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Automation in Medical Laboratory and Its Benefits - Dr. Th. Dhabali Singh MD

Automation in healthcare, particularly, medical diagnostics is relatively new. It has taken a cue from the manufacturing industry and has been proved extremely successful. Automation has become necessary when large numbers of specimens are processed every day. The increased demand for better services and the expectation of quick results by the patients mean the laboratories need to look out for ways to be efficient.

LABORATORY AUTOMATION

Laboratory automation comprises many different automated instruments, devices, software algorithms, and methodologies used to enable, expedite and increase the efficiency and effectiveness of the laboratory operations. For any laboratory with high sample load, it is inconceivable without automation to achieve timely progress and turn-around times (TATs). The functional steps in automation include *sample labelling with barcodes, transportation, centrifugation and pre-analytical processing*. Automation also continues to the analytical and post-analytical processes as well.

RATIONALE FOR AUTOMATION

It is primarily a means to improve efficiency and reduce human errors in all steps of testing. The barcoded labelling of samples help in better integration with the Laboratory Information System (LIS) and their easier identification. Automated pneumatic sample transportation system ensures faster delivery of samples to lab sections from the collection point. There is also an enhanced use of informatics continuum where there is a continuous recording of diagnostic test information. The laboratory, thus, becomes an essential partner in clinical care. Automation adds value to the test result with faster TAT, improved accuracy, precision and safety. The electronic verification and authentication of results enhance the information value which ensures more accuracy and also better storage and faster retrieval of results.

WORKFLOW ENGINEERING

Diagnostic process is a series of discrete steps linked in a linear fashion but often separated physically and temporarily from each other. Automation can help in organising these various steps. Many laboratories still rely on paper documentation method to transmit sample information and test requisitions. This takes up significant amount of labour and time during data entry and also makes the process more prone to errors. Manual sorting and processing of samples take up almost 25% of the total time for completing specimen analysis. An impediment to achieving maximum laboratory efficiency is the variability in specimen collection times, containers, labeling schemes, and transportation methods. The use of automation can simplify and organise workflow so that the entire process is more efficient. Automation is responsible for:

- Sample quality assessment at the beginning of the process
- Optimising specimen routing and scheduling
- Assessing process
- Specimen tracking
- Intelligent reporting
- Data retrieval and archiving
- Quality control documentation

BENEFITS OF AUTOMATION

No laboratory wants to go through the nightmarish experience of having delivered a wrong result to a patient because of which there had been devastating changes in treatment procedures. Most of these mistakes happen *because of random human errors during registration, sorting and identification of samples, manual labelling, selection of test processes, manual data entry from machines, and delivery of test reports to patients*. This is where the automation comes in. The repetitive and monotonous nature of the work of technicians also makes them prone to committing mistakes, and more so when the sample load is more. Automation takes care of this. Another advantage is that it allows for a reduction in the manpower requirement and cost because of a leaner system.

CURRENT TECHNOLOGY AND THE FUTURE

Laboratory automation, as mentioned before, is relatively new. With the advent of Information Technology (IT) and smarter machines, there is a corresponding increase in the demand for faster results by patients. Automation extends to radiological investigations as well. A patient brought after an auto accident could have his brain scan sent to the operating room online while other images of his are sent though phone lines to a specialist's home or office. Those images could be sent to doctors in other parts of the country for second opinion (Tele-radiology). Better archiving of the images and patient records are also possible.

With capabilities of handling hundreds of samples in an hour, the current range of automated machines have eased the workflow, facilitated faster reporting, and automated the inventory and quality control management. Laboratory automation does not benefit the laboratory alone but benefits the patients as well by way of more accurate and faster reports. Chances of mistakes are greatly minimised. All these help in delivering quality service to the patients and their treating physicians. The automation of laboratory testing does not mean there is no need for human intervention or expertise. Results, still need to be evaluated by medical technologists and other qualified laboratory professionals. What automation does is ease the concerns about error reduction, staffing, report timings, and safety.

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