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THE ROLE OF MEDICAL LABORATORIES AND NURSING IN DISEASE DIAGNOSIS

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Abstract
Disease diagnosis is important for disease treatment. The disease diagnoses can be conducted in medical laboratories, hospitals, and health care centers. The common role of a medical laboratory is to collect, receive, diagnose, and analyze specimens. An accurate diagnosis is the prerequisite for good medical treatment. Since there are different symptoms among patients, the disease diagnoses depend on many different parameters, including DNA, protein, and human biology. Currently, molecular biology has become the most important technology, and its relevance covers the study of DNA, RNA, and proteins, which enable laboratory scientists to perform their specialized functions and help clinicians utilize molecular diagnostics in their daily practice. Nurses play a key role in this process, including not only the collection of necessary specimens and their timing but also the proper management of the specimens and accurate transmission of the required information together with the samples.
The Role of Medical Laboratories and Nursing in Disease Diagnosis.

Keywords
Medical laboratory, nurse, disease, diagnosis, treatment, technique, laboratory, morphological, blood, electrocardiography, direct, indirect, testing, radiography, radioisotope, immune, microbiology, biopsy, microscope, technique, specific, treatment, nursing care, disease, laboratory test.

1. Introduction

Medical professionals hold a leadership position within medical centers and are the lifeblood of scientific and technical support. This includes medical laboratory and nursing teams. The medical laboratory is one of the important comprehensive departments of the clinical medical center. Even though it contains no operating room, it occupies about 40 to 60% of the results and offers the overall technical results related to the diagnosis and treatment of diseases needed for clinical diagnosis, treatment, and prevention. It also plays a role in health care, medical teaching, scientific research, and relevant guidance and monitoring for clinical medical care activities. As the central collaborative medical station for the medical departments, the construction of the department is the focus of the medical team in the clinical medical center. There exist a number of administrative

and professional technical problems in hospital management and production safety of clinical assays at present, the solutions of which need the joint efforts of laboratory and nursing professionals. Generally speaking, the combination of the administrative, professional, and technical functional system of the medical laboratory and nursing team is crucial to the management of the medical center. (Abbasi-Oshaghi et al.2020)

The medical laboratory of the hospital plays a central role in clinical medication as the subject that supports clinical diagnosis. The function includes a variety of biochemical assays for diseases such as blood, urine, biliary urine, and cerebral spinal fluid, as well as the performance of microorganism culture and drug sensitivity assays, immune diagnosis, blood transfusion, and more. As assistant personnel for assisting the clinical examination, the nursing management function developed over long-term operations. At present, the main three kinds of medical laboratories in the hospital are clinical biochemistry labs, clinical microorganism labs, and clinical immunology labs. With the continuous development of examination technologies, the improvement of the function of lab instruments, the influence of some labs on the results of originating tests is rapidly increasing, and the management in the test stage is gradually increasing. The total technical contents in some large hospitals have exceeded 65%, the detection profile has spread into over 100 items, and the level of technique has extended from routine exams to major check item exams, such as identification of six signal nearly lethal diseases, biochemistry, cortisol, blood-gas analysis, and manifestation of the digestive enzymes of the pancreas, and so on. (Vandenberg et al.2020)

Significance of Disease Diagnosis

One role of a medical center is to help people understand their physical condition and to diagnose diseases, utilizing health examinations and laboratory testing. High school students should also learn the necessity of disease diagnosis and the roles of those who are actually involved at medical facilities. Disease diagnosis is important because it can lead to recovery through early treatment in the case of illness. It is important to accurately diagnose diseases in order to prescribe effective treatment and to prevent the condition from worsening. To accurately diagnose diseases, it is necessary to utilize real-time information from a variety of health examination and laboratory test methods. Even for people who are healthy and do not feel ill, it is important to undergo a health examination to check their current physical condition and to confirm the existence of potential health risks in order to prevent disease. This applies to young people, middle-aged people, and older people. It is also important for pregnant women and nursing mothers, who must take care of both themselves and their children, to understand the current state of their physical condition and to maintain good health. (MacLeod et al.2021)

2. The Role of Medical Laboratories

Many diseases are diagnosed on the basis of laboratory tests. The laboratory test results could indicate the absence of disease or pre-disease. At times, the tests could help in the determination of causes of non-specific and specific symptoms of disease not diagnosable by other methods. Different medical departments or specialties could order the tests. Some tests are specific to the department ordering them. While most tests are those carried out on and interpreted by the patient's specimen, some are carried out to test the ability of the patient to produce normal reactions. Some tests are orderable for a patient with a particular condition and not for ones without that condition. Some tests are non-specific and should not be singled out in the differential diagnosis of a specific condition possessing a broad differential diagnosis. (Tang et al.2020) (Tang et al.2020)

It is recognized that the main function of pathology laboratories is to carry out tests on blood, urine, stool, biopsy, cerebrospinal fluid, lavage, etc. for diagnostic purposes. The cost of such

testing is increasing. However, the fact that costly or experimental tests are not clinically useful would be costly in additional work and possibly in iatrogenic injury and is still less appreciated, such that the benefit of a test is sometimes undefined, is recognized. It is reasonable, at times, to obtain fewer investigative amounts in clinical medicine. Fewer tests lead to both reduced expenditure and, it could be thought, less unnecessary worry for the patients. It is acknowledged that although the decrease in the number of tests ordered would reduce the number of tests analyzed by the laboratory and could expose it to the retention of fewer staff, even if many tests would no longer be performed, there would be costs. These might include the financial incentives to order tests within a managed care setting. On the patients' side, some tests, and particularly tests performed out of the laboratory, do cause anxiety and pain. (Retamero et al.2020)

2.1. Types of Medical Laboratory Tests

A laboratory test can be defined as a procedure that uses some general forms of examination, such as blood, urine, and others, used by doctors and other healthcare professionals to assist in the diagnosis of certain disorders, diseases, and infections, as well as to monitor the progress of a treatment, in order to refine treatment plans, and to screen for certain diseases or disorders before any symptoms appear. There are two major technologies used within medical laboratories: a) in vitro diagnostics, which enables doctors to detect diseases in the blood, body fluids, and tissue, such as liver disease, anemia, diabetes, and HIV, and b) in vivo diagnostics, which allows obtaining information that enables the diagnostic process to be refined, such as through X-rays and ultrasounds. Medical laboratories' range of tests is vast and very diverse, such as blood tests for the existence of lipid disorders, X-ray and nuclear imaging to evaluate the functioning of the heart, tissue biopsies, and cultures in order to detect and identify microbes. Some diagnostic tests provide information about comorbidities, organ function, and therapeutic drug monitoring measurements. Therefore, the health of the patient and the complexity of the described technologies require that professionals should be highly specialized and legally and ethically responsible for the tests being conducted in the medical laboratories. There are several words used to describe these professionals, ranging from analyst to technologist, but in most countries within the European Union, the name that is most often used is biomedical scientist. These professionals are trained in all of the aforementioned subjects and also ensure the validity and truthfulness of the tests. They provide the answers to almost all of the questions that the doctors ask regarding physiological or biochemical pathologies, as well as treatment options. In the end, they are the physicians' greatest allies in providing the diagnosis. Overall, due to the degree of satisfaction and self-accomplishment, a biomedical scientist plays a unique role in medicine, where there is not only a commitment to helping the patient, but also a commitment to the good of society. (da et al.2020)

2.2. Laboratory Equipment and Techniques

Specific techniques in medical microbiology include: A. Preparation techniques: 1. Blood smears a. The blood smear procedure: i. Purpose: A blood smear provides information concerning the number, shape, and dye uptake of the various types of blood cells. Before a smear can be made, at least one drop of blood must be placed on a microscope slide. The fluid side of another slide is then placed on top of the drop and careful pressure is applied, spreading the blood to provide a film of acceptable thickness. The smear is allowed to air dry, after which the film is heat-fixed by gently passing the slide with the smear and film side up over the flame of a burner several times. ii. Staining blood films: Because the cells take up dye poorly, a special staining technique called Romanowsky is used. A dilute, fast-acting basic dye is mixed with a dilute, slow-acting acidic dye, creating the so-called Romanowsky stain. To prepare the stain, a commercially available mixture

should be diluted with a buffer, this buffer containing methylene blue and azure A added in series and mixed at just the right times. (Dybas et al.2022) (Ye et al.2024)

The blood film is then immersed in a 2% aqueous solution of the stain for thirty minutes, after which it is covered with buffer for ten minutes, air-dried, rinsed quickly with distilled water, and air-dried once again. The result is a film where erythrocytes are pink, reticulocytes slightly bluish, polychromatophils varying from pink to bluish-gray, platelets lavender or magenta, eosinophils pink to crimson, basophils deep azure, lymphocytes bluish, and neutrophils lavender-gray. After a blood smear has been prepared and stained, a microscope slide is placed over the microscope viewer's stage, a light source is brought up through the stage, and the viewer is focused, with the coarse and fine focusing knobs, at the lines where cell conglomerations and other color distinctions noted above divide the blood smear. A typical blood smear, made with a similar Romanowsky stain, is shown. (Qin et al.2022)

3. The Role of Nursing in Disease Diagnosis

Nursing at all levels, whether as a flyer nurse, key clinic nurse, district hospital nurse, provincial nurse, urban nurse, midwife, or public health nurse, is responsible for seeing patients and, in doing so, continues to develop or cultivate their skills in the fields of diagnosis and health assessment. To achieve that goal, the community is encouraged to recognize its potential optimally, thereby playing a role in health education. In addition to that role, the nurse also plays a part in making a preliminary diagnosis, a process that is called the first diagnosis or defined as reflecting one of the main nursing tasks. However, nurses are often embarrassed about diagnosing illnesses, mainly after the results of the tests are negative or flow in different directions. (Karam et al.2021)

To overcome this, techniques and skills in detecting patients with potential for developing disease and knowledge in performing tests must be cultivated. Besides enhancing the health and care of patients, it also plays a role in easing the work burden and expenditure of medical and patient health services. Therefore, the community no longer sees the responsibility of healthcare as a task that only exists with the relevant parties but, instead, starts to take part in efforts to examine themselves and at least identify the medical symptoms they have. Based on the principle of giving information and advice to the community, a total healthcare concept is available and fully focused on the sick and healthy public. (Haleem et al.2022)

3.1. Collaboration with Medical Laboratories

Nurses' duties include caring for the sick, supporting patients, and educating the public. Nurses are essential to the treatment of patients with infectious diseases. When the workload is high, it is also possible that nurses cannot go to the medical laboratory conveniently. Because of these reasons, it could unconsciously bring some inconveniences for the diagnosis and treatment of nursing, and cooperation with the medical laboratory is the best solution to realize the concept of comprehensive nursing for a healthy patient. Once a patient checks directly at the medical institution, if the medical laboratory is not available, they must go to another hospital that has a medical laboratory for inspection. The results that will be released several days later extend the patient's suffering, and the charges needed to travel again increase the financial burden on the patient. On the other hand, the patient receives examination through the medical laboratory when they visit the laboratory center directly, and when the patient is seen in the medical institution, they can receive services because the job is reported at the patient's request, allowing staff for treatment to use it, and the patient receives the latest examination results quickly and at an economical charge. (Lee and Lee2020)

By actively utilizing the relevant opportunities for local medical laboratory services, it is possible for the patient to more reliably use medical services, and the collaboration between the medical

institution and laboratory can rapidly increase patient satisfaction, tightening connections as health managers in life. Also, clinicians usually have a relationship with a certain medical laboratory and can argue whether the test data that is continuously released is meaningful and correct. As clinicians or nurses are not exactly from the basis of each medical test, they can assess data reliability because the amount relies on the trust of the microbiological laboratory that needs the result. Consequently, direct communication and agreement between medical laboratories and responsible organizations or health managers would usually be more active and better utilized. (Asamrew et al.2020)

3.2. Patient Education and Support

Patients have a right to understand why examinations and tests are being performed, what services they will receive including the costs to the patient, the actions they should take before, during, and after the process, and the significance of the conclusive data both within the specific facility and in the context of disease. They should receive such information from the examining clinician, but preparing and supporting patients takes time, which is often in short supply. Moreover, third-party payers in many nations are increasingly claiming their place as policymakers with the authority to decide which materials are to be offered and how they are to be presented due to their financial influence on the practice of medicine and nursing. Despite this, clinicians are encouraged to use discretion in signaling patients about available products, for both the benefit of patients and the community. Direct-to-consumer advertising, product packaging, and advocacy groups are all potential pitfalls for the patient that might invite biased information. (Jacofsky et al., 2020)

Human beings do not engage in all types of activities unless they understand the role and the possible effect of such processes. For example, a woman with a new human being in her life—a baby growing within her—may be keen on learning about how a laboratory examination might assist in determining chromosome abnormalities and open neural tube defects in the developing baby and in considering the meaning of the results and her alternative decisions. It is certainly convenient for the laboratory not to discuss the exam with the patient since views may vary and the laboratory is removed from the difficult task of answering the deceptively difficult question, “What would you do?” However, providing evidence-based knowledge and referral services for relevant and worthy alternatives to high-risk invasive procedures can be of tremendous practical interest to pregnant women and to medical laboratory staff. Unfortunately, the entire world is not fluffy, nor happy, nor bright, nor gentle. Understanding often only comes with concern, care, and participation. The baby is carried by the mother, so she has the primary voice in deciding whether to obtain services as well as the disposition of juvenile offspring. The mother is also both the chief return from the service and the chief investment as a patient. Thus, although there are advantages to the other called caregivers, there are also obligations owed to the pregnant woman desiring to understand the feelings she is experiencing and the services and facilities she requires from healthcare workers and commercial manufacturers to calm down and understand the meaning of biomedical laboratory tests.

4. Challenges and Future Directions

Currently, 70% of medical decisions are based on the data from medical laboratories. The use of medical laboratory science knowledge, the performance of nursing tests under the nurse's authority, and the performance of tests with d-NAT and POCT possibilities should be strengthened. Nursing tests can be performed more easily for the diagnosis and follow-up of patients with chronic diseases. In this pandemic period, this scientific study has findings for health professionals and other stakeholders. Lab nurses, MLTs, future professionals, and their mentors

can contribute solutions to the problems found. These solutions will address many demands in health, especially in a crisis period like today. (Alowais et al.2023)

It is observed that the studies in the field of nursing tests in the literature are not at the desired level, and this is an important deficiency. In this study, it was seen that the test-related scientific studies in the laboratory branch under the authority of nurses are quite low. In the following, collaborative scientific studies undertaken by the representatives of the mentioned laboratory sciences can be presented. As a result of the research, it was determined that scientific studies conducted on this subject are insufficient. In addition, results on the general evaluation of the studies have been presented. In addition to the listed methods, allowing the development of interdisciplinary study, supporting and reporting multi-dimensional development with other scientists is one of the strengths of the study. On the other hand, the number of recommendations for the nursing profession has been limited because researchers conducted comprehensive research for the represented sciences.

4.1. Technological Advancements

Medical laboratories are the closest partners of the physician. The processing of the hundreds of specimens that are processed daily in the average laboratory involves powerful computers and sophisticated mechanical equipment. This equipment increasingly provides physicians with much of the objective information that they use to diagnose and monitor the progress of the patient's disease. Many doctors could no longer function effectively without this assistance. As the public's awareness of its health needs has grown and the costs of health care have risen, society therefore requires that its services be delivered intelligently, economically, and effectively. The relationship between doctor and laboratory, the benefit derived from the existing technology, and the future direction of that technology therefore require considered attention to issues of common concern to medical professionals and the patients they serve. (Church and Naugler2020)

5. Discussion

Despite the lengthy chain of healthcare providers from healthcare workers, medical laboratory professionals, clinicians, and nursing staff to pharmacists and patients, few publications focus on the triangular relationship when facing disease diagnosis. After all, the detection of infectious diseases holds a crucial position in the entire healthcare system. Simply put, without disease diagnosis, the relationship between patients and nursing staff only goes as far as throwing some over-the-counter drugs at symptoms, and the relationship ends without eliminating the source of the disease. However, once we introduce the critical contribution made by healthcare workers, medical laboratory professionals, and clinicians, we see that the team effort of diagnosing diseases makes the bond between patients and nursing staff more substantial. Over the years, the medical laboratory and nursing relationship promotes and optimizes the utilization of medical laboratory services, thus enhancing patients' health status and nurses' health quality perceptions. In the caring process, 'no proper diagnosis' is 'no proper care.' When each player in the system knows their role and cooperates properly, the diagnosis of diseases tightens the connection between nursing staff and the patients under their care. In summary, medical laboratories and nursing should cooperate closely in order to practice 'doing the right types of clinical laboratory testing on the right patient at the right time.' (Lynch et al.2024)

6. Conclusion

In conclusion, the role of medical laboratories and nurses in the care of every patient in the healthcare system is important in the prevention of disease, management, treatment, and rehabilitation. Patients worldwide rely on the medical laboratory for their diagnosis and treatment. The speed, accuracy, and reliability of the results delivered by this institution have an effect on

medical assistance and on the best management. Laboratorians must be able to successfully capture a significant portion of the inpatient care in the hospital, contribute, and be sustainable throughout the inpatient treatment. Close interdisciplinary medical laboratory team collaboration is vital to the successful realization of the whole process of diagnostics, treatment, and care of each patient using state-of-the-art technology, methods, and instruments within the scope of disciplines and services covering the medical laboratory. The diagnostic cycle of the medical laboratory should be monitored and, where possible and applicable, the technology and instruments used to reduce errors that occur at various stages of the diagnostic process. It seems likely that the proactive role played by laboratorians may very well be the antidote for reducing the volume of work inappropriately placing a burden on the worldwide healthcare system. (Alowais et al.2023)

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