new system—When starting up a computer system it may seem inconvenient and unwieldy to laboratory staff. Personnel accustomed to manual systems may be challenged by such tasks as correcting errors and uncertain of how to proceed when encountering situations where a field must be filled in.

- Cost—Purchase and maintenance are the most expensive parts of a computerized system, and the costs can be prohibitive in some settings. Additionally, some settings will not have good maintenance that is locally available. Surprisingly, computers use lots of paper, and the cost of materials must be planned for, as this can add up. Also remember that technology changes rapidly, and the life of a computer

may not be more than a few years. This might require repurchase of computer equipment periodically in order to remain current and compatible with other systems.

- Physical restrictions—Adequate space and dedicated electrical requirements are necessary, as well as placement of the computer away from heat, humidity, and dust.

- Need for back-up system—All computer information must be carefully backed up. Loss of data due to a damaged disk or system crash cannot be tolerated, and backup systems will be critical.