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MINI-REVIEW

Knowledge of the Laboratory is mandatory for nursing professionals

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Abstract

In present-day medicine, doctors depend closely on diagnostics to help them with patient management, making or except prognosis, and enforcing the suitable remedy. It is consequently critical for the laboratory to produce acceptable check results. As laboratories try out mistakes in the analytical processing, they are probably subdivided into laboratory departments, such as molecular biology, hematology, chemical pathology, and microbiology. Inappropriate samples due to mistakes while blood collection usually happen when the blood samples are drawn via way of means of nursing staff whose experiences and education are not enough to draw blood evaluating to the phlebotomists who are professionals for collection of blood specimens. Inappropriate sampling for laboratory tests eventually rises cost healthcare, troubles for patients and spreads the fancy and foresight of the laboratory. The paper highpoints the features distressing the outcome of laboratory, a few be managed by educating and training the nursing staff, and indicates version factors that cannot be modified.

Keywords

Nurses, Turnover tendency, Vulnerability, Stigmatized, Stereotyping.

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Introduction

Laboratory assessments play a critical function in the prognosis and remedy of diseases. Almost 70% of the selections about the prognosis, therapy, hospitalization, and discharge of sufferers are based on the effects of laboratory assessments. The check time includes three analysis stages: pre-analytical, analytical, and post-analytical stages[1]. The pre-analytical mistakes are the mistakes that arise from the time at laboratory check-in ordered with the aid of using the clinician till the specimen is reached in the laboratory for analysis. This degree of laboratory trying out is liable to mistakes encountered during the trying out process[2]. Pre-analytical segment of the laboratory and the hospital, the nursing employees are regularly assigned the duty of blood samples collected from the patients and directed towards the laboratory for analysis[3].

The correctness and reliability of a laboratory's final results rely upon the fine of each of those phases. Errors may also arise in any segment of an investigation. Pre-analytical segment bills for 75% of all laboratory test mistakes; they can emerge at any factor within the procedure, extending from the instruction of the patient, pattern collection, transfer/transport, processing, and garage to physiological effects and/or interventional factors. The insufficient amount and beside-the-point first-rate of the specimen might also additionally account for over 60% of pre-analytical errors[4] The lack of awareness of blood series process[4], mistakes in affected person identity and preparation[5], illness in pattern series device/ container[6] and errors in pattern coping with at the end consist of laboratory results.

These mistakes can significantly affect the reliability of looking at the development and adversely affect the affected person's care. As the pattern series is executed via means nursing workforce, those mistakes can hardly ever be diagnosed via the laboratory. The function of the 'human factor in pattern series makes removing mistakes unrealistic. However, recognizing and identifying regions of possible errors with adequate, repetitive, chronic expert education can appreciably lessen them[7]. The review aims to focus on common factors and educate nurses on common pre-analytical factors that affect test results.

Patient Identification

It is of extreme significance to become aware of the accurate affected person, an excellent way to accumulate a precise sample. Whenever the identity of the affected person is achieved, it miles constantly prudent to apply identifiers like call of the affected person & particular identity variety with the date of birth[8], and the in-residence sufferers ought to put on wrist bands with the above identity records that are tested via way of means of the group of workers time and once more the specimen are amassed by the affected person[8]. Identity of significantly ill, unconscious sufferers or kids ought to be performed with greater precaution via way of means of adopting the stringent vigilant technique to make certain that there may be no mistakes as any lax mindset couldn't simply bring about wrong sampling; however, additionally unreliable laboratory results in the long run affecting affected person care and in unfortunate instances mistakes in judgment inviting clinical negligence[9].

Sample Labelling

Incorrect labeling of patterns will inadvertently have wrong laboratory results. The team of workers ought to follow by accurate pattern labeling techniques with the labeling of tubes carried out right now after pattern series at the bedside according to the Clinical & Laboratory Standards Institute (CLSI) guidelines[10].

Specimen Error

Sample variation and irregularity, either labeling error (request, bottle/ vacutainer both); loss of point out of anatomical position in surgical pathology specimen wrong sample container; incomplete clinical history; incorrect specimen designation or improper handling of the specimen before arrival within the lab.

The cruelty of the difference will decide how and which range of patient can be affected, Mistakes might be common in surgical Histo pathology, and short identity is wanted to fall capability damage to patients. In operation theatres and surgical regions nursing dealing with tissue sample must have knowledge of the outcomes tagging the packing bottles and improperly filed paperwork. The loss of facts in the request form avoids the test center from alike handling the Tissue, eventually postponing examination and affecting personal care[11]. Tagging mistakes are normally of three types.

First, the sample container or specimen is recognized for specific patient, while the attached demand form belongs to any other patient. Second, the sample was collected in the wrong tube and directed to an irrelevant department. Third, the sample was collected properly and in an appropriate container, but the sample was not labeled and sent to the laboratory without patient information or a requisition form. Unfortunately, all these errors are human and are very common and held routinely in different hospital setups. Still, they can be minimized by educating and training the nursing staff. They can be overcome by nominating someone to double-check the sample before sending it to the laboratory for analysis[12].

Patient Preparation for the Test

The series of scientific chemistry samples for fastings, such as serum insulin, glucose analysis & blood lipid profile, calls for fasting (at least 12 hours). Those issues should be considered by the nursing workforce while phlebotomy of blood samples[13]. It can only be possible if the nursing staff is continuously briefed on the protocols of such types of sample collections.

Collection site

Venipuncture selection be able to set the value of the specimen. Median cubical vein is the maximum decided position for collection, observed through other vein like cephalic and basilica. Collecting from the basilica ought to might be consummate with warning as risk of harm to the adjoining artery and nerve which is brachial median nerve. Phlebotomy location must be applied with alcohol swab starting from middle of the selected place and persevering out in circles. Alcohol swab must be let to air dry earlier than beginning phlebotomy as infection with alcohol swab can lead hemolysis ensuing in elevations of ranges of analytes along with potassium, Lactate Dehydrogenase (LDH), and magnesium. A most important point which must be taken in mind while collecting a blood sample is that if the patient has a continuous infusion of saline, then the sample must not be collected from that site, or if it is not convenient to draw from any other site, the saline infusion must be stopped for 5 minutes before collection of blood from the same site. The collection of samples from the site of infusion leads to dilution of a blood sample which gives inappropriate results for clinical chemistry and hematology as well[14].

Tourniquet

The tourniquet ought to be carried out 3-four inches upward of the venipuncture site. Prolonged tie of tourniquet creates elevation in analytes which are protein bound and are non-diffusible. It is usually time-honored that a tourniquet should no longer be saved for a couple of minute[15].

Sequence of Sample Draw

The order of draw as endorsed with the aid of using CLSI for assessment blood series tubes: tube for blood culture, citrate tube, serum separator/serum tube, heparin, ethylene diamine tetra acetic acid, and fluoride tube. The infection of K2 or K3 EDTA on the needle from the lavender pinnacle tube to the chemistry tube can cause high serum potassium level[16].

Tube Mixing

Tubes containing components must be mixed via way of means of inverting tubes at least 8-10 instances for correct uniform mixing of the anticoagulant with the blood. Sample must not be shaken longer or vigorously as it would purpose hemolysis. The vacutainers must not be used if they expire as it could purpose a lack of vacuum, ensuing inappropriately extent and modifications in blood to additive ratio[17].

Delayed Transportation and processing of the sample

All tests ought to be handled expeditiously after collection. Delay centrifugation allows cells to stay in contact with the plasma or serum, which may lead to elevated concentrations of a few analytes like Ammonia, Creatine kinase, lactate, LDH, and phosphate[18]. At the same time, results of some parameters get decreased when the delay stays for a long time, including Glucose, acid phosphate, and bicarbonate. Arterial blood collected for acid-base analysis should be sent promptly to the laboratory in a temperature-controlled manner. Likewise, a sample collected for the analysis of platelet functioning should be sent immediately without vigorous shaking to avoid compromising the quality of the result[19]. The above two mentioned samples need special care and are kept in the practice of nurses by making them aware regarding the collection of samples[20]. The collected sample takes 20 to 30 minutes for clotting, and the tube should be kept upright in a rack for the separation of serum from the cellular component of blood. The tube containing anticoagulant can be taken to centrifugation after 10 minutes of sample collection and can be further processed[21]. The speed and time of centrifugation should be followed according to the manufacturer's recommendation[22].

Temperature

The nursing staff is also responsible for ensuring the transportation of samples to the laboratory at the preferred temperature for the sample. Some blood samples, including blood gases, pyruvate, parathyroid hormone, Adrenocorticotropic hormone (ACTH), ammonia, and lactate, are temperature sensitive and need a special protocol for transportation. There is a need to be aware and intensify the knowledge of nurses to minimize the pre-analytical errors by nursing staff, collect the appropriate specimen inappropriate tube drawn by the right person and in appropriate condition, and transport the sample time to the laboratory for the analysis[23].

Biological Factors

Although some factors have been mentioned above, there are still different variables that may not be accurately supervised but have their importance and can affect the laboratory results. Those variables mostly belong to the patient, including their gender, age, racism, Body mass index, pregnancy, menstrual cycle, dietary intake, lifestyle, which includes exercise, use of alcohol or caffeine, and their posture as well[24]. For instance, neonates have low glycogen storage, leading to their low blood glucose levels; likewise, they have elevated hemoglobin concentrations. Similarly, serum creatinine concentration depends on skeletal muscle development from infancy to adolescence[25]. There are various parameters that vary in genders and even variate age-wise, including enzyme levels of heart and Liver

Function tests as well as sex hormones, which alter in females during menstruation and even after menopause. However, multiple analytes are lower in females than males, for instance, calcium, creatinine, urea, uric acid, hemoglobin, and creatinine kinase[24, 26, 27]. Dietary intake also affects the concentration of analytes, such as junk meals causing elevated Glucose, lipids, and alkaline phosphatase but lowering the urate level.

In contrast, the protein diet affects the level of urea, phosphate, and cholesterol[28]. Physical exercises also influence different analytes, including hormones like glucagon, somatotropin, cortisol, ACTH, epinephrine, and norepinephrine, increasing their levels while insulin levels get decreased[31,32]. Multiple studies have been conducted on physical exercise, which exhibits a rise in the concentration of pyruvate kinase, creatinine kinase, urea, bilirubin, and Aspartate transaminase by two-fold, four-fold, and one fold respectively, tested in individuals after participating in marathon race[33]. The posture of patients while sample collection also affects aldosterone, renin, catecholamines, angiotensin II, and diuretic hormones as the supine position reduces the filtration process, which causes volume shifts in the intravascular compartment[34,35]. Similarly, if the patient is in an upright position, it may lead to a rise in concentration by 5 to 15 % of macromolecules higher in 4 nm diameter comparatively in supine position[36]. So, the nursing staff must be well trained and aware of these scenarios to minimize the errors in laboratory tests.

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