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The Study of Automation View on Laboratory Management in Medical Sector

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ABSTRACT
The management concerns in laboratories for diagnostic type of work are vital at medical sector. There are several ethics are important in the laboratory management such as consent, confidence, tallit, code of conduct, conflicts over diagnosis and patient care are often handled using the fundamental results and interpretations of laboratory test results. These activities already performed through manual and systematic process, the aim of this paper is to study the technologies used for automation of laboratory management and diagnosis system that generates more accurate result than manual ones in the modern era. This paper also brought light on growth of exactness and precision into clinical medical practise in the lab diagnostics using PT and CBC method analysis.
Keywords: Laboratory Management, Prothrombin Time Test, Complete Blood Count Test.

I. INTRODUCTION

In the healthcare sector several medical ethics that delivers advice as well as information to practitioner, scientists on health, safety particularly on how to conduct risk assessments and suitable control measures [9][10]. Modern laboratories like any other business or institution need a wide range of skills based on strict management principles for the ethical use of patient data and other materials, choices on the wellbeing of specific patients as well as general observation and interventions on patients' laboratory tests are also important. Generally, automation in laboratory management and diagnosis provide more correct result than manual equipment [11][12].

This study focused on manual procedure as well as automatic way concern to PT and CBC diagnosis using certain instruments. Let us see the detail working of both tests and analyse their result that specify essentiality of modes of diagnosis.

II. LABORATORY MANAGEMENT

The majority of lab administration tasks i.e., diagnosis tests such as maintaining equipment, refilling consumables, planning of tasks, providing technical guidance and preserving records of entire lab operations or incidents. To ensure most of these jobs fulfil in time it needs efficient way to do these jobs.

A. Manual Machine:

A handbook, document, or book known as a lab manual aid in understanding what must be done in a laboratory. The term "manual machine" refers to machinery or tools used in machine and fabrication shops that are controlled manually, for as by depressing buttons, turning knobs, or pulling triggers. Instead, then being controlled by a computer, these machines rely on the operator's intelligence and expertise.

B. Automated Machine:

An automated machine analyser is a type of medical lab that uses little to no human intervention to quickly measure various chemicals and other properties in a variety of biological samples. These measurable characteristics of blood and other fluids may aid in the rapid detection of disease. The best part of automatic machine tools is their overall better functionality and real-world performance, which improve the testing process's accuracy, consistency, and repeatability. Automatic machine tools operate automatically once they are set up, with the exception of applying power, lubricating supplies, and shutting off power.

III. LABORATORY DIAGNOSTIC TECHNIQUES

Lab tests and diagnostic procedures are used to determine whether a person's health is normal. A lab can examine a sample of your blood, urine, or body tissue to determine whether something is wrong.

A. PT (Prothrombin Time): Manual Method

Prothrombin Time (PT) is frequently used to monitor oral anticoagulant medication, screen for extrinsic factor shortage, and evaluate extrinsic coagulation factor levels. The basic figure of PT test is given below (3).

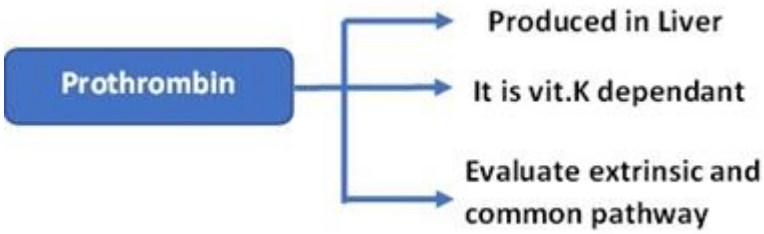

Fig.1 Prothrombin Time Test

The Fig.1 shows the PT test and its associated terms such as prothrombin produced in liver, its dependant on vit.k and used to evaluate extrinsic and common pathway.

The step-by-step procedure to perform PT test is given below:

1. Take 100 ul of plasma in a glass test tube.
2. Place in water bath or incubator for 5 min.
3. After 5 min Add 200ul of PT reagent (Tissue thromboplastin)
4. Start a stopwatch shake the tube gently to mix content.
5. By tilting tube note the clotting time.
6. In the manual method we cannot observe the micro sec as compare to automatic method.

$$\text{Prothrombin Time Ratio (PTR)} = \frac{\text{Clot time of the test plasma}}{\text{Clot time of the control}}$$

$INR = PTR^{ISI}$

Example: PTR of 2.0 and an ISI of 1.0

$INR = 2.0^{1.0} = 2.0$

B. Automatic PT-INR Method:

The manual method explains above and now see the automatic procedure of Prothrombin Time test i.e., PT-INR.

1. First, we have taken tube of sodium cr. In which sample were are collected.
2. Allow sample to settled in the centrifuge the sample 300 rpm for 5mins
3. Then take while in which manage tic rod where place then add 200 ul PT reagent the machine for 60 sec.
4. Then put the supernatant (plasma) for centre tube.
5. We can observe micro sec also and PT or INR also as compare to manual.

Fig.2 PT-INR Machine

C. Complete Blood Count (CBC): Manual Method

Automatic analysers replace manual processes and lower analytical mistakes as technology advances. The preanalytical stage of the entire continuum, however, becomes increasingly prone to problems as the No. of test orders in hospitals and, consequently, as the No. of sample accessioning in medical biochemistry laboratories, rise. Currently, the pre-analytical stage is when the vast majority of mistakes that affect test findings take place [1]. The total blood count is one of the studies' most assessed metric. CBC is thus one of the tests whose results are numerically impacted by preanalytical mistakes [2]. The management of the preanalytical process is challenging since divisions other than the laboratory must participate [6]. It is crucial to have knowledge of the factors that affect the CBC test in order to avoid preanalytical mistakes. The administration of the laboratory is responsible for creating and following the guidelines relating to this problem. This reference material was created as a helpful, appropriate, and practical guide for all medical laboratory personnel, nurses, phlebotomists, students, researchers and the explanation about RBC, WBC given below [4][5].

- **Red Blood Cells (RBC, erythrocytes)**: The akaryocytes that make up red blood cells have a concave disc shape. Its average capacity is 90 fL, and its average diameter ranges from 6.2 to 8.2 m.

Fig.3 Red Blood Cells (erythrocyte)

- **White Blood Cells (WBC, leukocytes):**

Due to their superior achromatic eyesight over that of red blood cells under a light microscope, white blood cells are given the name "white blood cells." They can be further classified into five groups: neutrophils, eosinophils, basophils, lymphocytes, monocytes, and thrombocytes. It takes a very long time to view the results of the manual full blood count technique.

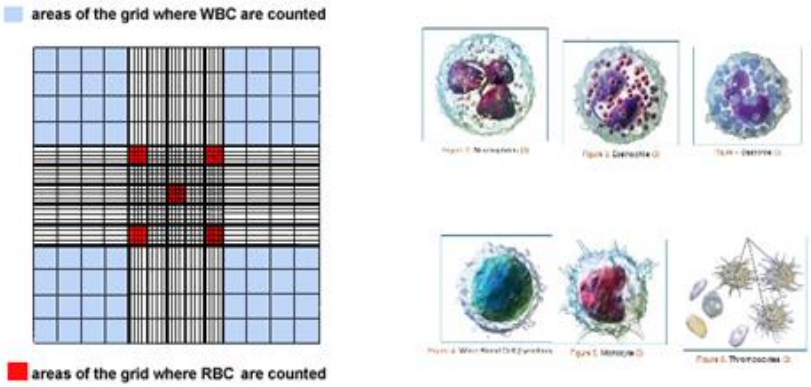

Fig.4 White Blood Cell (leukocytes)

D. Complete Blood Count (CBC): Automatic Method

Blood samples are subjected to testing using hematology analysers. White blood cell counts, complete blood counts, reticulocyte analyses, and coagulation tests are all performed using it in the medical profession [2]. Hematology analysers are available for both human and animal blood, which is helpful for research labs, zoos, and veterinarians. Hematology analysers have different features like “closed vial testing” and “open sampling testing” [6][7][8]. Some hematological analysers give the customer the option of selecting their preferred testing method. The sample size necessary, the kind and number of testing modes, the speed at which the results are provided, the automated flagging of findings that are outside of the normal range, and the number of test results it can store are further elements to take into account in a hematology analyser.

Fig.5 Hematology Analyser

In a matter of seconds, we can see that the automatic machine has displayed the entire CBC. like a manual machine. Because of this, I advise using an automatic machine, which is the best. Its laborious apparatus and data from multiple sources can be gathered simultaneously.

IV. CONCLUSION

The main purpose of the study is to identify impact on outcomes depends on manual and automatic method in diagnostic test carried out at laboratory. To know this PT and CBC tests considered and studied both the approaches i.e., Manual and Automatic Method. Although there is significant debate over the benefits and drawbacks of manual and automatic machines, the comparison and data presented above show that, in lab tests automatic machines outperform manual ones. According to the study, laboratories are much appreciated and accept automation equipment more than manual equipment.

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