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Turkish Journal of Biochemistry

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28-29 Nisan 2018, Kayseri

TBD-BD PREANALYTIC PHASE SYMPOSIUM 2018

28-29 April 2018, Kayseri

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WELCOME MESSAGE

Dear Colleagues,

Thank you for coming.
This year, we are performing **TBS-BD Preanalytical Phase Symposium** with the support of colleagues from Kayseri, at Kayseri Hilton, 28-29 April 2018.

Many important problems of preanalytical phase will be discussed at the meeting as well as education and training addressing preanalytical phase and practice at the city hospitals, the newly established big hospitals in different provinces of Turkey.
The scientific program of the symposium is very rich. The most important ones will be presented by colleagues from Ministry of Health: Monitoring errors of preanalytical phase at the National Safety Reporting System, and on a MoH Project, the Project of Rational Utilisation of Medical Laboratory.

Other important topics such as effects of posture and exercise on test results, centrifugation and preanalytical errors, validation and verification of blood collection tubes, difference between serum and plasma samples, the importance of equipment and pipetting, pneumatic systems, preanalytical phase of hematology and hemostasis testing, preanalytical phase in immunochemical analyses, blood gas analysis, therapeutic drug monitoring and drugs of abuse, mass spectrometry and atomic absorption spectrometry, by competent colleagues at these areas.

There are about 150 participants from different provinces of Turkey and 30 of them are speakers. These attendants will present 70 poster and oral presentations at the meeting. All presentations will be published in the **Turkish Journal of Biochemsitry**, a SCI-E indexed national laboratory journal.

We thank very much to BD and friends from BD-Turkey for their close and sincere collaboration and support.
We thank also to IFCC and EFLM for their auspices.
Of course, we thank very much to colleagues from Kayseri.
I wish a productive and successful syposium.

Best regards,
Dr. Doğan Yücel
TBS President

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INVITED SPEAKERS ABSTRACTS

MONITORING OF LABORATORY PREANALYTICAL PROCESS ERRORS IN NATIONAL SAFETY REPORTING SYSTEM

Dilek Tarhan
General Directorate of Health Services
Department of Health Care Efficiency, Quality and Accreditation, Ankara

Prevention of errors that occurred during health care has become the most important agenda of today's health service providers. As stated in the 1999 report "To Er is Human" published by the Institute of Medicine (IoM), millions of people die or suffer from medical errors every year. In addition, medical errors have also shown significant damage to countries' economies. After the report, the prevention of medical errors has been on the agenda for more and more countries' health care policies. In the "Improving Diagnosis in Health Care" report published by the same institute in 2015, it was stated that most of the mistakes were experienced during the diagnosis process.
The joint solution proposal, which is carried out by IoM and WHO in patient safety trials, is the development of a malpractice learning practice. In our country, attention has been paid to report of medical errors and culture of learning from mistakes within the scope of Turkey Quality System in Health since 2005. "Safety Reporting System" was created at the level of the health facility. Also in 2014, the "National Safety Reporting System (GRS)" has been established.
The "National Safety Reporting System" is a system developed specifically for Turkey, which aims to classify the adverse events occurring in the health facilities by a coding system by considering them in the categories of patient safety, laboratory safety, surgical safety, drug safety and employee safety. With a similar set of applications in the world, this system has a wider scope and content and appeals to a much larger population.
Notifications to the system can be reported immediately by GRS's reporting capabilities. In order to make guidance for the activities of health facilities' actions against the error risks and to make the health workers more conscious about the common mistakes, important reports are shared openly for everyone. In addition, all reports on errors are used with the aim of improving Health Quality Standards, thus avoiding errors related to health care processes.
Under GRS, the "Laboratory Error Classification System (LHSS)" has been developed, with the aim of systematically analyzing errors that may threaten patient safety in the laboratory. Using this systematic, both in-laboratory and inter-laboratory analyzes of errors are provided and a standard language association is provided for comparison.
According to the LHSS error process, 10704 errors (5.84%) were reported for the analytical process, 6151 errors (3,35%) for the postanalytical process and 166447 errors (90,80%) for the preanalytical process. The first 10 errors reported are "hemolyzed sample, clotted sample, inadequate sample, improper test request, improperly sampled sample, failure to record sampling time, incorrect sampling vessel / tube, regulation of pathology request form, (The results of laboratory errors based on the instantaneous reports from GRS notifications. Which are received on 17.04.2018).
The reports of the system can be found at https://grs.saglik.gov.tr/Default.aspx.
Further analyzes of GRS reports have not yet been undertaken. Detailed analyzes should be carried out in the academic frame by using the data of the Ministry and the results of the national GRS should be compared with the evidence based studies carried out at the institutional level. There is also need for studies to compare GRS data with national and international academic literature results.
It should also be used to improve the healthcare system of our country and to improve patient and employee safety, as well as the use of the results of the current outcomes and detailed analyzes to provide scientific contributions to the national and international literature.

QUALITY CONTROL AND QUALITY ASSURANCE AT PREANALYTICAL PHASE

Canan Yılmaz
Gazi University Medical Faculty, Department of Medical Biochemistry, Ankara

Quality control is the whole of the verification activities, methods and instruments that are performed to check the conformity of the laboratory service to the specified standards and requirements. Quality control is an application to check if the service meets the expectations and it aims to prevent possible mistakes and deficiencies by examining and testing with appropriate methods before presenting the service to the patient. Quality control aims to keep the quality under continuous control.
Service provided in laboratories should have certain standards. The point we reached today is "quality assurance" which is a patient-focused concept. Securing the quality is a legal and ethical obligation in laboratories. Quality assurance for clinical laboratories mean that the reliability of laboratory tests, productivity and clinical use are continuously improving, measurable and traceable. It is the whole of planned and systematic activities that are applied to ensure sufficient confidence that a product or service fulfills the requirements stated in the quality. On the basis, it aims to protect the quality through which the product or service passes at the planned level by using minimum resources at all stages such as instructions, duties, responsibility definitions, authentication, training and raising awareness about quality of employees etc. It should not be forgotten that it is important to focus on the target, not the fault in the process. Even if preventing faults before occurring is ideal, it is not always possible. It is aimed correcting the fault and prevent repeating, not ignoring. Quality assurance applications are used in laboratory service to determine the causes of deviations from standards and to provide process standardization; it includes quality planning and error prevention approaches. In this way, all of the laboratory processes are handled as a whole, and the continuity and improvement of the quality is ensured. Therefore quality assurance is an indication of reliability of the presented service. It simplifies the scope of quality control by securing the quality. It saves time and money, minimizes labor and material losses, and ensures the highest efficiency at the lowest cost. It increases motivation of the employees. It encourages to improve product and service quality. It protects the foundation's reputation. It increases the satisfaction of the customer and gives confidence the customer. It provides competition advantages.
There are some fundamental differences between quality control and quality assurance. The main difference is that quality control is based on examination, the quality assurance is based on prevention. The main goal of quality control is to provide the benefits that will help to correct the current processes in the laboratory. In other words, quality control is focused on the detection of faults. These determinations (evaluation of performance, comparison of performance with standards, etc.) are carried out through the controls performed during the laboratory processes. In the quality control, the target is determining the error, sorting and classifying it according to predetermined standards. The majority of the methods applied during these procedures are statistical methods.
At quality assurance, work performed with quality control is being carried to the next level. The main objective of quality assurance is to secure the continuity of control and verify it. It is a matter of taking precautions to prevent large losses in quality assurance. These precautions include early warning systems. The results obtained with quality assurance are gain not only for the laboratory in the production/service process but also for the patient and the hospital. The target in quality assurance systems is complying to the specifications of products/services through the use of methods such as assessing compliance with procedures and statistical process control. In quality assurance, institutions aim to establish a system that will control if the work is adequate for both design and conformity aspects.

PREANALYTIC STAGE QUALITY INDICATORS AND REPORTING

Funda Güçel
Ankara Etlik Zübeyde Hanım Gynecology Education and Research Hospital Biochemistry Laboratory, Ankara

The importance of laboratory data is great in the medical decision-making phase. Since the presence of laboratory errors will cause medical errors, avoiding laboratory errors will reduce medical errors. Medical laboratory errors come into play in preanalytical, analytical and postanalytical stages. Preanalytical phase faults make up a large part of the total faults.We need procedures that are objective, measurable, continuously improveable so that we can reduce lab errors. These indicators are quality indicators.Quality indicators are system improvement tools and can be corrected, neutral and quantitative.The quality indicators are also one of the conditions required by the TS EN ISO 15189 standard.
Regarding quality indicators, there are documents and studies carried out at international level. Quality indicators are mentioned in CLSI-QMS12-A Guideline. In addition, a working group called "Laboratory Errors and Patient Safety" was created by the IFCC. In the consensus conference organized by this working group, the quality indicators were determined and scored according to the significance scores. 28 preanalytic indicators have been defined. Of these, 22 are obligatory indicators.
Quality indicators for medical laboratories are also defined in the Health Quality Standards and Indicator Management Guide organized by the Ministry of Health. The preanalytical indicators stated in the indicator management guide are two. The number of rejected samples and the number of lost samples.
Reporting stage is important in indicator management. At this stage, indicator cards should be arranged. The calculation method, target value, data source, data collection period, data analysis period must be specified on these cards. Identified targets must be realistic. At least 6 months of data collection is required retrospectively.If the specified goal has not been achieved, then root-cause analysis is performed. To reach the target; data should be evaluated, comparison between results should be made, corrective preventive activities should be initiated if necessary, information should be given to relevant units and trainings should be organized.In indicator management, targets must be sustainable and improvement must be continuous. In addition, harmonization between laboratories and determination of quality specifications,and even regulation of external quality control programs related to quality indicators is the process of supporting the reporting phase.
Key Words: Quality indicator, preanalytic phase.

RISK MANAGEMENT IN THE PREANALYTICAL PHASE

Güzin Aykal
University of Health Sciences, Antalya Training and Research Hospital, Clinical Chemistry Laboratory, Antalya

Risk: Combination of the probability of occurrence and the severity of harm. Risk analysis: Systematic use of available information to identify hazards and to estimate the risk. Risk evaluation: Process of comparing the estimated risk against given risk criteria to determine the acceptability of the risk. Risk management: Systematic application of management policies, procedures, and practices to the tasks of analyzing, evaluating, controlling, and monitoring risk.
1- Risk identification is the first and the most important step in the risk management. Every preanalytical step carries varied risks and may require varied control measures.
1.1. Process mapping: This tool is used to analyze a particular preanalytical process by breaking it down into small steps from start to finish.
1.2. Fishbone diagram: A fishbone diagram outlines the cause and effect of a testing process.
1.3. Risk identification table is a simple table that lists all the errors identified in the different testing phases for a specific test.
2. The risk assessment matrix is constructed and interpreted according to the acceptabilty of the risk.
3. Risk mitigation: For any risk that is deemed unacceptable, the lab should identify ways to reduce the probability of harm, using prevention and detection methods, in order to bring the risk down to an acceptable level.
3.1. Determine a monitoring plan.
3.2. The risk assessment will be used to develop an Iaboratory QC Plan.
The implementation of the preanalytical risk management may seem daunting and certainly time consuming, but the process, if performed diligently, will increase laboratory quality and patient safety.

LBYS AND HBYS IN MONITORING OF THE PREANALYTICAL PROCESS

Cihan Coşkun
Istanbul Haseki Training and Research Hospital, Istanbul

Information system is an arrangement of data, processes, human and information technologies and these elements are in constant mutual interaction in order to collect, process, store and provide information required for supporting an organization. Health Information Systems (HIS) basically comprise of two main factors: administrative and clinical information systems. The first applications of HIS come across in developed countries such as the United States of America. Developments in this area have gained a momentum by means of some organizations such as “Healthcare Information and Management Systems Society” that was founded in 1961 with the aim of improving healthcare quality, safety, cost-effectiveness, and access, through the best use of information technology and management systems. However, early HIS applications were generally administrative-oriented due to health policies applicable in the United States in the 1960s. With the introduction of healthcare reforms based on patient safety and quality in healthcare services and the accelerated development in information technology in subsequent years, practices for clinical HIS have also become widespread. While the use of computers in healthcare institutions started in the mid-1990s in our country, especially in the beginning of the 2000s, the number of software for HIS increased with the incentives from the Ministry of Health. “Health-Net Project” launched in 2009 by the Ministry of Health in order to collect data from healthcare institutions has been accelerated the use of HIS across the country and the integration efforts among HIS. In addition, the Ministry of Health has made mandatory to use Hospital Information Management Systems (HIMS) and Laboratory Information Management Systems (LIMS) in certain preanalytical processes conducted by laboratories in accordance with “Health Quality Standards”. Conducting of preanalytical processes performed outside or inside the laboratory such as patient record, test request, and collecting, barcoding, aliquoting, sorting of samples with supporting of HIMS and LIMS reduced the errors in the preanalytical phase, which is responsible for a major part of errors in the total testing process. In addition, the use of preanalytical automation systems integrated with HIS has contributed to reducing the errors in the preanalytical phase. Conclusionally, the HIS used in the preanalytic phase helps to shortening of turnaround time and improvement of the quality of the health service offered. On the other hand, not fully standardized HIS applications, existing integration problems and the failure to provide adequate technical support by the HIS firms prevent the HIS from being used at the desired efficiency. Finally, it should be remembered that the problems that may arise during and after a new HIS is installed in any healthcare institution can be minimized by the cooperation among all stakeholders.

EFLM WORKING GROUP OF PREANALYTICAL PHASE ACTIVITIES

Pınar Eker
Istanbul Provincial Health Directorate Chairman of Public Hospital Services-2 Central Lab -2 Biochemistry Director, Istanbul

European Federation of Clinical Chemistry and Laboratory Medicine Working Group for Preanalytical Phase (EFLM WGPRE) was established to lead in standardization and harmonization of preanalytical policies and practices at a European level. Main goals: To promote the importance of the quality of the preanalytical phase of laboratory medicine; To define the best practices and provide recommendations for some critical activities in the preanalytical phase; by questionnaires to conduct with the aim to assess the current pre-analytical practices;
Working group of preanalytical phase in standardization and harmonization of the preanalytical phase in Europe activities based on published papers are these: Survey of national guidelines, education and training on phlebotomy in 28 European countries; Standardization of collection requirements for fasting samples; Preanalytical quality improvement; Compliance of blood sampling procedures with the CLSI H3-A6 guidelines: An observational study; Patient identification and tube labelling – a call for harmonisation; Local validation of blood collection tubes in clinical laboratories; standardization and harmonization of the preanalytical phase; Blood Glucose Determination: Effect of Tube Additives; Practical recommendations for managing hemolyzed samples in clinical chemistry testing.4 Conferences had been established on Preanalytical Phase first in Parma, 1-2 April 2011,second in Zagreb, 1-2 March 2013; and third in Porto, 20-21 March 2015 and last in Amsterdam 24-25 March 2017. Venous Blood Sampling Guideline is on progress. EFLM Webinars for the spring is arranged. EFLM-AACC Conference 2019 is scheduled for on November 8-9 2019, location is Washington D.C. 5th EFLM-BD European Conference on the Preanalytical Phase will be on March 22-23 2019.
Key words: Preanalytic, activities, working group, EFLM

THE IMPORTANCE OF EDUCATION IN THE PREANALYTICAL PHASE

Bağnu Orhan
Istanbul Training and Research Hospital, Istanbul

Laboratory test result is necessary and effective in many medical decisions such as detection, classification, treatment and follow-up of the disease. It is important for patient safety to report accurate and timely test results.
Laboratory test process comprises of preanalytical, analytical and postanalytical phases. It is also possible to add pre-preanalytic and post-postanalytic phases.
Preanalytic phase is the phase taking place before the analysis and covers the process from requesting the test appropriate for the patient to taking sample, its transport and preparation for analysis.
The majority of laboratory errors (60-70%) occur in the preanalytical phase. Most of these errors originate from humans.
Although automated systems and the developments in information management systems are effective in reducing errors in the preanalytical phase, many errors still occur.
In the preanalytical phase, procedures such as test request, patient identification, preparation of the patient, taking samples and transport, centrifugation and storage of samples are carried out. Errors based on these procedures may be: failure to request the appropriate test, errors in preparing the patient, errors in patient description, errors in taking the samples, holding the tourniquet for periods that are more than necessary, errors in taking samples, failure to observe the order of taking blood tubes and transfer-related problems etc.
In the preanalytical phase, the current condition must first be determined; then the process should be improved. One of the most important components of process improvement is training.
In addition to providing training to new beginners, other employees should also refresh their training. There are a high number of studies showing that continuous training is effective in preventing errors. A good communication and cooperation between laboratory and other medical departments will reduce the errors in the total test process and especially, in the pre-analytical phase.
Healthcare professionals such as physicians, nurses and others, transportation personnel and laboratory technicians from various training levels and professions play a key role in the preanalytical phase. When training is given, it is necessary to organize the training according to the professions and roles of such people, to refresh their knowledge at regular intervals and to measure the effectiveness of such training.
Consequently training has a great importance in reducing the preanalytical errors that constitute a large part of laboratory errors during the total test process.

PEDIATRIC BLOOD DRAWING AND BLOOD DRAWING FROM IV LINES

Ipek Cinaroglu
Becton Dickinson, Istanbul

Pediatric patients in difficult vascular access group, and blood collection procedures differ from adults. Different equipment for venous and capillary blood collection have been defined in the WHO and CLSI guidelines for quality sample handling and pain reduction. Therefore, before drawing blood; technique, site, proper equipment selection and the amount of blood to be drawn should be determined.
While the equipment differs depending on the site preference, age and weight for the venous collection, in capillary collection the depth and width of the incision and the amount of blood required is determinative. Where safety is very important, uncontrolled use of materials, can lead to very vital risk situations such as osteomyelitis or iatrogenic anemia.
In addition, increasing the blood flow by heating the site, scalp blood collection, use of incision device and determining the maximum amount of blood to be used in accordance with the patient weight is also important.
It may be necessary to draw blood from patients who are interfering with the catheter. It is a source of infection as it increases the number of catheter accesses. Therefore, the appropriateness of the procedure is very important to control the risk of infection, preventing catheter occlusion and providing sample quality.
There are many articles, guidelines on different aspects of catheter disinfection, appropriate washing solutions, syringe sizes, lumen choice, duration of infusions, amount of waste blood, equipment, and transferring sample to the tubes. Defining the most appropriate to create the most suitable, standard institutional procedures from these views is important.
Key words: Safe blood drawing, pediatric blood drawing, capillary blood drawing, difficult vein access, catheter blood drawing
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PLASMA OR SERUM ? EFFECTS ON ANALYTES AND TURNAROUND TIME

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Turnaround time (TAT) is the time interval which begins when a clinician orders a test and ends in the clinician obtaining the result of that particular test and is crucially important for emergency laboratories. To give glucose test results within 1 hour was the goal of our emergency laboratory to improve the laboratory quality strategies. In order to reduce our TAT, we planned to use BD Barricor™ tubes in the emergeny department.
BD Barricor™ tubes containing lithium heparin as additive, uses a mechanic elastomer separator resting on top of the tube. The separator moves to a proper position during centrifugation, stretches, and channels are created around the separator which allow blood cells to sediment out of the plasma throughout the 3 minutes of centrifugation. When the centrifuge slows, the elastomer returns to its original shape, forms a seal between the plasma above and blood cells below creating a stable barrier.
We compared the results of blood tests (myoglobin, CK-MB, cTnI, glucose, total protein, creatinine, cholesterol, triglycerides, UIBC, ALP, amylase, calcium, BUN, HDL, CK, AST, GGT, Mg, Na, K, Cl, P, bilirubin, albumin, LDL, Fe, ALT, LDH, uric acid, folic acid, fT4, fT3, ferritin, TSH, vitB12) simultaneously taken into SST and Barricor tubes. In this study, we also evaluated our TATs after using BD tubes in emergency department. When using SST tubes, we were able to give only 65-70 % of glucose test results in 1 hour. After starting to use BD Barricor™ tubes, this ratio increased up to 88-90 %. BD Barricor™ tubes provided a plasma sample with less cellular contamination, no gel globules or fibrin due to insufficient clotting mainly observed with SST and reduced our TAT in the emergency laboratory, improving patient care and enabling faster treatment decisions.
Key words: Turn around time, Barricor™ tubes

VALIDATION AND VERIFICATION OF BLOOD COLLECTION TUBES

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The Clinical and Laboratory Standards Institute (CLSI) published guideline, GP34-A, Validation and Verification of Tubes for Venous and Capillary Blood Specimen Collection; Approved Guideline is a guideline for manufacturers of venous and capillary blood collection tubes and users of blood collection tubes for serum, plasma, and whole blood testing.
Verification is confirmation, through the provision of objective evidence, that specified requirements have been fulfilled (ISO 9000).
Validation is confirmation, through the provision of objective evidence, that requirements for a specific intended use or application have been fulfilled (ISO 9000).
Validation is initially a manufacturer's responsibility to ensure that design goals are met and performance claims are stated. Verification is an end-user (clinical laboratory) responsibility to confirm that manufacturer's claims are met on the specific device in its hands, and also that medical needs are met.
Laboratory tests can be affected by numerous preanalytical variables, including the material used to manufacture the blood collection tube. Blood collection tubes are not inert containers for blood but have several constituents, including anticoagulants, surfactants, and lubricants for rubber stoppers, clot activators, and separator gels that can potentially interfere with assays.
Steps for verification:
Select groups of subjects to test (Samples from particular patient populations; such as dialysis patients, healthy subjects, emergency testing etc. or mixed group). The subjects must be adults (> 18 years old, one half of the participants should be women and one half should be men).
Select measurands of interest for testing. "Spiking" of samples may be necessary to achieve the needed analytical measurement range of each measurand. The subjects are chosen to cover a clinically meaningful range for the analyte.
Consider whether any visual observation of the sample is recorded such as serum yield, gel barrier formation, fibrin, and hemolysis.
Select the instrument(s) and method(s) for use in testing.
You can use single or dublicate tubes, with single tube, one can determine whether the mean difference between the control and evaluation is acceptable and ideally within predefined criteria.
Randomization is an important scientific primeval that applies to all aspects of evaluations.
Preanalytical variables must be standardized for all tubes collected and blood samples analyzed.
Determine the number of subjects required. For statistical significant, about 20 to 30 subjects are sufficient for most measurands. Some institutions provide guidance on this, such as the US Food and Drug Administration (FDA) and the World Health Organization (WHO), where 40 subjects are the norm.
Ethics committee approval must be received at the institution.
For within-tube precision, perform duplicate analyses on each type of comparative and evaluation tube. This can be achieved using specimens from a minimum of 20 subjects or by performing duplicate testing in the accuracy study. Results can be evaluated by EP Evaluator.
Determine the clinical acceptance limit (CAL) for the selected measurands. CALs can be generated based on: Evaluation of data using the formula for imprecision of replicates, biological variation for a measurand and published data.
Perform linear regression analysis, Bland-Altman plots and a two-sided confidence interval paired t-test.
Laboratories should demonstrate that blood collection tubes do not interfere with measurement or that they have not effects on analysis.

USE OF PLASMA TUBES IN URGENT SAMPLES

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Objectives: In this study, comparative analyses of serum and plasma specimens of some routine analytes in our laboratory, processing the plasma tubes in pre-analytical systems, recommendations and practices about the usage of plasma tubes in specific patient groups are studied.
Materials and Methods: BD Vacutainer® Barricor™ Plasma Blood Collection Tube (BD Barricor™) and BD Vacutainer® SST™ serum Tubes (BD SST™) were assessed simultaneously for the selected analytes in routine clinical chemistry and immunoassays using Beckman Coulter AU 5800 and Beckman Coulter DXI 800.
Results: Statistical comparisons of the analytical performances of BD Barricor™ tubes and BD SST™ serum tubes showed that the results were acceptable and the tubes can be used interchangeably. TAT was improved about 30-40 minutes by using BD Barricor™ tubes. Thanks to the different cap color of BD Barricor™ tubes, they can be automatically recognized by the inspector as "urgent" and thus BD Barricor™ tubes can be used in samples requiring priority, which can be send from emergency department, intensive care and daily chemotherapy clinics. Additionally, when we analyzed a number of Barricor™ tubes samples/day for about 6 months, it was observed for the tubes processed in pre-analytical system that the centrifugation process in pre-analytical system was sufficient for getting down the mechanical separator by centrifugation, and no problem was observed in decapping and recapping processes in preanalytical system.
Conclusions: It was concluded that BD Barricor™ plasma tubes can easily be used in on-line pre-analytical and post-analytical systems for emergency patients as well as using in manual centrifugation and in stand-alone analytical systems for emergent sample analyses.
Keywords: BD Barricor™ plasma tubes, pre-analytical, stat samples

PREANALYTIC PHASE IN IMMUNOCHEMISTRY

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In spite of the improvements in laboratory medicine, the pre-analytical phase is still the main responsible for laboratory errors. Immunoassay is an important part of the diagnostic process. Because of the relatively low concentrations of analyte being measured and the complexities of the antigen-antibody interaction, this technique is relatively susceptible to interferences. There are many possible reasons for false results to be obtained during an immunoassay procedure. Interferences in immunoassay fall in to two broad categories: analyte-independent and analyte-dependent.
Analyte-dependent interferences
○Cross reacting substances (lack of specificity)
○Endogenous antibodies
Antireagent antibodies (heterophile, HAAA, RF)
Antianalyte antibodies-autoantibody (macro complexes)
○Hook effect
Analyte-independent interferences
○ Inadequate centrifugation with microclots
○ Hemolysis, lipemia, icterus
○ Specimen collection tubes, transport, stability and storage
○ Disease states
The ways of becoming aware of possible interferences and the investigation them
Discordant results
Clinical interaction
High index of suspicion
Exclude pre-analytical problems
Repeat analysis on another instrument from a different manufacturer
Treatment with heterophilic blocking reagents
PEG precipitation
Serial dilutions
Check using a different matrix e.g. urine for hCG
Selective removal of immunoglobulins
Chromatography
Tandem-mass spectrometry
Falsely high or falsely low results due to interferences endogenous to the specimen present a particular risk to patient care because they (a) are not detectable by normal laboratory quality control procedures, (b) are reproducible within the test system, (c) are often clinically plausible and (d) are relatively rare.
The mechanism of interference and its severity depend both on assay design (two-site; one step) and on the nature of the interfering antibody.
It is important to recognize that interfering antibodies may be present only transiently in a patient's serum, and that their characteristics and reactivity may vary, such that no immunoassay can be considered to be completely robust to all possible interference. Therefore it is important to inform clinicians and activate the consultation process between the departments.
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PREANALYTIC PHASE IN ADVANCED SYSTEMS

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Diagnostic medical branches such as clinical biochemistry, clinical microbiology, pathology and radiology, keep pace with technology in a faster way than other medical areas. In the last 15 years, with the emergence of electrospray ionisation (ESI) method especially for the ionization of molecules, mass spectrometry finds place in routine laboratories. All analyse methods have three common stages: Isolating the particular analyte from a complex matrix, determining the concentration and reporting the result in proper units. Mass spectrometers (MS) determine analyte concentrations more accurately than the other systems. Especially therapeutic drug concentrations, biologic amins and steroid hormon measurements are more sensitive in MS measurements. Today, in routine laboratories, small molecule (metabolite) analyzes are shifting towards mass spectrometers. High-precision measurement of modern MS systems means that chemical contamination is also measured. Hence, preanalytical errors can lead to serious errors in these systems. In the clinical laboratories, in addition to the pre-analtytical phase of routine biochemistry and hormone systems, preanalytical phase of MS systems must be evaluated and unfortunately the process has to be re-examined from the very beginning. Sample collecting time, sex, age, fasting state, sample types, tubes and sample containers should be re-examined for MS systems. The preferred sample type for blood analysis in MS systems is plasma. In addition, dried blood spot (DBS) is accepted to be an alternative sample for MS measurements. Plasma and serum metabolic profiles are different. Metabolism of the cells in serum continues until coagulation has occurred. In particular, platelets are active from the moment they are removed out from the body, and secrete many metabolites during coagulation eg. lipids and proteases. It is important that the plazma or whole blood can be placed directly in ice.
Preanalytic stage standardization in MS systems:
1. Before validating the method, evaluation should be done for any contamination from water, equipment used: tubes, pipette tips
2. Hemolytic specimens must be handled carefully and clarify the interaction with the analyte
3. As soon as samples are collected, precautions must be taken to quickly start the cooling process
4. Cells from plasma/serum should be separated as quickly as possible and samples should be transferred to secondary tubes
5. Samples to be stored for analysis should be stored at -20 ° C and then at -80 ° C
6. Repeated thawing-freezing is not acceptable
7. A standardized / validated SOP should be prepared for sample pretreatment prior to analysis
8. An SOP is also required for each new method, containing sample collection, separation, transport, storage and sample preparation steps.
Metal analyzes have been performed by Atomic Absorption Spectrometry (AAS) or Atomic Emission Spectrometry (AES) methods from the early 1900's. In the last 20 years, Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) has been developed to measure simultaneous and highly precise measurement of multiple heavy metals in a single run Whole blood, serum, urine and CSF heavy metals can be analyzed by these systems. Contamination may be a problem during sample collection and analysis. Hence special equipment and training are required for the sample collection.

THE IMPORTANCE OF PREANALYTICAL PHASE IN THERAPEUTIC DRUG MONITORING AND DRUG ABUSE TESTS

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Therapeutic drug monitoring (TDM) is defined as measuring serum concentrations of a drug in a single or multiple time points in a biological matrix after a dosage. The purpose of therapeutic drug monitoring is to individualize the dosage to achieve maximum efficacy of a drug and at the same time minimize adverse drug reactions and toxicity risk. Drug abuse tests (DAU) are usually categorized as a part of drug tests and defined as the excessive and persistent use, usually by self-administration, of any drug, licit or illicit, which may lead to adverse physical or psychological consequences. Examples of drugs of abuse include depressants (opioids, barbiturates, benzodiazepines, alcohol), stimulants (amphetamines, cocaine), hallucinogens (LSD, mescaline, phencyclidine), and cannabinoids (marijuana). The laboratory plays a central role in the detection of DAU and quantitating therapeutic drug concentrations in different human specimens.
Preanalytical phase is as critical as the analytical phase for accurate results during TDM and analysis of DAU tests. Identification of sources of error can take under

control. One of the most important aspects to this phase is the knowledge of the time at which the sample was collected and its relationship to the time of dosing or ingestion. These pieces of information are absolutely necessary for interpretation of the results. In addition, samples must be collected using the proper devices and processed or stored under conditions that minimize alterations to the drug concentration. Bilirubin, hemolysis, lipemia, drug/nutrition interactions, systemic disease that the patient have (such as liver, thyroid, cardiovascular, kidney disorders), the change of protein binding ratio (pregnancy) and in vitro drug stability are other important pre-analytical factors that influence interpretation of the analytical results. Patient related factors such as pharmacogenomics and pharmacokinetics, those change the metabolism of drugs individually must be taken in consideration in TDM to calculate the accurate dosage of drug or when toxicity is suspected.
In addition to TDM, DAU tests can include some more pre-analytical error sources for urine specimens which are the most preferred sample type. For the assurance of no substitution, adulteration or dilution made, specimen integrity tests including urine temperature, specific gravity, creatinine, pH and oxidants must be applied before the analytical procedures. Also direct observation of sample collection and proper documentation are important variables in addition to other pre-analytical factors for all laboratory tests.
Laboratories should establish their own TDM procedures by considering various factors such as specimen type, tube, pharmacokinetic and pharmacodynamic effects.
Keywords: therapeutic drug monitoring; drug abuse tests; pre-analytical phase

PREANALYTIC PHASE RELATED TO BLOOD GAS AND PH TEST

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The term “blood gas analysis” (BGA) is used for all laboratory tests related to the patient’s acid-base balance and oxygenation status. BGA is an important factor for intensive care medicine. Current analyzers measure not just blood gas parameters but electrolytes (sodium, potassium, chloride, ionized calcium, ionized magnesium) and metabolites (glucose, lactate, bilirubin, creatinine). BGA is exposed to risks of errors caused by improper sampling, transport and storage conditions. The Clinical and Laboratory Standards Institute (CLSI) generated documents with recommendations for avoidance of potential errors caused by sample mishandling. Two main documents related to BGA issued by the CLSI are GP43-A4 (former H11-A4)-“Procedures for the collection of arterial blood specimens” approved standard – 4th ed., and C46-A2-“Blood gas and pH analysis and related measurements” approved guideline–2nd ed. Although many laboratories use state of the art analyzers, still many preanalytical procedures remain unchanged. Continuous efforts to optimize workflow, improve safety for the staff and avoid preanalytical mistakes are important and should reflect quality management standards. It is necessary to begin to describe the concept of “preanalytical error” in the first class and as soon as possible. Because preanalytical error is a cultural issue. It takes a lot of time to place it.

PNEUMATIC SYSTEMS: FEATURES AND IMPORTANCE ON STAGE PREANALYTICAL

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“Modern Laboratories now provide transfer of samples with pneumatic systems.”
In clinical laboratories, there are three phases in the total test process: pre-analytical, analytical and post-analytical.
Pre-analytical phases consist of intra-laboratory and extra-laboratory processes. The total laboratory error rate of this period, including collecting and transfer of the sample, is up to 70% of total.
Sample transport has great prominence in the management of clinical laboratories. The durationof the transfer period has a direct impact on the turnaround time. The safety and cost of this process is a major precaution in terms of management of laboratories.
Pneumatic is derived from the Greek language word “pneuma” which means “breathing” in Greek. In healthcare, pneumatic applications started after 1950. Thanks to the transfer of pneumatic tube systems, rapid and safe sample transfer are ensured.
Pneumatic Tube Carrying Systems are called as systems which transmit between two or more units with suction and blowing logic within a closed circuit established with plastic pipes, stations, and directors. Pneumatic systems are the systems that carry blood tubes, medicines, documents safely. With the pneumatic systems, 6-8 m/sec distance can be moved.
The most common error seen in pneumatic systems is hemolysis. The most affected parameters are LDH and Potassium. Samples and blood components move at a controlled rate and maintain a certain temperature to prevent hemolysis and preserve the integrity of blood components. The acceleration they are exposed to, can cause changes in the laboratory results. For this reason, there are many studies in the literature comparing the test results of both the pneumatic system and transfered by a porter.
Effective use of pneumatic systems is one of the most straight forward methods that enable laboratories to produce fast results. On the other hand, validation of the system and effective follow-up of preanalytic error rates should be among the quality indicators of laboratory experts.

CENTRIFUGATION AND PREANALYTIC ERRORS, REFLECTIONS ON BIOCHEMICAL TESTS

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Centrifugation is basically a separation method. Particles within the sample are separated by their shape, dimensions and density using the centrifugal force obtained from the rotational motion. Although used for analytical purposes, centrifuges are a pre-treatment tool used mostly in the preparation of serum, plasma, urine specimens in medical laboratories. For this reason, centrifugation is one of the important steps of the pre-analytical phase.
Knowing the working principle of the centrifuge, recognize the tools used and knowing the behavior of the tubes used in the sampling in the centrifuge will prevent many mistakes in practice. Tubes should be waiting for recommended time and hold in perpendicular position. Tubes should be always capped and paced in the centrifuge in balanced. Daily cleaning and periodical maintenance of centrifuges should be performed and training should be given about how to deal with inappropriate situations that may arise.
Centrifuges should be well recognized by the laboratory workers and pre-analytical effects should be known well. Related information can be found dispersedly in guidelines issued by international organizations such as the World Health Organization (WHO), Clinical Laboratory Standards Institute (CLSI), in user manuals of the manufacturer as well as in research studies focused on special subjects. The Guideline for Centrifuge Usage in Medical Laboratories prepared by the Turkish Biochemical Society for the purpose of providing a compact and useful resource and has been presented to the use of laboratory staff and researchers.

IMPORTANCE OF SAMPLE PREPERATION IN PREANALYTIC PHASE: EQUIPMENT AND PIPETTING

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The sample preparation stage affects the analysis results in a significant way, thus it is being investigated in the scope of laboratory process within the preanalytical phase. Nowadays, sample preparation is required and some tests analyzed in chromatograph laboratories and autoanalysers. This preparation is an important step in the analysis, sometimes it can go up to 60% of the analysis time. For this reason, a careful sample preparation stage is very important for the correct result of the analysis and finally the all equipment in use must be operated efficiently and correctly.
Equipment: In clinical laboratories, borosilicate or aluminum silicate glass materials resistant to high temperatures and plastic equipment made of polystyren, polyproplene, polycarbonate and polyvinylchloride are used. Glass equipments used in the laboratory are grouped in two, namely volumetric and non-volumetric. Volumetric ones (pipettes, measurements, burette, balloon jojobs etc.) are preferred for preparing standard solutions whereas nonvolumetric apparatus (beaker, erlenmayer, test tubes etc.) are preferred for boiling, mixing and titration. Since glass or plastic equipments are in contact with biological material, they should be decontaminated and cleaned according to appropriate protocols if they are planned to be reused.
Other equipments used in sample preparation include centrifuge, vortex, magnetic stirrer and precision scale. Within the quality management system, equipment management is very important. Thus, operating and maintenance instructions of all equipment must be kept available; and periodic maintenance, repairs and calibrations should be recorded regularly.
Pipetting: In clinical laboratories, pipettes are used during the dilution of patient samples and preparation of reagents, controls and calibrators. Although laboratories use a wide variety of pipettes ranging from manual pipettes to multi-channel automated pipettes, semiautomatic or automatic pipettes are the most commonly used pipette types with features such as more stability, ease of use and less need for cleaning. One should note that calibrated pipette use will affect the analysis and the accuracy therefore accuracy of the pipettes must be checked and recorded periodically during and after the first use. In laboratories, 30% of pipetting errors were due to pipetting, tips and calibrations while 70% of the pipetting errors were user-driven. For this reason, it is very important to train the laboratory staff on correct pipette usage techniques.

CASE REPORTS IN PREANALYTICAL PHASE-1

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Preanalytical phase is the most important phase of laboratory work flow process. It has been demonstrated that errors especially in the sample collection, identification, transportation to the laboratory steps result in misdiagnosis of the patients. Poor quality of samples such as hemolysed, lipemic or icterus is approximately 5-10-fold higher than the other preanalytical conditions that lead to the suppression of the test results. Breakdown of the eritrocytes and the release of hemoglobin and other intracellular components to serum results in chemical and spectrophotometric interferences and laboratory errors. Visual inspection of hemolysis should be avoided because it cannot be standardized and it is subjective. Systematic automated assessment of hemolysis index in serum should be performed to maintain patient safety. If the automated hemolysis index measurement is unavailable visual colored charts comparing the serum color should be advised to minimize errors. Hemolysis index values should be stored in laboratory information systems and be given in the patient test reports. Hemolysis index values should be standardized g/L units for harmonization. Test specific hemolysis index critical values should be identified and algorithms for the hemolysis index should be described in the laboratory for standardization. The laboratory report procedure for high levels of hemolysis index should be defined in algorithms. Descriptions should be clear on the suppression of hemolysis specific test, all tests and the hemolysis index values in laboratory reports. Analytical assessments of hemolysis, bilirubin and lipemic samples should be performed by internal and external control materials. Case reports on preanalytical phase will be discussed in the lecture.

PREANALYTIC PHASE IN FLOW CYTOMETRIC AND COMPLETE BLOOD COUNT SAMPLES

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The blood collection site, shape, and the diagnosis and treatment status of the patient should be well known to prevent preanalytical errors in whole blood counts and flow cytometry specimens. In full blood count; blood samples should be taken with the purple capped K2EDTA tubes. (Hemoglobinemia, hyperlipidemia, hyperbilirubinemia, dysproteinemia) and blood sampling (insufficient in young infants) due to abnormalities in hematological values of the patient (hyperlococytosis, erythrocyte agglutination, erythrocyte fragmentation, hemolysis, cold agglutinins and platelet clusters) or fetal blood collection) are the preanalytical factors affecting blood count results. Blood should be processed within 2-6 hours at the latest. While the study period is delayed, caloric leukocytosis, low neutrophilia, and lymphocyte excess are waiting in the room temperature, while they can be stored at + 4° C for a maximum of 24 hours. After 24 hours, neutrophil excess and low lymphocyte are observed, unlike the tube waiting in the room heat. For flow cytometric analysis, peripheral blood samples as well as bone marrow apical / biopsy specimens, lymph nodes, solid tissue cerebrospinal fluid (CSF), bronchoalveolar lavage (BAL), pleural fluid, acid mai, available. The disadvantage of using EDTA for AS is that the light scattering properties (FSC, SSC) are more rapidly deteriorated as blood stays, while the advantage is that mature myeloid cells cause less sticking to the wall of the tube. The EDTA sample is preferred if spreading is also performed for morphological evaluation of the incoming sample. If samples of body fluids (pleural, acid fluid etc.) are sent for leucemia-lymphoma phenotyping, samples should be taken to contain 10 units / mL of heparin without preservatives and should be transported at 2-8 ° C by adding cell medium to the medium. EDTA / heparin / can be used for other body fluids. Carrying should be done at room temperature. As soon as possible, samples should be processed as soon as possible. Samples can be stored at + 4 ° C in cases where expectation is obligatory

THE PRENALYTICAL PROCESS IN HEMOSTASIS LABORATORY

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Hemostasis is a process to prevent hemorrhage by arresting and keeping the blood within the damaged vessel walls. Hemostasis is a complex process that is contingent on the complex interaction of platelets, plasma coagulation cascades, fibrinolytic proteins, blood vasculatures and cytokine mediators.
Routine haemostasis testing and determination of coagulation factors are influenced by many pre-analytical variables. These variables include sample collection, sample processing, sample storage conditions (whole blood, centrifuged plasma maintained in the original sodium citrate tube or aliquoted centrifuged plasma), storage time and temperature, reagents and system used to analyse the sample.
The main causes of unsuitable samples is the presence of interfering substances. Haemolysis, icterus and lipaemia (HIL) in specimen may affect the reliability of coagulation test results. This possible interference can be influenced by several factors including the level of interfering substance in plasma, the assay principle and the end-point detection system, that is optical versus mechanical detection.
In former times, checking sample quality by visual inspection was the most common way to check for interferences. Today, a number of coagulation analysers allow a systematic assessment of interference by optical measurement using different wavelenghs. Understanding the potential impact of these variables on laboratory results is of great importance. Results affected by pre-analytical errors can have a significant impact on patient outcomes, such as diagnosis or treatment.
The clinical and Laboratory Standards Institute (CLSI) guidelines (Document H21-A5) state that whole blood samples or plasma samples, stored at room temperature (RT), for routine haemostasis tests or determination of coagulation factors should be analysed within 4 hours after sample collection, with exception of prothrombin time (PT) testing with stability up to 24 hours. However, for many coagulation parameters, acceptance of a longer storage time at RT is described. This information can be interesting, for example, when additional coagulation tests are requested or when laboratories have to outsource coagulation tests to a laboratory at distance from the place of sample collection.

TBS PREANALYTICAL PHASE WORKING GROUP PRANALYTICAL PHASE IN COAGULATION TESTS - SURVEY RESULTS

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Preanalytical phase quality, which begins with test request and includes patient preparation, sample collection, handling, transport, processing and storage, is very important for coagulation tests. This phase, based on a variety of manual activities, is the most vulnerable part of the total testing process and is a major component of the reliability and validity of results in coagulation tests and constitutes the most important source of erroneous or uninterpretable results. This phase is not standardized and is responsible for the most errors. The accurate standardization of preanalytical phase is of pivotal importance for achieving reliable results for coagulation tests. A few international guidelines are available for the management of the preanalytical phase. A survey was created by the Turkish Biochemical Society-Preanalytical Phase Working Group to determine the status of standardization of the preanalytical phase in the coagulation laboratories in our country and to emphasize the importance of the preanalytical phase for these tests. The survey was consisted of a total of 28 questions and included almost all steps of the preanalytical phase. The survey results showed that we need a national guideline for standardisation of preanalytical phase for coagulation tests, and training should be improved.

PREANALYTIC STAGE IN CITY HOSPITALS

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The preanalytical phase begins with the test request, the identification and preparation of the patient, the retrieval of the samples, and the transfer to the laboratory until analysis. The main phases of the pre-analytical process are correct and timely sampling in the clinical laboratories as well as recording and delivering the sample to the relevant laboratory without delay. Although the main goal in the development of laboratory medicine is to reduce analytical errors, it has been shown that about 60-80% of all errors are due to preanalytic phase. City Hospitals provide services through a public-private cooperation protocol that enables a facility to be financed by the private sector, designed, constructed, rented for a certain period of time, allows some of the goods and services on the leased premises to be partially or wholly operated by the contractor. While City Hospitals are going through the process, we aimed to share our experiences in terms of preanalytic stage. Turkey's first city hospital, Yozgat City Hospital has a 475 beds capacity. Adana City Hospital is the 4th hospital with a bed capacity of 1550 and meet the features as a training and research hospital.
In the Public-Private Partnership model, the Company provides all necessary technical resources staff (except for Nursing and Medical Services) and support activities to the Administration to study all the laboratory tests specified in Annex A of the current Health Practice Statement.
We assess the preanalytical process arrangements, precautionary activities related to the sources of error we predicted before moving, and preanalytical phase faults we have detected after relocation in Adana and Yozgat City Hospitals. We dealt with the predicted and detected preanalytical phase errors and the activities performed to prevent them or inadequate activities in terms of 2 different hospitals.
We hope that sharing our experiences will shed light on the planning of the preanalytical universe to the colleagues who will join the City Hospitals.
Keywords: City Hospital, Preanalytical Phase, Preanalitycal Error

PREANALYTIC PROCESSES AND ERROR RESOURCES IN PUBLIC HEALTH CARE LABORATORIES

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Preanalytical errors are one of the most important problems in Public Health Care Laboratories (PHCL) as other laboratories.
Antalya PHCL is one of the 83 PHCL in Turkey, has of two main units which are medical laboratory and water analysis laboratory.
In the medical laboratories family physicians are served, in some cities patient applications are also accepted. In APHCL routine biochemistry, hormone, hemogram, sedimentation, Hb A1c, blood group and thalassemia analyzes are performed.
Antalya provide services to 780 family physicians in 240 family health centers. The samples of eastern district are studied in the Alanya Laboratory and the samples of the central and western district are studied in the Central Laboratory. Test requests are made by family physicians, and samples are centrifuged after taken by family members. Collected samples are sent to laboratories and taken to the relevant units for analysis.
Preanalytical phase consists of prepreanalytical and "real" preanalytical phase. Pre-preanalytical phase involves suitable test selection and sampling, labeling and transportation phases and preanalytical phase involves sample acceptance, centrifugation, aliquotting, dilution steps.
Especially in PHCL which serves to family physicians cause prepreanalytical and some preanalytical processes are not under the control of the laboratory and intervened only after samples reach to the laboratory makes it difficult to follow up and results in higher error rates. In addition, the excess number of centers and the change of staff over time make process management difficult.
Pre-preanalytical errors observed in APHCL are samples came to laboratory but doesn't have record in Laboratory Information Management System (LIMS) and recorded to LIMS but samples does not arrive to laboratory. Preanalytical errors in PHCL are, Hemolysis / Icterus / Lipemic Samples, Clotted Samples, Incorrect Recordings (Identification Error), Erroneous Test Requests, Inadequate Samples and Inappropriate Results.
In order to manage the preanalytical processes more controllably barcoding, sample transport arrangements and education programs to family physicians, family health workers and carrier are planned in the next procurement period.
Key words: Public Health Laboratory, Pre-preanalytical error, Preanalytical error

EFFECTS OF POSTURE AND EXERCISE ON LABORATORY TESTS

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Postural change during venous blood collection is a major source of bias in clinical chemistry testing. Blood volume in an adult decreases about 10% with changing position from supine to standing upright. For this reason concentration of many large molecular weigth analytes (proteins and protein-bound analytes) increases relatively. Postural change increases catecholamine, aldosterone, angiotensin II, renin and antidiuretic hormone secretion. Serum epinephrine and norepinephrine may increase twofold in 10 minutes but their urinary excretions do not change. Thirty minutes after standing upright a significant rise in potassium level occurs. Prolonged bed rest leads to fluid retention and serum proteins and albumin concentrations may decrease 3-5g/L on average respectively. Also protein bound particle concentrations decline. Ionized calcium levels rise with mobilization of calcium from bone. Urinary excretion of nitrogen, calcium, sodium, potassium, phosphate and sulphate rises.
Laboratory tests changes depending on exercise type, intensity and duration. Moderate intensity regular exercise shows opposite effects compared to vigorous exercise. Previous studies revealed that vigorous exercises increase free radical formation and regular exercises strengthen antioxidant defense. Exercise decreases plasma volume and results in hemoconcentration. Hemoglobin rises because of reduced fluid volume which leads to increased oxygen carrying capacity. Leukocytes rapidly increases. Serum glucagon, cortisol and growth hormone rises during acute exercise. Transient proteinuria is common after exercise.
Regular exercise has beneficial effects on lipid levels. Decrease in total cholesterol and increase in HDL is observed. Regular exercise leads to augmentation of macrophage functions, it enhances neutrophil functions slightly and natural killer cell functions markedly. Additionally, as activated partial thromboplastin time, platelet aggregation, tissue plasminogen activator antigen, anti-hemophilic factor A levels decrease tissue plasminogen activator activity increase, prothrombin time is not altered.
Exercise reduces cellular adenosine triphosphate leading to increased cellular permeability. Increased cellular permeability causes to a slight increase in serum levels of skeletal muscle originated enzymes including CK, LDH, AST and aldolase. Serum CK increases may be permanent in regular exercise. As a result considering all biochemical parameters, experimental researches shows that regular exercise has beneficial effects whereas acute exercise shows opposite effects. Patients with increased or decreased laboratory test results and unclear signs should be asked if they were physically active during testing phase. Also physical exercises should be avoided 48 hour prior to blood collection.

PREANALYTICAL CASE REPORTS-II

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Medical Biochemistry Laboratories should inform the clinician in a timely and reliable period with the most accurate form of patient results. Before reporting patient results in post analytical phase, to be sure the results are accurate, preanalytical and analytical phases should be complete with minimal error.
Studies about laboratory quality show that laboratory errors originate from the preanalytical phase. It is about %60-75.
It is effective to determine errors under quality indicators for evaluating preanalytical errors frequency all around the world. Some quality indicators can be calssified as:

- ✓ samples lost-not received
- ✓ samples collected in inappropriate container
- ✓ hemolyzed samples
- ✓ clotted samples
- ✓ insufficient sample volume
- ✓ inadequate sample-anticoagulant ratio
- ✓ samples damaged in transport
- ✓ samples improperly labelled
- ✓ samples improperly stored

Although classification of errors under quality indicators is effective in terms of standardization and classification, patient-centered evaluations are at the forefront.
For example;
A 45-year-male with kidney transplant from an outside hospital came to a laboratory for 24 h urine protein estimation. On testing, the 24 h urine protein estimation came out to be 18,000 mg/dl. A repeat test was done, and the value remains unaltered. On close examination of the sample received, it was found that the urine sample was sent in a formalin container which was reused after washing. Strong formalin odor was present in the sample. The literature search was done to study the effect of formalin contamination in urine protein estimation resulting in markedly protein estimation.

ORAL PRESENTATIONS ABSTRACTS

OP-001
THE EFFECTS OF TWO DIFFERENT BLOOD COLLECTION TUBES AND DIFFERENT STORAGE CONDITIONS ON AMMONIA CONCENTRATIONS

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Objectives: We aimed to evaluate the effects of two different blood collection tubes (Barricor ™, Lithium heparin [Beckton Dickenson]) on blood ammonia concentrations and also to evaluate the effects of different storage conditions on blood ammonia concentrations collected in Barricor ™ tubes.
Materials and Methods: 15 healthy subjects were included in the study. We draw blood samples into one lithium heparin tubes and three Barricor ™ tubes from every participants. The blood collected in lithium heparin and Barricor ™ tube ammonia concentrations were immediately measured and then these tubes were stored at + 4 °C and the ammonia concentrations were measured again at 4th, 24th and 48th hour. Besides, one of the remaining two Barricor ™ tubes were stored at -20 °C and the other tube were stored at -80 °C and then ammonia concentrations were measured at 4th, 24th and 48th hour. Ammonia concentrations were measured with spectrophotometric method using biochemistry autoanalyser.
Results: No differences were observed between lithium heparin and Barricor ™ tubes at zero point in terms of ammonia concentrations (p = 0.089). We also observed no differences between Barricor ™ tubes stored at -20 °C (p = 0.570) -80 °C'de (p = 0.256) and zero point
Conclusions: Barricor TM tubes can be used routine analysis. The stability of samples collecting in Barricor TM tubes at -20 °C and -80 °C until 4th hours determined as an advantage.
Keywords: Lithium heparin, BarricorTM, Ammonia

OP-002
SAMPLE STABILITY AND OTHER PREANALYTICAL FACTORS IN ACTH MEASUREMENT

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Objective: ACTH is a 39-amino acid peptide hormone, with diurnal rhythm. Plasma ACTH is important in the differential diagnosis of hypo/hypercorticolism. It is usually measured along with cortisol or under stimulation/suppression tests. Preanalytical conditions during blood sampling, transport to laboratory, processing and storage may affect laboratory results. In this study, the effect of preanalytical factors on ACTH measurement was investigated.
Materials and Methods: Prospective and retrospective studies were conducted. First, all ACTH requests made at our hospital between December 2017-April 2018 were reviewed, retrospectively. Test request, sampling, laboratory acceptance and result/approval times were determined. Then the stability test was performed. Plasma ACTH pools were prepared at three-different concentrations, and plasma samples were stored at 2-8 0C and at -80 0C for up to 72 hours after ACTH measurement. Plasma ACTH levels were repeated.
Results: In the retrospective study, 84.6% of the laboratory admissions for the ACTH test were observed to be done until 10:30 in the morning. In total 62.2% of samples were taken in the first 30min after the request, and 64% in the first 60 min. Laboratory acceptance was found in 29.9% of the samples in the first 30 min and 61.6% in the first 60 min. It was determined that 20.1% of all specimens were transported to the emergency laboratory first and then to the central laboratory, and the mean waiting time was 13.45 hours at 2-8 0C after plasma were separated, The stability test showed a decrease of 3%, 11% and 15.3% at low, medium and high concentrations at 2-8 0C, respectively. The decrease in samples stored at -80 0C was less.
Conclusion: Ensuring proper analytical stability at the preanalytical stage is important for obtaining accurate/ reliable results. The results show that samples for ACTH measurement should be transported directly to the hormone laboratory in our hospital.
Key words: ACTH, diurnal rhythm, stability, preanalytical variables

OP-003
INSUFFICIENT SAMPLE VOLUME OF VACUUM TUBES EFFECT ON BIOCHEMICAL PARAMETERS

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Objective: Incorrect results are one of the most important sources of medical error. Hemolysis occurs when blood is taken in an insufficient amount of vacuum tubes. It has been known for many years that hemolysis is a source of errors in laboratory tests for a variety of reasons, such as the release of erythrocytes outside the cell, dilution, interference with tests on similar wave lengths. In this study, it was aimed to observe the effect of hemolysis on biochemical parameters in blood samples taken in missing volumes.
Materials and Methods: Venous blood samples were taken from 32 patients who had two gel seperator tubes (Biochemistry and Cardiac Panel) at the same time in the Central Laboratory of Cebeci the University of Ankara Medical School. When taking samples from these patients, 5 mL tube was filled completely so that no vacuum was left, and ml of blood was withdrawn as the second tube remained vacuum. The samples were centrifuged at 2500 RPM for 10 minutes. 31 biochemical parameters from both samples were studied in the Beckmann Coulter 5800 autoanalyzer with serum indices.
Results: Cholesterol, LDH, total protein, AST, iron, RF were significantly higher (p <0,05), Glucose, total protein, Na values were significantly lower in the vacuum remaining tubes. When the % change rates were examined, all tests were below the CLIA and biological variation total allowable error values (glucose (%1,39), cholesterol (%0,75), T. Protein (%0,83), LDH (%11,6), AST (%4,6), iron (%2,17), RF (%12,12), Na (%0,42)). There was no difference in hemolysis index as well as no visible hemolysis in the samples.
Conclusions: This study was observed that hemolysis did not make a difference affecting hemolysis index but statistically significant differences were found in hemolysis affected parameters. It should not be forgotten that the % change values in the affected parameters will increase the total error rate even though the CLIA and the biological variation are below the total allowable error values.
Keywords: Insufficient sample volume, hemolysis, CLIA, biological variation

OP-004
THE USE OF LUER ADAPTER IN EMERGENCY DEPARTMENTS ON THE HEMOLYSIS INDEX

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Objective:Frequently encountered insamples of Emergency Department,hemolysis is one of the most important preanalytic errors affecting the laboratory test results and quality. The aim of this study is to investigate the effect of using Luer Adapter (LA) during blood-letting in Emergency Department on thehemolysis index.
Materials and Methods: In the study, luer tipped (like an injector tip) LAs were distributed to the personnel drawing blood in the Emergency Service on27 February 2018 and they were asked to use LA needles (BD) instead of injectors. By choosing the dates before LA (5-25February 2018) and LA (5-25March 2018) and the Hemolysis indices of samples that came from the emergency service and were placed in a biochemistry device were taken from the LIS to be analyzed. LIH levels weresemi-quantitatively measured in theBeckman Coulter AU 5800 device with the original kit and the results were reported in the interval of normal - +5 positive.
Results:Throughout the study; the number of samples that came for biochemistry analysis was 5971 (51.7%) before LA, 5587(48.3%) after LA, and 11.558 in total. Regarding the distribution according to age and gender; there was no difference before LA (age:47.3±21.2, M:47.7%, W:52.3%) and after LA(age:46.2±20.9, M:47.8%, W:52.2%). The rate of samples with hemolysis was 48.9% before LA and 38.9% after LA, which was found to be significantly low (Chi-square test, p<0.0001). Lipemia was determined respectively as 10% and 8.2% before and after LA; whereas icterus was determined as 3.5% and 1.8%. Comparing the degree of hemolysis; a decrease was observed in all levels of hemolysis index after LA; however, this result was not observed in lipemia and icterus.
Conclusion:In order to enhanceespecially the quality of sampling, it is required to increase the cooperation between the laboratory and the relevant unit in units like emergency department where there is a great density of patients. By considering the features of units to which the laboratory renders service; it is recommended to makeerror proofing plans jointly. It is also recommended to discuss the procedure of blood-letting from the vascular access.
Keywords:Sampling, Preanalytic error, Hemolysis index, Luer Adapter

OP-005
STABILITY OF FULL BLOOD COUNT PARAMETERS UNDER DIFFERENT STORAGE CONDITIONS

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Objectives: In this study, we aimed to evaluate the stability of complete blood count in response to changes in different storage conditions and also evaluated acceptability according to clinical decision levels
Materials and Methods: Thirty-six volunteers were included in this study. Two K2EDTA blood samples from each volunteer were taken. Randomly both tubes were analyzed within 15 minutes on the Sysmex XN-1000 CBC analyzer (the results were accepted as basal values). After the analysis, one of the two EDTA blood samples were stored at room temperature; 24 hours, and the second blood sample was stored at 2-8 °C for 24 and 48 hours until reanalysis. The difference between test results were compared by the paired t-test and the Wilcoxon signed rank sum test. Clinical decision levels were calculated using total allowable error (TEa)
Results:The difference between the baseline and the at room temperature

results of WBC, Hb and PLT were not statistically significant (p> 0.05) with the exception of RBC (p=0.002). There was statistically significant difference between the baseline results and the values at 24. and 48. hours (refrigerated at 2-8 ° C) (all p <0,05) with the exception of WBC (24 hour refrigerator p = 0.410) No significant difference was found in the test results which were examined in terms of clinical decision level.
Conclusions: There was no significant difference in terms of clinical decision level; WBC results seem to be stable both at room temperature and in the refrigerator (24 hour) whereas the results of RBC, Hb and PLT were not stable.
Key words: Stability, CBC, Temperature

OP-006
THE EFFECT OF EDUCATION AND A 4-YEAR EXPERIENCE OF A STATE HOSPITAL IN THE EVALUATION OF PREANALYTIC PROCESS

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Objective: Preanalytical errors have an important ratio in all laboratory processes. To reduce laboratory errors, the IFCC Working Group on Laboratory Errors and Patient safety (WG-LEPS) developed laboratory quality indicators (QIs) for the preanalytical process. The purpose of this study is to evaluate QIs of the preanalytical process over a 4-year period and show the effect of education.
Materials and Methods: In this study, Balikesir State Hospital biochemistry laboratory were retrospectively reviewed for rejected samples for four years between 1 January 2014 - 31 December 2017 (2014, 2015, 2016 and 2017 years). We examined QIs for preanalytical processes such as; misidentification errors (QIs-5), inintelligible test requests (QIs-6), lost-not received samples (QIs-7), incorrect container (QIs-9), samples hemolyzed (QIs-10), sample clotted (QIs-11), insufficient sample volüme (QIs-12), incorrect sample type (QIs-13), unsuitable transportation (QIs-14) and improperly labelled tube (QIs-15). In our hospital, regular training is given to hospital staff and laboratory staff at least twice a year for sample taking, specimen storage and transfer training, as well as laboratory staff, laboratory processes and management of improperly sample.
Results: In our study, the preanalytical phase error frequency was 0.64%, 0.63%, 0.58% and 0.76% for all years respectively. It is seen that the most frequent error is clotted sample (0.31%, 0.32%, 0.27% and 0.37% respectively).
Conclusion: According to the QIs we assessed during 4-year study, our results were well and below the optimum values recommended by IFFC-WG-LEPS. This shows the importance of regular in-service training in our hospital to prevent preanalytical errors.
Key Words: Laboratory errors, quality indicators, laboratory process, laboratory error classification, laboratory error management

OP-007
ASSESMENT OF SAMPLE REDUCES ACCORDING TO SIX SIGMA METHODOLOGY IN BILECIK CENTRAL PUBLIC HEALTH LABORATORY

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Objectives: Preanalytical process is the most common source of laboratory errors. The frequency of preanalytical errors; depends on fault definition, possibilities, detection system and sample type. According to Six Sigma Methodology, “efficiency sigma level” is an indication of efficiency and cost effectiveness and provides a holistic view of the process. Process sigma levels are calculated according to pre-analytical process errors. In this study, we aimed to evaluate the performance of the preanalytic process according to the Six Sigma Methodology.
Materials and Methods: July 2017-December 2017 preanalytical quality indicator markers (inadequate sample, cohort sample, hemolyzed sample, inadequate tube, incorrect barcode, inadequate sample, false sample, overexposed sample, inappropriate sample container, lipemic sample) were examined retrospectively. Monthly process sigma levels were calculated in the six sigma calculator using Westgard site for every type of error. 4 sigma level target performance level was selected.
Results: For each error type, the process sigma level; It was over the target for six months. The highest error rates; “insufficient sample” ranked first, “clotted sample” second ranked for July, August, September, October; the “clotted sample” ranked first in November and the “insuffcient sample” ranked second, the error rates for both are equal in December.When we look at total error rates, the lowest error rate was in July (%0,06) and the highest error rate was december (%0,16).
Conclusions: With our work, low process sigma level faults can be detected in our laboratory; these errors can be evaluated as a whole with analytical and post-analytical processes. The frequency of reported preanalytical errors is mostly in the sample intake phase.
The preanalytic process performance evaluation based on the six sigma approach and the analysis of the frequency of errors can be done in universal dimensions to provide corrective, preventive actions with low sigma level.
Key Words: Six Sigma, Error Rates, Preanalytical process

OP-008
A QUALITY ADVENTURE IN A PRIVATE HOSPITAL

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Objectives : We want to evaluate the quality indicators of our laboratory between 2006 and 2017.
Materials and Methods: Between 2006 and 2017, the quality indicators were determined due to the standards of Clinical and Laboratory Standards Institute (CLSI), Joint Comission International (JCI), ISO 15 189 and Quality Standards in Health in Mesa Hospital/ TOBB ETU Hospital/ TOBB ETU Faculty of Medicine laboratory and analysed monthly. Data analysis was performed according to the contents of these indicators for preanalytical, analytical and postanalytical phases and the results were expressed in percentage.
Results: The indicators evaluated in January 2006 were The percentage of Wrong/ Inappropriate Samples and Incorrect/Repeated Test. In October 2009, The percentage of Panic Value Notification Time, in January 2010 The percentage of Reports Delivered Outside Specified Time, in May 2017 The percentage of Missed Samples and finally in July 2017 The percentage of Inappropriate Performances in Internal/External Quality Controls were added. The target values were determined and updated annually. For the results above target value, corrective and preventive actions were initialized. By giving theoretical and practical education to the staff or by changing materials used, improvement in the indicator ratios was provided.
Conclusions: The results of medical laboratories affect 60% to 70% of the critical decisions to be made during the patient follow-up. Therefore, incorrect laboratory results can lead to medical errors. In order to have accurate and reliable test results, measurable, objective and continuously renewable quality indicators are needed to evaluate the potential errors and to prevent their repetition.
Key Words: Medical Laboratory, Quality, Indicators

OP-010
THE EFFECT OF DIURNAL VARIATION ON ERYTHROCYTE SEDIMENTATION RATE

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Objective: Despite the fact that some laboratory tests show diurnal variations, studies in this area are inadequate in the literature. Erythrocyte sedimentation rate (ESR) is one of the most frequently used parameters to evaluate acute phase response. ESR increases after 24 hours from the onset of inflammation and may last up to one month. There is a limited number of literature on ESR’s diurnal variation. In this study we examined diurnal variation of ESR.
Materials and Methods: Blood samples were taken from 12 volunteers (8 males, 4 females) between 18-50 years of age into 3.8% sodium citrate tubes at 09:00, 12:00, 15:00, 18:00 and 24:00 hours. The ESR was studied by Westergren method. The samples taken at 09:00 were accepted as basal. The samples taken at 12:00, 15:00, 18:00 and 24:00 were compared with the baseline level. Statistical analyzes were performed in the SPSS 15.0 package program and Bonferroni correction was performed, and p <0.0125 value (0.05 / 4 = 0.0125) was considered statistically significant.
Findings: The mean age of the volunteers was 34.4 ± 5.79 (mean ± standart deviation) years old. The rate of erythrocyte sedimentation from volunteers was found to be lowest at 09:00 [5.5 (3.92-9.8)] [median (25.percentil – 75. percentil)] and the ESR of the samples taken at 12:00 and 24:00 hours were found to be statistically and significantly higher than the baseline levels [7.8 (4.3 – 11.5) and 6.6 (5.1 – 8.8); p values of 0.002 and 0.009, respectively].
Conclusion: We found that ESR had diurnal variation in our study, and was at the lowest level at 09:00 am. We therefore think that the change of ESR in patients during the day should be taken into consideration.
Keywords: Erythrocyte sedimentation rate, diurnal variations, variance

OP-011
HOW TO OVERCOME THE EFFECT OF DELAYED ANALYSIS ON HEMATOCRIT RESULTS: CORRECTED HCT VALUES

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Objectives: It is a well-known fact that there may be some changes in results of complete blood count (CBC) analysis due to excess waiting time of EDTA whole blood samples. The aim of this study is to determine a correction formula estimating the initial value from measured hematocrit with duration of delay in cases of delayed analysis by using linear regression which is the methods of machine learning.
Materials and Methods: We designed training and test data sets to determine correction formula. Training set includes 10 K2 EDTA whole blood samples from 10 healthy volunteers analyzed at 0th,1st,3rd,5th,7th,11th,15th,24th and 30th hours. Test set includes 20 samples analyzed at 0th,2nd,4th,6th,8th,24th,27th and 30th hours. All samples were analyzed for CBC with Sysmex XN-1000 hematology analyzer. Both simple and multiple linear regression (SLR, MLR)

studies were conducted to obtain correction formula. Only time was used as prediction parameter in SLR whereas hemoglobin, and erythrocyte were included along with time in MLR. The predictions were tested by using test set. R 3.4.3 (R Working Group, Vienna, Austria) was utilized for statistical analyses.
Results: Our training data showed us that time is not the only component for prediction. MLR model with time, hemoglobin and erythrocyte presented more compliant results with measurements than SLR model (R2=0.93, F=364.4 and R2=0.33, F=42.5, respectively). Correction formula for Hct was found as: Htc_pred=Hct_meas (0.00294*time(min)-0.78*RBC+0.12*Hb+0.36)
Conclusion: Prolonged waiting time prior to analysis is a subject of concern especially for samples collected during occupational screenings. Although the best way to overcome this problem is to obtain new samples, a correction formula may be a useful solution when resampling is not an available option.
Keywords: Linear regression, hematocrit, complete blood count, correction formula, machine learning

OP-012
AN EVALUATION OF PREANALYTICAL ERRORS IN COAGULATION TESTS

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Objectives: Coagulation tests in biochemistry laboratories are important. In coagulation tests, it is a priority to give accurate results with short turnaround time. Aim of study was to retrospectively investigate the causes of rejected coagulation samples in routine and emergency biochemistry laboratories in coagulation tests.
Materials and Methods: Between 1 July 2017-1 March 2018, the number of samples that rejected in emergency and routine biochemistry laboratories and delayed test results were obtained from the laboratory information management system (LIMS) and retrospectively reviewed. Rejected samples were classified by error sources, error percentages were calculated and sigma values were found.
Results: Number of samples for emergency laboratory coagulation tests was 28356 and total number of rejections was 339 (1.12%). Error rates were found as insufficient volume 139 (41.0%), inappropriate specimen container 108 (31.9%), clotted sample 70 (20.6%) and other causes 22 (6.5%). Number of samples for coagulation tests in the routine laboratory was 34513 and total number of rejections was 896 (2.59%). Error rates were inappropriate specimen container 630 (70.3%), insufficient volume 220 (24.6%) and clotted sample 46 (5.1%). The sigma values for preanalytical errors in the coagulation tests were 3.78 in emergency laboratory and 3.44 in routine laboratory.
Conclusions: To minimize the most common preanalytical errors in laboratories is necessary for accurate and timely results for accurate patient. In the case of these preventive plans, training of the blood collection staff is important, especially in order to reduce the rejected sample rates.
Keywords: Coagulation, preanalytical error, patient safety

POSTER PRESENTATION ABSTRACTS

PP-003
ARE GEL SEPARATOR TUBES SUITABLE FOR ANALYSIS OF TRACE ELEMENT?

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Objective: Preanalytical factors are now the most important cause of faulty trace elements results in biological fluids. In blood, there is less than 1% of total body zinc and copper levels. For this reason, analysis of trace elements requires precise measurements. One of the most important points that cause preanalytical errors the use of appropriate materials to ensure accurate results when working in biological fluids and preserving samples while increasing sensitivity. Studies have shown that in tubes containing gel, a portion of zinc and copper; does not pass to the serum by attaching to the pores of the gel and it shows that some loss of element have occurred. Despite being the ideal gel-free tube for trace element analysis, different tube types are sometimes used. The aim of this study is, to investigate effectively the zinc and copper levels of different tube types.
Materials and Methods: Blood samples collected from 24 volunteers were gel-free, to gel separator and heparinized tubes. Centrifuged at 1500 g for 5 minutes, and serum and plasma were obtained. Serum and plasma copper and zinc levels were measured by Atomic Absorption Spectrometer (AAS).
Results: The levels of zinc [60 (54-62) µg/dL; (69 (61-81), p <0.001] and copper [64 (54-71 µg/dL), (66 (60-76), p = 0.012] in gel separator and gel-free tubes were found to be statistically different, respectively it was seen that the lowest zinc and copper levels were found in plasma samples. There was a significant difference (p <0.001) between the levels of serum and plasma.
Conclusion: If serum and plasma are used replace each other for trace elements, the appropriate reference intervals for plasma or serum should be taken as basis. For serum zinc and copper measurements it is suitable to take samples in gel-free tubes.
Key Words: Blood collection tubes, Trace Elements, Atomic Absorption Spectrometer

PP-005
OUR PATIENT-SPECIFIC EXPERIENCE ON HOSPITAL INFORMATION MANAGEMENT SYSTEM

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Objective: Preanalytical phase errors begin at the point of requesting lab tests by clinicians and it is quite difficult to standardize them because they arise not only from the lab but also from the units out of lab and the patients. As a result of 32-75% of Total Error (TE) is in the pre-analytical phase, it is important to focus on pre-analytical phase for reducing TE. Very high serum total protein levels are observed in patients with Multiple Myeloma (MM). In lab practice, this subject results in that serum blood clot are not separated from each other in serum separator tubes (SSTs) which we usually use. This problem can be solved by using Lithium-Heparine (Li-H) added blood collection tubes (BCTs) (except serum lithium levels). We investigated the effect of the personal regulation of the Hospital Information Management System (HIMS) on the collection of sample to correct BCT in such patients.
Materials and Methods: Personal definition applied on HIMS for the patients diagnosed with MM. When a test for which should be collected in SSTs requested, a warning message appears on the computer to the corresponding users thus, the sample is being collected into Li-H BCT in the direction of warning.
Results: Serum separating problem in patients with MM has been solved after this personal definition.
Conclusion: Personalizing the HIMS by editing special definitions at the different levels e.g., patient, diagnosis, corresponding user will allow us to arrange special regulations. Finally, we consider that arranging special definitions in HIMS may reduce pre-analytical phase errors.
Keywords: Preanalytic error, HIMS, serum separation, Lithium-Heparine

PP-007
EFFECT OF PNEUMATIC TRANSPORT SYSTEM ON HEMOLYSIS RATES

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Objective: The use of pneumatic transport systems in clinical laboratories has resulted in decrease of turnaround time and reduction in the work force requirement. However, it may cause hemolysis, and therefore preanalytical errors due to the physical stress brought on blood specimens. In this study, we aimed to compare the hemolysis rates of blood samples before and after the establishment of pneumatic transport system in our hospital.
Materials and Methods: Using our hospitals laboratory information management system, monthly hemolysis rates of 12 months before the establishment of pneumatic transport system, and 6 months after the use of pneumatic transport system were obtained. Mann-Whitney U test was performed to compare groups. P < 0.05 was considered statistically significant.
Results: The mean monthly hemolysis rates before and after the use of pneumatic transport system were 0.42±0.156% and 0.38±0.042%, respectively. The difference between the groups was not statistically significant (P = 0.820).
Conclusion: It is known that, possibility of hemolysis and breakdown of the erythrocytes will increase as the level of physical stres increases. In our study, it was concluded that the pneumatic transport system of our hospital does not cause physical stress at high levels, therefore hemolysis rates did not increase. It was considered that the pneumatic transport system could be a reliable method to reduce the turnaround time in clinical laboratories.
Keywords: Hemolysis, pneumatic transport system, preanalytical error

PP-008
EFFECTS OF REGULATION CHANGES ON ETANOL ASSAY SAMPLE TRANSFER AND REJECTION RATES IN BLOOD

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Objective: With the Department of Laboratory Services of the Ministry of Health entering into force with the general rule no. 2017/12, corrective actions were taken in the preanalytical, analytical and postanalytical processes related to the regulation of ethanol in the hospital and laboratory. The aim of this study is to evaluate the effect of changes in the preanalytical process determined by the circular on the sample acceptance / rejection rates in addition to the safety of the forensic sample.
Materials and Methods: After the circular, a locked bag was prepared for the transport of the requested samples of ethanol test. From July, before the circular, the retroactive 7month period between 01.01.2017 - 01.08.2017, after the circular, the ethanol test reject statistic was scanned retrospectively from September, 01.09.2017 - 01.04.2018 over the laboratory information system Results: In the period before the circular; Hemolysis rate, number: 1.003, 16. After the circular Hemolyzed sample rate: 2.766%, 41. The hemolyzed sample rate and number were found to increase significantly (p <0.001).
Conclusion: After the circular, it was concluded that hemolytic index should be evaluated for the ethanol test in plasma as well as the hemolytic index evaluation in our other biochemical tests as the result of the increase in the rate of hemolyzed samples resulting from the application of the locked bag which we started with the name of safe transfer in sample transfer. By showing the application example of our hospital, it has been shown that different effective applications can be made for certain conditions.
Key Words: Ethanol, Transfer, Hemolysis

PP-009
COMPARISON OF CK MB ACTIVITY AND MASS MEASUREMENT METHODS

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Objective: CK-MB is a test with high diagnostic value in AMI. Immunoinhibition, which is still widely used in the routine laboratories for CKMB activity measurement, may result in misdirect of the clinician while reducing the specificity of the test by giving results above the reference intervals in healthy people without myocardial necrosis. The aim of this study is to compare CK-MB mass and activity measurement and examine the effect of hemolysis on these parameters.
Materials and Methods: In February-March 2018, a total of 187 patients who were admitted to the emergency room with complaints of chest pain and 36 of whom were diagnosed with AMI, CK-MB activity and hemolysis index measurements were performed in the Roche Cobas 6000 autoanalyzer C501 module using the Roche Diagnostic kit using the immunoinhibition method, CK-MB mass measurement was performed in the Roche Cobas 6000 autoanalytical-E601 module with the Roche Diagnostic kit by electrochemiluminescence method.
Results: In patients with AMI, the mean CK-MB values were 42.6 U/L for the activity, 26.7 ng/mL for the mass, and 27.4 U/L and 2.4 ng/mL for the healthy subjects, respectively. There was a statistically significant difference (p <0.01, p <0.001, respectively) in the AMI patient group when compared with the Mann-Whitney U test in terms of CK-MB activity and mass levels in the healthy group. The CK-MB activity values of the healthy group were 46.5 U/L in the hemolysis index-positive cases and 16.8 U/L in the negative ones. There was a statistically significant increase in CK-MB activity levels (p <0.001) in hemolysis index-positive patients in the healthy group, but no significant difference was found in the hemolysis index-negative ones (p> 0.05).
Conclusion: In AMI patients, the increase in CK-MB activity was more

significant, while the increase in mass and CK-MB activity was significant. While CK-MB activity measurement is affected by hemolysis, mass measurement is not affected by hemolysis. In AMI, CK-MB mass seems to be a better method than activity because it is more susceptible to mass measurement and prevents unnecessary further examination and treatment due to interferences in emergency services where hemolysis (hemolysis index was found high in 36% (54) of 151 healthy cases in healthy group) is seen at a higher rate.
Key words: Hemolysis, AMI, CK-MB

PP-010
COMPARISON OF SOME BIOCHEMICAL TESTS IN DIFFERENT BLOOD COLLECTION TUBES

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Objective: Blood Collection Tubes(BCT) related interferences in test results can adversely influence patient outcomes, decrease laboratory efficiency, delay test results, and increase the cost per test due to recollection and retesting. Blood from patients who are receiving anticoagulant therapy may take longer to clot. We compared with BD (Becton- Dickinson, Franklin Lakes, USA) Vacutainer Serum Separator Tubes (SST), BD Vacutainer® Barricor™ Plasma Blood Collection Tubes, BD Vacutainer® RST (Rapid Serum Tube).
Materials and Methods: 32 samples were obtained after the dialysis were included in the study. 8 routine clinical chemistry parameters (AST, creatinin, urea, PTH, glucose, LDH, PTH, K, calcium) were analyzed on Beckman Coulter AU 5800. The results of biochemistry tests obtained from, BD Vacutainer® RST (Rapid Serum Tube) and BD Vacutainer® Barricor™ Plasma Blood Collection Tubes were compared with BD Vacutainer SSTs as reference tubes. The significance of the differences between samples was assessed by paired t-test or Wilcoxon Rank test after checking for normality. Evaluation of clinical significance was performed based on total allowable error.
Results: Results of Glucose, K, Urea, LDH, PTH were statistical significantly different between the BD Vacutainer SSTs and BD Vacutainer® Barricor™ Plasma Blood Collection Tubes (p=0.017, p=0.00, p=0.011, p=0.019, p=0.00 respectively). Results of PTH was significantly different BD Vacutainer Serum Separator Tubes (SST) and BD Vacutainer® RST(p=0.00). Statistical significance of test results was not clinically significant for the biochemical parameters.
Conclusion: BD Vacutainer® Barricor™ Plasma Blood Collection Tubes provides a fast, clean, high-quality plasma samples, safety results and may lower times and costs.
Key words: Blood collection tube; Plasma; Serum

PP-012
EFFECT OF DELAYING EDTA CONTAINING TUBES VERTICALLY OR HORIZONTALLY ON CBC RESULTS

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Objective: Prolonged delay of EDTA-containing whole blood specimens vertically or horizontally may cause preanalytical errors. The purpose of this study is to evaluate the effect of delaying EDTA-containing tubes vertically or horizontally for two hours on complete blood count(CBC) results.
Materials and Methods: CBC analysis of 100 patients was performed within 10 minutes after the sample acceptance. 50 of these samples were kept in the vertical position, while remaining 50 were kept in horizontal position for two hours and analyzed afterward. Paired samples t-test or Wilcoxon signed-ranked test was used for the comparison of groups. P<0.05 was considered statistically significant.
Results: WBC, MCV, MPV, PCT, PDW, PLT, RDW, neutrophil counts and lymphocyte counts of 2-hour vertically delayed group were significantly different than their first results (P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, respectively). WBC, RBC, HGB, MCV,
MCH, MPV, PCT, PDW, PLT, RDW, neutrophil counts and lymphocyte counts of 2-hour horizontally delayed group were significantly different than their first results(P=0.003, P=0.022, P<0.001, P=0.026, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, P<0.001, respectively).
Conclusion: Keeping the blood samples with EDTA-containing tubes horizontally or vertically for two hours caused statistically significant differences in CBC results. Therefore, it is important to perform CBC analysis immediately to ensure correct results. If sample admission time for the EDTA-containing blood samples will be as much as two hours, transferring the blood samples vertically can minimize the incorrect results.
Keywords: Complete blood count, EDTA, horizontal, preanalytical error, vertical.

PP-013
HYPOPOTASEMIC PERIODIC PARALYSIS, DRAMATIC RESPONSE TO POTASSIUM TREATMENT: CASE REPORT

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Objective: The hypopotassemic periodic paralysis is an uncomman and autosomal dominant disease characterized by recurrent muscle weakness. It occurs due to mutations in the sodium, potassium or calcium channels. If appropriate treatment is not received, patient may be lost due to cardiac arrhythmias or insufficiency in respiratory muscles. We wanted to present a case with quadriparesia and also affecting respiratory muscles, because of the hypopotassemic periodic paralysis. Case: 18-year-old girl was brought to emergency department with complaints of weakness and respiratory distress. She had a history of similar complaints about two times in last one year. There was no trauma history before and no pathological finding except for neurological assessment on her physical examination. Quadriparesia near to quadriplegia was detected. In laboratory tests, serum potassium level was too low (1.8mEq/L). The other hematological and biochemical tests were in normal range. And blood gas analyzes were also normal except potassium (1.5mEq/L). To exclude a central and respiratory event, radiological images were taken. Patient was taken to the emergency observation unit and potassium replacement was done quickly. The muscle strength and respiratory distress were recovered within hours. According to the clinical and laboratory investigations and the response to treatment, hypopotassemic periodic paralysis was considered. The patient was discharged by arranging treatment after 12 hours observation and genetic tests (mutation in gene CACNA15) and short exercise EMG were suggested for definite diagnosis.
Conclusion: Although it's rare, low potassium level with widespread muscle weakness let us consider hypopotassemic periodic paralysis. The patients should be warned about some conditions can trigger the the attacks just as more exercise, carbohydrate-heavy meals, infection deseases, stres and trauma.
Key words: hypopotassemia, paralysis, respiratory distress

PP-014
INVESTIGATION OF THE FACTORS AFFECTING TURNAROUND TIMES IN ETHANOL TESTING

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Objective: Turnaround time (TAT) is an important indicator of the laboratory quality. In the present study, it is aimed to investigate the differences between the TATs of the ethanol test ordered from different clinics in the hospital, the influence of chain of custody on TATs, and the contribution of intra-laboratory and extra-laboratory TATs to the total TAT in ethanol testing.
Materials and Methods: 15 months of TAT data of ethanol test was gathered from laboratory information system. The differences between TATs of the ethanol test ordered from discrete clinics were analyzed by Kruskal-Wallis test. Mann-Whitney U test was used for comparing the TATs before and after the chain of custody procedure. The relationship between sub-processing times and the total TAT was evaluated by Spearman test.
Results: The chain of custody procedure had no influence on total TAT (p=0.441). The TATs of samples from the psychiatry clinic were found higher than the emergency service and the reanimation clinic (p<0.001, p=0.018 respectively). While preanalytical and extra laboratory TAT had a very high (r=0.925) and high (r=0.722) positive correlation with total TAT respectively, low positive correlation (r=0.310) was found between analytical TAT and total TAT (p<0.001).
Conclusion: The chain of custody procedure did not extend total TAT. TATs of the ethanol test ordered from distant clinics were found prolonged. Furthermore, preanalytical and extra laboratory TATS constituted the majority of total TAT. Establishing satellite laboratories close to the remote clinics or the utilization of pneumatic tube systems to transport samples can help to achieve better TATs.
Keywords: turnaround time, ethanol, preanalytic phase

PP-015
A DIFFERENT VIEW ON THE PRENATAL SCREENING TEST REQUEST RATES OF KAYSERI REGION IN RECENT YEARS

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Objective: It is aimed to investigate the prevalence of clinical request of prenatal double and triple screening testing for Turkish citizens (TC) and immigrant refugees(IR).
Materials and Methods: Between January-2015 and April-2018-approximately 40 months-were scanned and evaluated statistically for the double and triple

screening test numbers requested in the Clinical Biochemistry laboratory.
Results: Total number in double and triple test requests; 18.216 and 19.047 for TC and 1.853 and 2.320 for IR, respectively. When the distributions of the dual test requests according to years are examined; The average monthly demand rate for TC's in 2015 was 94%, compared to 89% in 2017. For triple test; For IR, the rate for 2015 was 8%, compared to 14% in 2017. Double test request rates for TV have been changed from 23%, 4% and -4%, respectively, to the previous year from 2015, and to 6%, - 0.6% and - 8% for the triple test. For IR, the double test request rates have been 46%, 29% and 16% from 2015 onwards, respectively; for the triple test has been 17%, 29% and 13%.
For TC, in 2016, the percentage of increase in the average number of dual test requests compared to the previous year was 23%, compared to 47% for IR. For TC by 2017, the percentage of increase in the average number of dual test requests compared to the previous year was 4%, while for GM this rate was 29%. While the percentage of increase in triple test request worked in total in 2017 was 3.4, this ratio has been 7 percent for double test.
Conclusion: During the research period, it was seen that the majority of the pregnancy follow-ups were TC, and about 10% of the total pregnancy cases constituted IR. Based on the year 2015, it has been determined that the demand rate of the tests increases in 2016 and 2017. It has been determined that these increases are similar between TC and IR. In addition, when laboratory planning is done, it is predicted that annual test demand can be met with an increase of about 7% compared to the previous two years.
Key Words: triple test, double test, rate

PP-016
EFFECTS OF VITAMIN D ON ISCHEMIC STROKE

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Objective: Ischemic stroke (IS) is a heterogeneous multi-factorial disorder and attenuated 25- hydroxyvitamin D [25(OH) D] levels are reported to be associated with increased risk of IS. We aimed to investigate the possible contributions of serum 25(OH) D and vitamin D binding protein (VDBP) levels along with leukocyte vitamin D receptor (VDR) gene expression in patients with IS.
Materials and Methods: From December 2016 to February 2017, consecutive stroke patients admitted to the emergency department at our University Hospital were identified and enrolled to this study. A total of 90 participants, 51 diagnosed with acute IS and 39 control individuals, in the same age range were examined. Severity of IS was assessed at admission using the National Institutes of Health Stroke Scale (NIHSS) score. Gene expression of vitamin D receptor in leukocyte was assessed by real time polymerase chain reaction.
Results: Vitamin D deficiency was detected in both control and patients group. The serum VDBP levels were not markedly modified in IS patients. Additionally, no marked changes were observed in the leukocyte VDR gene expressions in patients with IS when compared to controls. However, we detected a negative correlation between 25(OH) D levels and the NIHSS score ($r = -0.3201$, $P = 0.0342$).
Conclusion: Our results suggest that there is a correlation between serum 25(OH) D levels and severity of IS assessed by NIHSS. Our data showed that serum VDBP levels and leukocyte VDR gene expressions did not contribute the pathogenesis of IS.
Keywords: Ischemic stroke, vitamin D, vitamin D binding protein, gene expression

PP-017
THE RATE OF UNSUITABLE SPECIMENS IN URINARY ORGANIC ACID TEST REQUESTS

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Objective: Organic acids are analyzed in patients suspected of having a broad range of metabolic disorders including inborn errors of amino acid, fatty acid, carbohydrate, neurotransmitter, vitamin, sterol, mitochondrial energy, and purine and pyrimidine metabolism. The aim of this study was to find out the rate of unsuitable specimens in urinary organic acid test requests.
Materials and Methods: Samples sent to the biochemical metabolism laboratory from Selçuk University Faculty of Medicine clinics between 2017-2018 years for organic acid analysis were included in this study. The percent of urine creatinine values below 5 mg/dL in these samples was calculated as a ratio to the total number of requests.
Results: In our laboratory, 208 urinary organic acid test were requested in a year period and 40 (19.2%) urine creatinine values were found below 5 mg/dL.
Conclusion: Quantitative error may occur in the analysis of some acids (keto or polar) extracted from urine specimens with low creatinine. the extent of the error resulting from the dilution effect may be such that the quantitative response is significantly altered, possibly changing the clinical interpretation when successive samples from a given patient are monitored.
Keywords: Organic acid analysis, Inherited metabolic disease, Urine creatinine

PP-018
HOW IS UNNECESSARY REQUEST OF PROSTATE-SPECIFIC ANTIGEN TESTING PREVENTED?

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Objective: In this study, it was aimed to show how the unnecessary desired free prostate-specific antigen (sPSA) test changes with some regulation.
Materials and Methods: The sPSA requirements when total PSA values below 4 ng/mL or above 10 ng/mL were considered 'unnecessary test request'. To do this, the relevant physicians were informed and the sPSA test was arranged to have a separate second window on the request panel and physicians were requested only tPSA test requests. An additional sPSA test was conducted by the laboratory staff from patients with a tPSA score of 4-10 ng / mL.
Results: It was seen that 1236 sPSA and 1292 tPSA tests (sPSA/tPSA = 95.6%) were performed in our hospital between 17.01.2017 and 09.03.2017 while 328 sPSA and 1139 tPSA tests were performed between 17.01.2018 and 09.03.2018 (sPSA / tPSA = 28.7%). The ratio of sPSA test request to tPSA test request was found to be reduced by 66.9 %.
Conclusion: It was prevented significant financial and labor loss reducing the number of unnecessary sPSA tests with regulations made at the test prompt.
Keywords: Prostate-specific antigen, unnecessary testing request, laboratory, cost analysis

PP-019
COMPARISON OF PREOPERATIVE AND POSTOPERATIVE APELIN, CALCIUM AND ALBUMIN LEVELS UNDERGOING UNILATERAL TOTAL KNEE ARTHROPLASTY PATIENTS WITH TOURNIQUET

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Objective: Apelin is a peptide-based molecule whose pathophysiological effects have begun to be identified in recent years, it shows its effect via APJ named receptor. APJ activation depends on the regulation of various intracellular effectors such as adenylate cyclase inhibition, intracellular calcium increase and activation of extracellular signal regulatory kinases. The aim of our study was to compare preoperative and postoperative (1th and 24th hours) apelin, calcium and albumin levels undergoing unilateral total knee arthroplasty (UTKA) patients with tourniquet.
Materials and Methods: Twenty-nine patients who underwent UTKA with tourniquet in Selcuk University Faculty of Medicine Clinic of Orthopedics and Traumatology were included in the study. Patients with diabetic microangiopathy, cardiovascular disease history, peripheral arterial disease, and three months extremity surgery history were excluded from the study. Serum calcium and albumin levels were analyzed by routine biochemistry autoanalyzer (Beckman Coulter AU5800). Serum apelin levels were analyzed by ELISA device (Kayto RT- 2100-C Microplate Reader). Paired sample t test was used for statistical analysis by IBM SPSS 20.0.
Results: It was seen a reduction between Ca0-Ca1, Ca0-Ca24, Alb0-Alb1, Alb0-Alb24 periods ($p=0.001$; $p=0.025$; $p=0.001$; $p=0.013$), respectively. It was not seen no significant differences in other periods and parameters, especially in terms of decreased postoperative apelin levels.
Conclusion: In many studies, it was reported that usage of tourniquet during surgery increases oxidative stress status depending on ischemia in knee arthroplasty. According to our results, we think that apelin levels were decreased due to enhanced oxidative stress status. But it was observed that these reductions were not significant in our study.
Keywords: Total knee arthroplasty, tourniquet, apelin, calcium, albumin

PP-020
COMPARISON OF THE LIPID PROFILE AND THE ICTERUS AND LIPEMIA INDEX

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Objective: Haemolysis, lipemia, and other factors that interfere with test results can be identified as qualitative or semiquantitative. Serum indices of serum lipid profile and bilirubin levels were investigated in this study.
Materials and Methods: During January-February 2018, the SI values determined by Abbott Architect CI16200 autoanalyzer were retrospectively screened. 23.891 SI values were semiquantitatively grouped.
Results: When Lipemia Index categorized as 0= 0-50, 1=51-100, 2=101-150, 3=151-200 and 4≥200, TG, total-cholesterol, HDL-C, LDL-C, total-bilirubin, direct-bilirubin, albumin , total-protein and TG/LI were statistically significant($p<0.05$). When Icterus Index categorized as 0 =<2, 1=2-4, 2=4,1-10, 3=10,1-20, 4≥20, total-cholesterol, HDL-C, total-bilirubin, direct-bilirubin, total-protein and TG/LI, there was a statistically significant difference between variables($p<0.05$). According to multi-factor ANOVA results of variables correlating with LI and II, it was determined that LI was associated with LDL-C, total-cholesterol, total-bilirubin, direct-bilirubin, albumin and II with TG, HDL-C, total-bilirubin and direct-bilirubin. For regression analysis of related values, we found 0,468+1,086*total-bilirubin for II with r2=0,28 and -10,383-0,241*LDL-C+0,232*total-cholesterol for LI with r2=0,17.
Conclusion: Lipemia defined as tribudity that can be seen with the naked eyes in the sample. It is known that the contribution of all lipoproteins to the increase in turbidity is not equal, the increase is mostly associated with large lipoprotein molecules. However, the presence monoclonal, polyclonal gammaglobulin increase, etc. that may cause turbidity increase should be considered, lipemia and triglyceride incompatibilities should be carefully examined. It should also be taken into account the II can interact with serum total-bilirubin level and direct-bilirubin and also other tribudymetric effects may also interfere with these.
Keywords: Lipid profile, lipemia index, icterus index

PP-021
EFFECTS OF TIME AND TEMPERATURE ON STABILITY OF SOME TUMOR MARKERS AND HORMONES

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Objectives: In this study, the stability of analytes measured by immunoassay at different times and temperatures was examined in serum gel tubes and plain tubes.
Materials and methods: Ten healthy subjects were recruited and blood was collected into four tubes, two with and two without gel separator. All samples were allowed to clot for 30 min at room temperature before centrifugation. Analyzing the baseline samples in 30 min, all were stored at 4 °C and 24°C for 6, 24, 48, 72 and 96 h. Thirteen analytes were measured on each sample. If the change between the initial and subsequent measurement results were greater than the acceptable change limit (ACL), it was considered clinically significant.
Results: On the fourth day, most analytes remained stable including AFP, Ca-125, Ca-15-3, Ca-19-9, fT3, fT4, TSH, FSH, LH ve PRL regardless of tube types at 4 °C and 24°C. Insulin was stable 6 h at 24 °C in gel tubes and then decreases, but was stable 96 h at 4 °C. Also, insulin was stable less than 6 h at 24 °C in plain tubes. At 24 °C, PTH was stable up to 24 h in gel tubes and up to 6 hours in plain tubes. B12 was stable up to 72-h at 24 °C in serum gel tubes and plain tubes.
Conclusions: Serum gel or non-gel tubes might be used interchangeably for all analytes at 24 °C or 4 °C as long as four days, except for insulin, PTH, and B12.
Keywords: Stability, temperature, time, tubes

PP-022
EFFECT OF PREANALYTICAL EXTRACTION METHOD FOR URINARY CORTISOL DETERMINATION

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Objective: Cortisol is lipophilic and is transported bound to cortisol-binding globulin (CBG) and albumin; a small fraction (10%) of total serum cortisol is unbound and biologically active. Automated immunoassays are used to measure cortisol but lack specificity and show significant inter-assay differences. The aim of this study was to compare the effect of extraction on urinary cortisol measurement in immunoassay systems.
Materials and Methods: A total of 30 urine samples were analyzed with Roche cortisol commercial immunoassay kit. 24-hour urine samples were collected and liquid-liquid extraction was performed for a portion of urine sample via dichloromethane. Urine cortisol was analysed in both extracted and unextracted samples. Statistical analysis was performed with SPSS v21. $p<0.05$ value was considered as statistically significant
Results: According to paired sample t test, there was a statsitically significant difference between extracted and unextracted 24-hour urine cortisol measurement in immunoassay platform. The mean values were 80±62 and 337±232 mcg/24 hours for extracted and unextracted urine samples, respectively ($p<0.001$)
Conclusion: Cortisol immunoassays are thus deteriorated by varying degrees of antibody cross-reactivity with other steroids, endogenous and exogenous and can be unreliable in certain clinical settings such as congenital adrenal hyperplasia (CAH) and in patients treated with synthetic glucocorticoids. According to this study's results, It might be effective to analyze the samples with liquid-liquid extraction in immunoassay systems.
Keywords: Cortisol, Dichloromethane, Immunoassay

PP-023
RATIO OF HIGH HEMATOCRIT LEVELS AS A CAUSE FOR FALSE RESULTS IN COAGULATION TESTS

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Objective: One of the many preanalytic variables which affect the results of routine coagulation tests is the high hematocrit value. In many studies, it has been found that PZ and aPTZ increase with an increase in hematocrit value. CLIA and CAP suggested to adjust the amount of citrate used for blood samples with high hematocrit value. In our study, we aimed to evaluate the coagulation results of patients with high hematocrit (> 55%) from the automation system.
Materials and Methods: Ankara University Medical Faculty Cebeci Biochemistry Laboratory automation system patient data were obtained between November 2017 and January 2018 for hemogram and coagulation tests. Hematocrit> 55% patient outcomes were evaluated. For coagulation tests, a tube with a total volume of 1.8 mL containing 3.2% citrate was used.
Results: Twenty-one (0.22%) of the 9451 patients who required hemogram and coagulation tests at the same time, had hematocrit value> 55%. Two patients with hematocrit> 55% had a high PT with a hematocrit of 60.2% and high aPTT with a hematocrit of 70.5%. All other outcomes were among the normal reference intervals.
Conclusion: CLIA and CAP recommend adjustment of citrate concentrations in patients with high hematocrit (> 55%). Adjustment of citrate concentrations can be done using a normogram in CLIA documents or a mathematical formula C = (1.85 × 10-3) (100 - Hct) (VBlood). Both methods provide suitable citrate concentrations for elevated hematocrit values. With this application, more accurate and reliable results are obtained in the presence of coagulation test results incompatible with patient clinic. Each laboratory should develop a procedure for eliminating errors at high hematocrit levels
Keywords: Preanalytical variables, hematocrit, prothrombin time, aPTT

PP-024
ISTANBUL PROVINCIAL HEALTH DIRECTORATE PUBLIC HOSPITAL SERVICES-2 CENTRAL LABORATORIES-2 EFFECT OF INCREASED WORK LOAD ON TRANSFER PERIODS

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Objective: The central laboratory began serving on March 13, 2014. The service is based on the principle of transferring the samples at certain times of the day via the couriers. This study examines how additional workload impacts sample transfer periods.
Materials and Methods: In the Central Laboratory, the transfer periods are recorded with the data logger which is used together with a special bag transfer software program and also the RFID system which is in the vehicles.
Results: Haydarpaşa RTH, Beykoz State Hospital, Üsküdar State Hospital, Ümraniye RTH, Zeynep Kamil RTH, Siyami Ersek RTH, Şile State Hospital, Medeniyet University Göztepe RTH, Erenköy Psychiatric and Neurological Diseases Hospital, Erenköy Physical Therapy Hospital, Fatih Sultan Mehmet RTH and affiliated outpatient clinics started with 15 different centers and reached to 26 in 2017 and continued till 8 January 2018.
The average transfer times for 2015, 2016 and 2017 are 44,46,41 minutes respectively.
The average 2-minutes increase in 2016 was optimized by a 5-minutes decrease in the average over 2017.
Conclusion: The transfer times are reviewed every month, and due to the deviations, the courier program is constantly revised to be optimized as follows:
1. Vehicle-based records are examined and data control is provided.
2. Route changes were made to the additional centers for traffic flow.
3. A new vehicle is included in the system.
As a result, despite the increase in workload, there was no significant increase in transfer times, and by the end of 2017 the average transfer time was provided with shorter recovery activities.
Key Words: Central lab, transfer, improving

PP-025
A COMPARISON BETWEEN THE VES-MATIC 200 ERYTHROCYTE SEDIMENTATİON RATE INSTRUMENT AND A MODIFIED WESTERGREN METHOD

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Objective: Estimation of the erythrocyte sedimentation rate (ESR) has a long history. The ESR measurement is inexpensive and easy to use in clinical laboratories of various sizes. The methodology and measuring principles vary markedly according to method although, in principle, all methods should be evaluated in comparison with the reference standardized method to obtain harmonization. Although EDTA samples would be usable for both ESR and hematology measurements, 1:5 citrate diluted samples are widely used for ESR analysis. The International Council for Standardization in Hematology (ICSH) has prepared recommendations for the measurement of ESR. The calibration of ESR is very important for accurate measurements because of the differences in blood sample quality (citrate or EDTA, sampling tubes), measuring principles and measuring times. Some of the automated methods use EDTA as an anticoagulant, which is ideal because of its usability in other hematological measurements. Our aim in the present study was to compare the 'modified Westergren' method and the vesmatic-200 method by analyzing the same patient with EDTA sample.
Materials and Methods: The study included 32 samples. Blood drawn in patients in the same time with EDTA and Citrate tubes and studied different methods. Intrarun precision determined with 3 patient samples, each analyzed 3 times during the same 8 hour period. The interassay CV% was measured by using a commercial control. A correlation coefficient, Bland-Altman plot and PassingPablok analysis were used in analysis.
Results: The study included 32 patients. The intra-assay CV% was 9.8 % in Ves-matic 200 method. The interassay CV% was measured by using a commercial control and it was 7.3% in Ves-matic 200. The mean ESR was 22.93 mm/h in Ves-matic 200 analyzer and 23.53 mm/h in the modified Westergren method. The difference between the averages was 0.59 mm/h (2.3%). The overall correlation coefficient was 0.92 according to the Passing-Pablok method comparison (y = 1.9799 + 0.8738 x , intercept 1.9799and slope 0.8738). There was a non- linear relationship between the two methods. (P value < 0.05)
Conclusion: Since the ESR has a marked role globally in the diagnosis and follow-up in patient care, the different ESR methods should better agree with each other because the reference ranges used are the same. We found that the vesmatic 200 method is highly corelated with modified Westergren method we used to have. We thought that same referance ranges are usefull both tecniques. Every laboratory should do that comparison and decide their referance ranges before changing methods.
Keywords: Erythrocyte sedimentation Rate (ESR), EDTA, citrate

PP-026
EVALUATION OF PREANALTIC ERRORS of URINARY ANALYSIS IN A TERTIARY HOSPITAL

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Objective: Laboratory errors are classified as preanalytical, analytical and postanalytical errors. Today, preanalytical errors account for more than 70% of laboratory errors. The aim of our study is to identify major sources of error, especially by determining the percentage distributions of error sources in our urine analysis laboratory.
Materials and Methods: Between January 2017 and April 2018, routine urine and emergency urine analysis and 24-hour quantitative urine anaysis were retrospectively screened by the laboratory information management system (LIMS). The reasons for rejected samples were investigated and the error rates were calculated.
Results: The total number of urine samples studied during this period was 239 814 while the number of rejected samples was 218 (0.09%). 98% of the rejected samples were caused by preanalytical error. Rejection rate was higher (89%)in emergency laboratory than that of the routine laboratory. The first three most common error sources were inadequate specimens, macroscopic haematuria, and empty specimen vessels.
Conclusion: Among the sources of errors in our urine laboratories, we have found that preanalytical errors are the major error source and that the most common preanalytical error sources are insufficient samples (92%). Preanalytical errors should be detected and required precautions should be taken. The staff must be trained to inform the patients. The results should be presented faster and more accurately.
Key words: Preanalytical error, urine, error analysis

PP-027
COMPARISON OF PREOPERATIVE AND POSTOPERATIVE OMENTIN AND VISFATIN LEVELS UNDERGOING UNILATERAL TOTAL KNEE ARTHROPLASTY PATIENTS WITH TOURNIQUET

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Objective: It is thought that adipokines secreted by white adipose tissue, as well as extreme mechanical loadings of obesity, play a critical role in the etiology of rheumatic diseases such as osteoarthritis and rheumatoid arthritis. The aim of our study was to compare preoperative and postoperative (1th and 24th hours) omentin and visfatin levels undergoing unilateral total knee arthroplasty (UTKA) patients with tourniquet.
Materials and Methods: Twenty-nine patients who underwent UTKA with tourniquet in Selcuk University Faculty of Medicine Clinic of Orthopedics and Traumatology were included in the study. Patients with diabetic microangiopathy, cardiovascular disease history, peripheral arterial disease, and three months extremity surgery history were excluded from the study. Serum omentin and visfatin levels were analyzed by ELISA device (Kayto RT-2100-C Microplate Reader). Paired sample t test was used for statistical analysis by IBM SPSS 20.0. Results: There was not found a significant difference between Omt0-Omt1, Omt0- Omt24, Omt1-Omt24, Vft0-Vft1, Vft0-Vft24, Vft1-Vft24 periods (p=0.404; p=0.200; p=0.172; p=0.563; p=0.502; p=0.329), respectively.
Conclusion: Beginning with reduction of blood flow to the tissue and oxygen deficiency ischemic tissue damage results inflammation, which is caused by increased free radicals triggers the accumulation of inflammatory cells in the region. Cytokines released through the interaction between endothelial and inflammatory cells cause expanding of damage due to reperfusion. In our results, it was seen that omentin levels decreased in the postoperative 1th hour, increased in the 24th hour, visfatin levels increased in the 1th hour slightly and after decreased to preoperative levels in the 24th hour. But these changes have not realized significant.
Keywords: Total knee arthroplasty, tourniquet, omentin, visfatin

PP-028
TURNAROUND TIME (TAT) IN ROUTINE BIOCHEMISTRY PARAMETERS

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Objective: TAT is defined as "elapsed time between two specified points through pre-examination, examination, and post-examination processes" according to ISO 15189:2012, which includes time of clinician requisition, sample collection, sample transportation, sample analysis, etc. TAT is one of the most vital quality indicators of laboratory services. It is aimed to compare the TAT values of routine biochemical parameters in different days and hours and to determine the factors influencing these time periods.
Materials and Methods: In our study, we randomly selected a weekday and a weekend day. We collected the data (sample requisition, sample reception, input to the autoanalyzer, result arrival from autoanalyzer and result reporting times) belonging to biochemistry parameters requisition from the Central Laboratory of the University of Ankara Medical Faculty, Ibni Sina Hospital via laboratory information system. Using our collected data we calculated the pre-analytical time (time between sample requisition and autoanalyzer entry); analytical time (time between autoanalyzer entry and result arrival from autoanalyzer); post-analytical time (the time between result arrival from autoanalyzer and result reporting times) and TAT (time between sample requisition and result reporting times). A statistical analysis of the calculated times (mean±standart deviation) was performed.
Results: In our study, when weekday and weekend biochemistry parameters requisition data were compared; there was no significant difference between intra-laboratory TAT (time between sample reception and result reporting times) values (respectively 87.8±40.31 and 61.3±24.79). Weekday pre-analytical (80.05±29.7 min) and analytical (15.45±2.4 min) durations were significantly lower than weekend pre-analytical (103.4±62.8 min) and analytical durations (20.6±6.6 min) ($p<0.001$ for each one). It was found that the weekday post-analytical duration (29.5±35.6 min) was significantly higher than the weekend post-analytical duration (10.9±11.3 min) ($p<0.001$).
Conclusion: In this study, both of the weekday and weekend TAT values for routine biochemical parameters were found to be not to exceed the intra-laboratory TAT goal (180 min) predetermined for our laboratory.
Key Words: TAT, pre-analytical, biochemistry parameters.

PP-029
COMPARISON OF TROPONIN TURNAROUND TIME (TAT) VALUES ON WEEKEND AND WEEKDAYS

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Objective: Turnaround time (TAT) is commonly defined as the duration between a test's order and result report time, which includes pre-analytical, analytical and post-analytical stages. Early diagnosis and treatment of a disease and also early discharge of patients from emergency departments depend on TAT. The aim of this study is to investigate how TAT results of troponin, one of the most frequently requested tests in emergency department, is influenced by the performance of laboratory employees on different days and at different hours of the day.
Materials and Methods: In our study, we randomly selected a weekday and a weekend day. We collected the data (sample requisition, sample reception, input to the autoanalyzer, result arrival from autoanalyzer and result reporting times) belonging to troponin requisition from the Central Laboratory of the University of Ankara Medical Faculty, Ibni Sina Hospital via laboratory information system. Using our collected data we calculated the mean pre-analytical time (time between sample requisition and autoanalyzer entry); analytical time (time between autoanalyzer entry and result arrival from autoanalyzer); post-analytical time (the time between result arrival from autoanalyzer and result reporting times) and TAT (time between sample requisition and result reporting times) values. Calculated values (mean ± standart deviation) were statistically compared. Results: In our study when weekday and weekend troponin data were compared; there was no significant difference between TAT values. When the weekday and weekend day working hours were divided into three groups (1st group; 08:00- 12:00, 2nd group; 12:00-17:00 and 3rd group; 17:00-08:00), only at the weekend the post-analytical period of 3rd group (13,4±13,7 min) was significantly higher than 1st (4,8±5,3 min) and 2nd group (2,5±2,1 min) ($p<0,05$).
Conclusion: The TAT values calculated in this study was found to be compatible with our laboratory's predetermined TAT goal (90 min). The statistically significant difference in the weekend group wasn't evaluated to be clinically significant. Since; the mean intra-laboratory TAT we calculated for troponin is 63 min in weekdays and 48 mins at weekend, neither of which exceeds intra-laboratory TAT goal.
Key Words: TAT, pre-analytical, troponin.

PP-030
MACROPROLACTIN; SHOULD IT BE SCREENED IN ALL HYPERPROLACTINAEMIC PATIENTS

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Objective: The different forms of prolactin (PRL) are defined according to molecular size: monomeric PRL (predominant form, 23kDa), big PRL (50–60kDa), and big-big PRL (macroprolactin, 150-170kDa). Macroprolactin is described as a complex of PRL with immunoglobulin G which is related to antiprolactin autoantibodies. This formulation of PRL may cause limited bioactivity. Immunoassays show variability in the detection of macroprolactin. The aim of this study was to perform macroprolactin screening in patients with hyperprolactinemia and determine the problems encountered in routine practice.
Materials and Methods: Macroprolactin screening was performed by precipitation with polyethyleneglycol (PEG) in 900 patient samples with hyperprolactinemia over a period of approximately 6 months. Recovery values of less than 40% and greater than 60% were considered as macroprolactinemia and predominantly monomeric PRL, respectively. 40–60% recovery formed borderline values. PRL levels were analysed by cobas e-602.
Results: 900 (17.9%) of the 5007 reported prolactin results were out of reference range. 31 (3.4%) of patients with hyperprolactinemia had a recovery percentage of less than 40. However, the macroprolactin test was requested from only 171 patients over a period of approximately 6 months and 7 of these patients had less than 40% recovery. Although macroprolactin test was not requested by clinics, we detected predominantly macroprolactin in 24 patient samples.
Conclusion: Patients with high prolactin levels may be screened for macroprolactin to avoid unnecessary test repetition, examinations and inappropriate treatment. However, the screening of all hyperprolactinemic patients is not cost effective. Therefore, it is important to inform clinicians and activate the consultation process between the departments.
Key words: Macroprolactin, hyperprolactinaemia, PEG precipitation

PP-032
THE EFFECT OF SERUM SEPARATOR TUBES ON THE STABILITY OF THYROID FUNCTION TESTS

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Objective: Gelled tubes are known to cause interference in immunoassay methods. Serum FT3, FT4 and TSH levels were aimed to compare gelled tubes with gel-free tubes and were planned to evaluate the FT4, which is indicated in the literature, to be the most adsorbed and to cause false low measurement.
Materials and Methods: Blood was collected into three different tubes from 21 patients who applied to our hospital. Becton Dickinson(BD) and Türkplast(TP) were used as gelled tubes, Vacusera was used as gel-free tube. During drawing blood, the tube line was randomized. Serum TSH, FT3 and FT4 assays were measured on Beckmann-UniCelDXI800 devices without incubation. Also, after the tubes were waited for five hours, FT4 was run again. We assessed whether there was a difference in terms of potential gel interferences between the groups.
Results: When the groups were compared, there was no statistically significant difference (p values for TSH, FT3, FT4 are p:0.998, 0.930, p: 0.890, respectively). In addition, after the tubes were left for five hours, FT4 was run again and there was no significant difference between the three tubes. To add, no differences were found when comparing the first and last measurements of the tubes themselves (p values for BD, TP, Vacusera are p: 0.753, 0.530, p: 1 respectively).
Conclusion: Three of the tubes can be used for thyroid function tests. In the repeated measurements within five hours, the FT4 test was not found to be statistically significant. Each laboratory should make tube selection and verification.
Keywords: Thyroid Function Tests, Preanalytic, Gel, Immunoassay

PP-033
THE EFFECT OF IN VITRO HEMOLYSIS ON SERUM NITRIC OXIDE LEVELS

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Objective: NOx ,which is formed by the nitric oxide synthase enzyme from L-arginine, affects host defense and immunity, as well as plays an important role in the regulation of many physiological events, including blood vessel tone and neuronal transmission. There are many studies about the pre-analytic hemolysis on laboratory test results. This study was carried out to investigate the effect of hemolysis, which is an endogenous interference example, on NOx during scientific research.
Materials and Methods: This study was carried out in our Research Laboratory of Department of Medical Biochemistry. Blood was taken simultaneously from 20 volunteer patients to two gel-free biochemical tubes. Clear serum was obtained from one of the tubes, visible hemolyzed(+) serum was obtained after vortexing other tube for fifteen seconds. In both groups, NOx measurement was performed with colorimetric kit of Cayman brand.
Results: Statistical analysis of the data was performed with the SPSS20 program. Mann-WhitneyU test was used to compare the NOx levels, $p<0.05$ was taken to be statistically significant. As a result of comparison, the mean of the control group and the hemolyzed group were found to be 2.86 ± 2.41µmol/L and 5.66 ± 2.33µmol/L ,respectively. There was a statistically significant difference between the NOx levels ($p <0.001$).
Conclusion: Hemoglobin spectrally shows a strongly absorbing peak at wavelengths of 415, 540 and 570nm. In the Griess method ,which we used for NOx measurement, the measured wavelength coincides with this spectrum therefore hemolyzed samples must not be included in the study.
Keywords: Hemolysis, Nitric Oxide (NOx), Interference

PP-035
EVALUATION OF ALCOHOL TEST WITH SIX SIGMA METHODOLOGY IN EMERGENCY LABORATORY

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Objective: Six Sigma methodology is based on statistical evaluation of internal quality control and external quality assessment data for analytical reliability of laboratories. In our study, we aimed to evaluate the alcohol test in our emergency biochemistry laboratory with six sigma methodology.
Materials and Methods: Internal quality control data for the alcohol test between January 2017 and March 2018 were obtained from the laboratory information management system and external quality data were obtained from the results of the external quality assessment scheme in the same period. Sigma values were determined using bias, coefficient of variation (CV%) and allowable total error (TEa) goal.
Clinical Laboratory Improvement Amendments (CLIA 88) data was used for TEa.

Sigma values were <3 unacceptable, 3-6 were acceptable, ≥6 were considered optimal.
Results: Process sigma value; for alcohol testing was calculated as 3,98 for the normal level of the internal quality control and 4,05 for the pathological level. Conclusion: In emergency laboratories, tests with problematic processes should be evaluated carefully. The Six Sigma methodology can also be useful in identifying variables in process evaluation in such tests.
Keywords: Six sigma, alcohol, quality control

PP-037
THE EFFECT OF PREANALYTICAL ERRORS ON THE TEST QUALITY IN CLINICAL LABORATORIES

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Objective: Preanalytic period; "Procedures that begin with the clinician's request, chronologically, the test procedure, the identification and preparation of the patient, the retrieval of the primary samples, the transfer of the primary samples in the laboratory and the laboratory, and the end of the analysis process". Today, preanalytical errors account for more than 70% of laboratory errors. The majority of preanalytical errors; preparation of the patient, collection of samples, transportation, preparation for analysis and storage. Errors such as improper labeling, hemolyzed samples, lipemic samples, clotted samples, improper containers, insufficient samples are causing time and money loss.
Quality indicators have been determined based on these errors. Our aim in this study is to evaluate the distribution of faults in the preanalytical period and to use them as quality indicators.
Materials and Methods: Preanalytical process error data from January 2017 to January 2018 was obtained from the laboratory information system. Monthly percentages were calculated and evaluated for each type of error by the IFCC Working Group according to the Quality Indicators (QI) developed by Laboratory Errors and Patient Safety (WG-LEPS).
Results: In the samples coming to the biochemistry, hormone and urine laboratory, the quality indicators calculated according to the error types in the preanalytical period were determined at the optimum performance level in line with the quality targets. Among the error rates, "hemolyzed sample" was the first and "insufficient sample" was the second.
Conclusion: Continuous monitoring and management of preanalytical errors is crucial for the quality of laboratory performance. Our findings have shown that quality indicators may be useful in evaluating the preanalytic process. Errors in the laboratory can cause clinicians to report incorrectly, which can significantly affect health care services. According to quality indicators, the root of the errors affecting patient safety can be determined, corrective and preventive actions can be made. The monitoring of the preanalytical process as well as the analytical process to prevent laboratory errors will increase the reliability of the patient-physician relationship.
Keywords: Preanalytical errors, preanalytical process, laboratory performance

PP-038
EDTA-DEPENDENT PSEUDOTHROMBOCYTOPENIA

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Objective: Thrombocytopenia in a complete blood count, firstly false thrombocytopenia should be considered after incorrect identification, a clotted sample, inappropriate sample size and other sources of error are excluded. Platelet clusters developed due to antibodies in the bloodstream are counted as giant platelets or small lymphocytes by the analyzer when EDTA is generally used as an anticoagulant. Therefore, the platelet count may be inaccurately low.
Materials and Methods: A 55-year-old male patient with hyperlipidemia and atherosclerosis who admitted to the polyclinic cardiology was scheduled for coronary angiography after complaints of dyspnea and reduced exercise capacity. Thrombocytopenia was detected in the whole blood count despite the fact that the patient was incompatible with the clinical findings and the story, and then the whole blood count measurements were made by taking a sample of the citrate anticoagulant with the assumption that the patient may have pseudo thrombocytopenia due to EDTA.
Results: The EDTA anticoagulant showed a significant decrease in platelet counts at the 0., 60. and 120th minutes ($13x10^3$/µL, $10x10^3$/µL ve $5x10^3$/µL, respectively); platelet counts at the 0, 60th, and 120th minutes ($158x10^3$/µL, $152x10^3$/µL, $144x10^3$/µL/µL, respectively) remained around the reference range lower limit ($150-400x10^3$/µL) in the sample containing citrate anticoagulant. The result of the measurement was reported by confirming the diagnosis of pseudothrombocytopenia.
Conclusion: Pseudothrombocytopenia may occurs with the use of anticoagulant-containing tubes such as citrate, oxalate, heparin for complete blood count and often associated with EDTA. This condition usually interferes with the diagnosis of true thrombocytopenia and leads unnecessary diagnostic tests, false diagnosis and treatment approaches, labor force, cost and time loss.
In the case of thrombocytopenia, it is important not to ignore this condition, taking a new sample containing a different adjuvant and detecting the thrombocyte clusters in the peripheral blood smear in order to exclude pseudothrombocytopenia.
Keywords: Pseudothrombocytopenia, EDTA, citrate

PP-039
IMPACT OF FORMALIN-FIXED PARAFFIN –EMBEDDED (FFPE) TISSUE PROCESS AS A PREANALYTICAL FACTOR

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Objective: Formalin fixation and paraffin embedding is a timeless method of preserving tissue. This reservoir of specimens is increasingly being used for DNA and other molecular analyses. For that reason to evaluate the impact of preanalytical factors associated with the formalin fixation and paraffin embedding process on molecular methods is important.
Materials and Methods: Potential sources of preanalytical variability associated with the procurement, fixation, and storage of FFPE tissue were identified based on the experience of our molecular biophysics laboratory.
Results: Investigations of the potential effects of tissue size, before fixation, found that PCR success rates were highest when DNA was extracted from specimens that were to 10 mm in diameter as opposed to smaller specimens or larger specimens. Importantly, extraction method and amplicon size have been shown to influence. Also, when unbuffered formalin and neutralbuffered formalin (NBF) were compared, our results shown that DNA extracted from NBF-fixed tissues gave greater yields and genotype determination success rates.
Conclusion: We must be careful about the archival FFPE tissue when the handling. Fixation, processing, and storage parameters for a specimen are unknown. With a concerted effort and attention to detail, accuracy, and awareness, FFPE tissue can serve as an important resource to clinical and research activities.
Keywords: Formalin-fixed, paraffin-embedded (FFPE) tissue, preanalytical factors

PP-040
ARRANGEMENT OF CAUSES OF REJECTION IN THE PRE-ANALYTICAL PROCESS AT THE UNIVERSITY HOSPITAL CENTRAL LABORATORY

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Objective: Preanalytical process is the time between the test request and arrival of the specimens. We aimed more efficient pre-analytical process management targeted by optimizing sample rejection causes.
Materials and Methods: Reasons for rejection have been re-examined and categorized, taking into account the EFLM recommendation and laboratory needs, in order to use the reasons for rejection more efficiently in Manisa Celal Bayar University Hafsa Sultan Hospital.
Results: In consideration of the reasons for rejection manually entered in the previous 24 reasons for retrial and other categories and for the requirements and EFLM proposals, the top 10 headings and the total 20 reasons for rejection were determined as follows.
1. Inappropriate quantity: a) Inadequate, b) Overfilled
2. Clotted
3. Hemolyzed
4. Inappropriate test request: a) Missing parameter, b) Double, c) False, d)Not-analyzed in the night shifts
5. Inappropriate tube: a) Incorrect, b) Empty, c) Over expired date
6. Lipemic
7. Icteric
8. Contaminated: a) with EDTA, b) with fluid
9. Barcode error: a) Double barcode, b)Sample-patient incompatibility
10. Transport fault: a) Opened cap, b) Inappropriate transport, c) Inappropriate timing
In year 2017, 15,228 samples (%1.50) were rejected among 1,010,569 samples. Rejection causes for the samples starting from the most frequent were inadequate (%41.2), clotted (%29.6), hemolyzed (%18.7), inappropriate test requests (%5.6), and inappropriate tubes (%3.9). The reasons for rejection were determined by paying attention to these ratios and a user friendly system was aimed.
Conclusion: For good process management one should be open to innovations, follow the literature and take into account the needs of the laboratory. This change in the system will provide a more efficient pre-analytical process management.
Key words: rejection analysis, preanalytical process, process management

PP-041
THE EFFECT OF FREEZING-DISPOSITION ON PLASMA HOMOCYSTEIN MEASUREMENTS

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Objective: Homocysteine is an independent risk factor for cardiovascular disease. The current recommendation for the collection of homocysteine samples is to centrifuge within 1 hour and place on ice. Plasma homocysteine levels are stable for at least 24 hours at room temperature and may stabilize for a few months when stored frozen. Our goal in our study is to evaluate the effects of these preanalytical error sources on the stability of homocysteine samples during donation and storage of samples by performing freeze-thaw procedures on homocysteine samples.
Materials and Methods: The homocysteine samples were frozen at -20 ° C and the subsequent analyzes were carried out on a fresh sample, followed by a two-day frozen-thaw procedure and analyzed with a Thermo Scientific Ultimate 3000 UPLC instrument. The preanalytical error level that could be attributed to this procedure was statistically evaluated using the Spss IBM 21 program.
Results: We found that the plasma homocysteine measurement between the fresh sample and frozen-thawed sample showed statistically significant difference in the chromatographic platform compared to the paired t-test. The mean values for fresh and frozen plasma samples were 5.46 ± 1.66 and 4.52 ± 1.53 µmol / L, respectively ($p < 0.001$).
Conclusion: For homocysteine measurement, it may be more reliable to analyze plasma samples without freezing.
Keywords: Homocysteine, storage, stability

PP-042
THE EFFECT OF STORAGE ON EXTRACTED SAMPLES FOR CHROMATOGRAPHIC HOMOCYSTEINE MEASUREMENT

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Objective: One of the significant preanalytical factors that can affect the reliability of homocysteine measurements is storage. The reported stability for homocysteine measurement was two days after extraction in the commercial kit insert. The aim of this study was to demonstrate the effect of storage on extracted samples for chromatographic homocysteine measurement.
Materials and Methods: A total of 30 plasma samples were analyzed. 50 µL plasma was added to 50 µL internal standart, 20 µL reducing agent and 100 µL derivatizating agent. After vortex and incubation for 10 minutes at 60 0C, plasma samples were colled on 2-8 0C. 100 µL precipitation reagent was added, vortexed and incubated again. Samples were centrifuged at 10000 rpm for 5 minutes. 20 µL supernatant was injected to the chromatography system. A portion of extracted supernatant was stored for 5 days at 2-8 0C and reanalyzed for plasma homocysteine.
Results: According to Wilcoxon test, there was a statistically significant difference between first analysis and stored sample for homocysteine measurement in chromatography platform. The mean values were 6.60 (1.57-48.6) and 6.43 (1.55-45.8) µmol/L for first and stored plasma samples, respectively ($p=0.003$).
Conclusion: It might be more reliable to analyze the plasma samples immediately after sample collection for homocysteine measurement. Although the extracted supernatant was stored in 2-8 0C, the stability was deteriorated after five-day storage.
Keywords: Homocysteine, storage, stability

PP-043
EFFECTS OF LIPEMIA ON PROTROMBIN TEST, A CASE REPORT

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Objective: In biochemistry laboratories interferences are common that affect the result of the measurements. Lipemia is one of these interferences. Lipid molecules cause light scattering and affect the result of the analysis. It causes false evaluations affecting laboratory results in blood samples of patients. To avoid lipemia interferences, different methods are used to remove lipids, such as ultracentrifugation, extraction with organic solvents and detergent addition. In this case report, our aim was to prove that the correct results can be obtained by using different brand test kits on lipemic samples in coagulation test measurements.
Materials and Methods: A 46-year-old male patient was admitted to the orthopedic and traumatology clinic of Selçuk University Faculty of Medicine with a complaint of joint pain. Laboratory results of the patient were examined, serum lipemia index was +4 positive. A blood sample of patient which was drawn to citrate tube with a milky white plasma after centrifugation was suggestive of lipemia. The PT, INR analysis was performed on the Sysmex CA-1500 autoanalyzer using the Siemens Innovin brand test kit and resulted as no coagulation. Due to clinical and laboratory incompatibility of the patient, for explain abnormalities the test was reanalyzed on the BFT-2 instrument using Siemens Thromborel S test kit, PT: 15 s and INR: 1.39 were measured. The same patient sample was also detected as PT:14, INR:1.38 using the Siemens Tromborel S test kit with the manual hook fine needle method.
Results: To avoid misdiagnosis in lipemic samples, abnormal coagulation results should be carefully evaluated in terms of measurement technique. False elevations should be considered according to the clinical condition of the patient and appropriate technical measurements should be considered. Otherwise, improper treatment might be performed for the patient.
Keywords: Lipemia, prothrombin time, INR

PP-044
THE RATE OF HEMOLYSIS IN AMMONIA SAMPLES ADMITTED TO BIOCHEMISTRY LABORATORY

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Objective: Hemolysis is defined as the breakdown of erythrocytes and the spread of hemoglobin content outside the cell. Hemolyzed samples causes latency of laboratory results thus increasing health costs and workload, excessive sample collection from patient and delay of clinic decision. In this study, our aim was to investigate the rate of hemolysis in ammonia samples admitted to our laboratory from pediatric clinics.
Materials and Methods: Ammonia samples of 710 patients that admitted to Selcuk University Faculty of Medicine Pediatric Services between 2012-2017 were examined retrospectively in our laboratory. Hemolysis indexes were assessed using the Abbott Architect c16000 and c8000 autoanalyzer. Hemolysis indexes were evaluated with a hemoglobin values >200 g/dL as (+++,++++).
Results: In our hospital, it was determined that the rate of hemolysis in the samples with ammonia test requested from the pediatric clinics over 5 years period was 8.4%.
Conclusion: Erythrocyte ammonia content is three times higher than plasma. The stability of ammonia is 3 hours in 2-8 degrees, 24 hours in -20 degrees. It has to be transported on ice to laboratory. Because of the difficulty in obtaining blood from newborns, the exclusion of urea cycle defects may be a good laboratory practice if samples with hemolysis are analyzed and their value is in the reference range.
Keywords: Hemolysis, pediatric sample, Ammonia.

PP-045
THE EVALUATION OF INTERN KNOWLODGE ABOUT THE FACTORS WHICH CAUSE TO PREANALYTIC ERRORS

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Objective: The clinical laboratory's results are very important for accurate clinical diagnosis and prognosis. Preanalytical variables can account for up to 70% of laboratory errors. The most of the preanalytical errors occur during preparing patients, sampling, storage and transporting of the samples. In our hospital, usually interns are responsible for these processes. We aimed in this study is to determine knowledge of interns about taking and transferring laboratory samples.
Materials and Methods: Sixty volunteer interns were included in the study. A survey containing 44 different types of questions was used by the researchers to collect data.
Results: According to the survey results, it can be said that in our hospital, blood and urine samples are collected by interns however in the previous period they have not gained sufficient experience. It was also determined that more than half of the participants did not have adequate and / or correct knowledge of most of the venous blood sampling stages and the transfer of the blood gas sample. Interestingly, about half of the whole group (% 49,2) stated that they did not want to receive training on preanalytical factors. When assessed individually, it was also shown that there was no significant relationship between students' GPAs and course demands and the scores they had received on this test.
Conclusion: It is extremely important to control the preanalytical faults that have the most impact on the quality of the results produced by the laboratory and which have the most faults and to produce accurate and concurrent quality results when these results are evaluated, it can be argued that theoretical biochemistry courses taught to medical faculty students are not clinically adequate and students should be trained practically for the clinical biochemistry course.
Key Words: Preanalytic, survey, intern.

PP-046
EFFECTS OF DIFFERENT PREANALYTIC CONDITIONS ON LYMPHOCYTE SUBGROUPS

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Objective: The analysis of whole blood samples by flow cytometry for pharmacodynamic and biomarker assessments in clinical studies has been limited by the necessity to test these samples within a short time frame after blood collection. In most clinical studies, blood specimens are shipped to a centralized testing facility; it is critical to demonstrate specimen stability over a period of time which will encompass the time elapsed between specimen collection and testing. We examined the effect of time and temperature on the stability of markers for T lymphocytes (CD3, CD4, CD8), B lymphocytes (CD19), NK cells (CD16+CD56).
Materials and Methods: Blood samples from 5 volunteers were collected to two EDTA tubes form each volunteer and lymphocyte subgroup analysis were done. While one of the samples was kept at room temperature, the other was kept at + 4ºC. Measurements were made at 0. - 8. - 24. -32. -48. hours for each sample. Lymphocyte subgroups were analyzed on the BD FACS CANTO2 device. Relative error rates based on 0. hour samples data were calculated using Microsoft Excel 2015. Relative error percentage values were compared with the total change limits recommended by the ICSH and appropriate operating conditions were assessed.
Results: Mean relative change values for CD4 and CD8 T lymphocytes were <5%, B lymphocytes <10%, and NK cells <15%. T lymphocytes, B lymphocytes, stability of NK cells were not affected until 48 up to storage at 4 ° C and at 25 ° C.
Conclusion: Cooling time or samples can be delayed up to 48 hours. It is advisable to work in a larger population and patient group to achieve optimal results.
Keywords: T lymphocytes, B lymphocytes, NK cells, Stability

PP-048
THE EFFECT OF THE DIFFERENT BRAND INSULIN INJECTORS ON BLOOD HEPARINIZATION

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Objective: The blood gas collection with liquid heparin is one of the sources of preanalytical errors. It was reported that collection of blood gas samples into the syringe with liquid heparin caused dilutional errors. But, heparinized blood collection for blood gas analysis in some hospitals is still preferred in plastic syringes with liquid heparin instead of syringes with dry heparin due to economical and traditional reasons. In this study, it was aimed to calculate dead space volumes for different brand syringes.
Materials and Methods: Five different BRAND insulin syringe was used for this study. Dead space was calculated with the remaining amount of pure water in syringes which were filled with pure water and then emptied. Also percent dilution ratio was calculated by using pure water density.
Results: The dilution rate of different insulin syringes during heparinization varies according to the injector brands used. Although attempted to standardize the heparinization procedure, different results were observed within the same group.
Conclusion: Considering these results, it was observed that the dilution ratio with heparin was very variable due to the difference in the dead space volumes of the syringes used. This may result in more dilution than is accepted, and may result in insufficiency of the anticoagulant effect. Therefore, it is very important to standardize the injector type and heparin concentration used to reduce the preanalytical error rate in blood gas analysis.
Key Words: Blood gas, preanalytic errors, heparinization, dead Space.

PP-049
FACTORS AFFECTING PREANALYTICAL STANDARDIZATION IN PERIPHERAL SMEAR-STAINING SYSTEM

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Objective; Complete blood count is composed of the analysis of quantitative morphological and content measurements of the plasma, erythrocytes, leukocytes and platelets and their calculated parameters. Whole blood count and evaluation of the peripheral smear-staining are used on clinical diagnosis, treatment and follow-up. Cells are assessed according to the characteristics of being mature, immature and pathologic cells of the bone marrow. The preanalytical process should be standardized for the quality of evaluation of peripheral blood smear and staining used as a clinical and reflex test. The programming of the sample and smear system for standardization should be flexible according to the sample parameters.
Materials and Methods; Control samples were analysed by the Sysmex XN 1000 whole blood count autoanalyzer in our standardized laboratory. The programmed spread volume-angle-rate and incubation time in solutions are defined according to the hematocrit values in the Sysmex SP1000i automatic peripheral spreading-staining system. Peripheral smear-staining was performed ten times according to the hematocrit value of the specimens and fixed hematocrit value of the control specimens.
Results; Peripheral blood smear and staining process is completed with Sysmex SP1000i system. The preparations were evaluated under the microscope. The smear and staining qualities were similar. Cell characteristics and distribution of erythrocytes, leukocytes and thrombocytes were evaluated. There was no significant difference between different smears of the same sample.
Conclusion; The preanalytical process has been standardized with the optimization of the laboratory environment, the concentration of the solutions, the stability of the solutions, hematocrit value of the sample, smear thickness, smear angle, smear rate, residence times in solutions.
Key Words; Peripheral smear, peripheral staining, preanalytical standardization, automated system.

PP-050
THE EFFECTS OF INTENSE EXERCISE ON BILIRUBINE RESULTS

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Objective: It is usually thought that laboratory tests reflect patient's actual status. But in some cases, factors that can affect the test results may occur. The control stage of laboratory includes mostly the analytic phase not the whole process. Most of the laboratory errors are come up during the preanalytic phase. The aim of this study is to identify and fix the error source which effects bilirubin results. Materials and Methods: 150 samples that arrived in our laboratory on 8th of March belonged to police academy students who gave blood after an effort test. In approximately 100 samples of 150, the bilirubin levels were high while other parameters are normal. Upon this we applied calibration and control, asked technic service to check up on the device. Despite all our efforts there had not been any change in the results. Whereupon we remeasured these samples in two different hospitals and listed the results in a chart.
Results: There was not a significant difference between the bilirubin results that we measured with three different devices (AU680-AU5800, AU6801-Beckman Coulter, Architect CI2200-Abbott). Patients with high bilirubin level had normal values in other parameters that could be related with bilirubin and hemolysis (such as the number of red blood cells, hemoglobin, iron). There was also no increase with liver and muscle enyzmes.
Conclusion: Total bilirubin largely depends on the degree of hemolysis which increase with physical efforts. In our study the examined hematological parameters did not indicate the occurence of increased hemolysis, also there was no significant relationship between the total bilirubin concentration and the other parameters.
At the end, these elevated concentrations of total bilirubin appear to be due to changes caused by exercise and it should be noted that the reference ranges depend not only on the population but also on other factors.
Keywords: Exercise, bilirubin, reference range

PP-051
AUTOMATIC SEPERATION OF BLOOD SAMPLES: A UNIVERSITY EXPERIENCE

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Objective: Separation of blood samples is the critical step of pre-analytical phase of total testing process. It is expected that this step will be accurate and precise because of the errors in this step can cause incorrect results. The aim of this study is to investigate the analytical performance of a stand-alone blood separation system.
Materials and Methods: In this study an automatic stand-alone blood separation system was investigated. For this aim an observational study was planned. In a random week from Monday to Friday, the workflow of the stand-alone system was observed from 8:00 am to 4:30 pm in each day. Dispensing tube number and dispensing laboratory zone number were determined in different periods of a day. Then the weekly data was taken from the device and compared with observation.
Results: Total about 11000 samples were observed, 6600 of them were outpatients. The maximum total sample number dispensed by the automated system was found to be on Monday. A decrease was observed from Monday to Wednesday. The lowest number was on Friday. It was also showed that the most frequent (85%) dispensing tube number was one-tube whereas the least one was 3-tubes (4.5%). Dispensing laboratory zones contained thirteen different zones. In each different period of a day, those were different. However on each day the most frequent dispensing laboratory zones were serum protein laboratory followed by Immunoassay-1 and ELISA-2 laboratories.
Conclusion: The stand-alone blood-fractionation system in the laboratory showed a suitable analytical performance. Therefore, it is concluded that it can be used in clinical laboratories.
Key words: sample processing, blood fractionation, pre-analytical errors

PP-052
PREANALYTIC PROCESS IN A STATE HOSPITAL BY THE NATIONAL LABORATORY ERROR CLASSIFICATION SYSTEM

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Objective: The national Laboratory Error Classification System (LECS) was developed to improve the quality processes of laboratory and patient safety by the Turkish Ministry of Health in 2015. In this study, we aimed to evaluate the total laboratory process and quality indicators (QIs) in biochemistry laboratories according to LECS.
Materials and Methods: This retrospective study included 3700 samples according to LECS out of total 489156 samples between 1 January 2017 and 30 December 2017. The number and type of rejected samples were obtained by the laboratory information system of Balıkesir State Hospital. Laboratory processes were organized by the LECS. The data were expressed in percentage.
Results: The rates of pre-analytical phases were 81.7%. The maximum error type was clotted samples (0.37%). The main place of error was emergency service (26%). The error time intervals were between 8:00-12:00 (34%). The major profession group which made errors was the nurse group (53%).
Conclusion: Different QIs have been used in clinical laboratories in Turkey and in the world in recent years to comply with the requirements of accreditation standards. In this study, laboratory error rates were evaluated according to the LECS system used in Turkey. The results were similar to other studies. We believe that our work will contribute to future laboratory total testing proccesses and reduce error rates.
Key Words: Laboratory errors, quality indicators, laboratory process, laboratory error classification

PP-053
THE EFFECT OF HEPARIN ON HIGH SENSITIVE TROPONIN T AND CREATIN KINASE MB ASSAYS

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Objective: The aim of this study was to investigate the effect of heparin on the measurement of high-sensitivity troponin T (hs-cTnT) and creatine kinase MB (CK-MB).
Materials and Methods: Residual sera of the patients who applied to emergency service and having hs-cTnT results of 14-20 ng/L, 50-100 ng/L, 100-200 ng/L, >500 ng/L; CK-MB results of 1-3 ng/mL, 3-5 ng/mL, 5-10 ng/mL, >10 ng/mL were collected and 4 serum pools were prepared. Heparin was added to the pools at a concentration of 50, 98, 450 IU/mL, and hs-cTnT and CK-MB were measured in duplicate in each sample. The mean percent change (MPC) values of serum pools were calculated and displayed as interferograms. Critical systematic error (ΔSEc) values were found by the formula '[(TEa-Bias) / CVa]-1.65' and MPC values were also evaluated by ΔSEc, by calculating the coefficient of variation (CVa) values separately according to the normal and pathological control results.
Results: Negative interferences exceeding the 10% limit of 450 IU/mL heparin concentration were observed in pools with hs-cTnT levels of 50-100 ng/L and >500 ng/L according to OMD values. No changes in other hs-cTnT and CK-MB pools were found beyond the 10% limit. ΔSEc was found to be 6.7% for low level hs-cTnT, 7.02% for low level CK-MB, 20.5% for high level hs-cTnT and 9.6% for high level CK-MB. There was a negative interference at 50 IU/mL and higher heparin concentrations in the pool with hs-cTnT 50-100 ng/L and at 98 and 450 IU/mL heparin concentrations in the pool of hs-cTnT 100-200 ng/L.
Conclusion: In our study, heparin was observed to reduce hs-cTnT at most levels, but there was no effect on CK-MB. There are studies in the literature that heparin affects troponin and CK-MB measurements in different directions. Our study has shown that heparin can affect hs-cTnT results negatively.
Keywords: Heparin, Interference, Troponin, Creatin Kinase MB

PP-054
EFFECT OF HEMOLYSIS ON HIGH SENSITIVE TROPONIN T AND CREATINE KINASE MB ASSAY

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Objective:The aim of this study was to investigate the effect of hemolysis on high-sensitivity Troponin T(hs-cTnT) and creatine kinase MB(CK-MB) measurements.
Materials and Methods:Serum pools with three different pathological analyte concentrations were prepared from the residual sera of the patients who applied to emergency department and requested hs-cTnT and CK-MB. Hemolysate was added to these pools to obtain a Hb concentration of 20 g/L and then serial dilution was performed. Analytes were studied in both pools. Using the data obtained, the mean percentage change (MPC) values of each serum pool were calculated and displayed as interferograms. Two critical systematic error(ΔSEc) values were calculated for each parameter using the normal and pathological control coefficient of variation (CVa) with ΔSEc=[(TEa-bias)/CVa]-1.65 formula. The MPC values were evaluated accordingly.
Results: The concentrations of hs-cTnT in pools were 14, 122 and 360 ng/L. CK-MB concentration was found to be 2.5, 5.5, 11.6 ng/L. There was a negative interference exceeding 10% limit when the Hb value was 5g/L for all of the pools for hs-cTnT. No effect exceeding the 10% limit for CK-MB was detected. ΔSEc is 6.7% and 20.5% for hs-cTnT; 7.02% and 9.6% for CK-MB. Regarding ΔSEc; there was a negative interference exceeding 6.7% limit when the Hb was 5g/L in pools with concentrations of 14 and 122 ng/L hs-cTnT. Negative interference exceeded 20.5% limit when the Hb value was 9g/L in a pool with a concentration of 360ng/L hs-cTnT. Hemolysis effect on CK-MB did not exceed ΔSEc limits.
Conclusion: The results indicate that hemolysis negatively interferes with the hs-cTnT test in a concentration-dependent manner.CK-MB was not affected by hemolysis up to 20g/L Hb concentration.
Keywords: Hemolysis, interference, troponin T, creatin kinase MB

PP-055
EFFECT OF LIPEMIA ON HIGH SENSITIVE CARDIAC TROPONIN T AND CREATINE KINASE MB MEASUREMENTS

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Objective: Aim of this study is to investigate the effect of lipemia on high-sensitive cardiac troponin T (hs-cTnT) and creatine kinase MB (CK-MB).
Materials and Methods: Serum pools containing hs-cTnT at pathological levels (14-20 ng/L, 50-100 ng/L, 100-200 ng/L and >500 ng/L) were collected from the remaining serum samples of patients who applied to emergency department and hs-cTnT and CK-MB mass assays were studied. In these pools CK-MB mass was also determined. Serum pools were divided into two. Oliclinomel N4-550e (10%) was added to pools to create a lipid concentration of 20 g/L to mimic lipemia. Serial dilutions were carried out to obtain serum pools containing lipids at concentrations of 20, 10, 5, 2.5 and 1.25 g/L. In the other half, deionized water was added to remove dilution effect. Triglyceride levels and lipemia index were measured in pools with and without lipid emulsion. Using the data obtained, mean percentage change in each serum pool was calculated. Interference was determined according to mean percentage change values and it was accepted that the assay was affected by changes exceeding the 10% limit. The critical systematic error (ΔSEc) of the measurements was calculated using formula [(TEa-Bias) / CVa] -1.65 and compared with mean percentage change results.
Results: Positive interference exceeding 10% limit at 2350 mg/dL triglyceride level was observed in the pool with hs-cTnT level 14-20 ng/L according to mean percentage change values. No change in other pools exceeding the 10% limit was detected. Using CVa values obtained from normal and pathological level control results, for hs-cTnT, ΔSEc was 6.7% and 20.5%; and 7.02% and 9.6% for CK-MB, respectively. According to these values, the serum pool of hs-cTnT in the range of 14-20 ng/L had an effect exceeding the 6.7% limit of 1151 mg/dL triglyceride. Other levels were not affected according to ΔSEc percentages.
Conclusion: In hs-cTnT pool at a concentration of 14-20 ng/L, a positive interference exceeding the 10% limit was detected when the triglyceride value was 2350 mg/dL. When evaluated according to critical systematic error, there was an effect in the same serum pool exceeding 6.7% limit at a concentration of 1151 mg/dL triglyceride.
Key words: Lipemia, Interference, Creatine kinase, Troponin

PP-056
UNCERTANITY OF HEMOGLOBIN A1c MEASURED BY CATION EXCHANGE CROMATOGRAPHY

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Objective: Medical laboratories primarily contribute to clinician and consequently patient management about clinical decision. Because no test result can represent absolute truth, the measurement uncertainty is crucial for the test result to be used for patient benefit. The aim of this study is to calculate the measurement uncertainty using the test performance data of the HbA1c test measured in the Kayseri Training and Research Hospital Medical Biochemistry Laboratory.
Materials and Methods: The measurement uncertainty calculations described in the GUM and EURACHEM guidelines were used in this study. HbA1c measurement was performed by on a BIO-RAD Variant II Turbo 2.0 HPLC cation exchange chromatography and VariantTM II Turbo HbA1c kit. Standard combined uncertainty and expanded uncertainty was calculated after determining the uncertainty components.
Results: The measurement uncertainty which arises from calibrator, calibration bias, the external quality control, and the reproducibility for HbA1c was calculated. The standard combined uncertainty for HbA1c was %3.01 and expanded uncertainty was found as %6.02 at %95 confidence interval.
Conclusion: We found that the measurement uncertainty for the method

used in our laboratory at the %6.5 HbA1c decision level, which could be the diagnostic criterion for diabetes alone, could affect the clinical decision despite the acceptable limit for HbA1c. For this reason, clinical laboratories should calculate the measurement uncertainty especially for tests with clinical decision level and reports these values together with the test results. Thus, the analytical reliability of the results will be checked and the clinician will be informed about the measurement quality.
Key Words: HbA1c, measurement uncertanity, clinical biochemistry

PP-057
COMPARISON OF KAYSERİ PUBLIC HEALTH LABORATORY FMEA BASED RISK ANALYSIS RESULTS WITH SAFETY REPORT SYSTEM OUTPUTS

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Objective: Laboratory results are essential for at least 70% of disease diagnosis and preanalytic part has the biggest error ratio of total laboratory testing process. To control proactively the preanalytic errors with risk management strategies is an important part of international medical laboratory standard, EN ISO 15189. Turkish Ministry of Health gives importance to risk management as a part of "Standards of Accreditation in Health Laboratory Kit". This study is aimed to compare a primary health care laboratory's risk analysis results with outputs of Ministry of Health's preanalytic errors report.
Materials and Methods: The preanalytical errors seen at Kayseri Public Health Laboratory in 2016 evaluated with Failure Mode and Effects Analysis (FMEA) and the most frequent ones are compared with outputs of Ministry of Health's "2016 Statistical and Analysis Report of Safety Report System (SRC)". As mentioned in CLSI EP18-A2, EP 23A, ISO/TS 22367E, FMEA based risk evaluation was calculated as risk priority number (RON) which is multiplication of risk probability, risk severity and risk detectability grades.
Results: According to FMEA preanalytical risk analysis the highest degrees of RONs (≥100) were centrifuge errors, unlabeled specimens, hemolysed samples and clotted samples. The risks were not compatible with the most frequent preanalytical errors of 2016 SRC report.
Conclusion: Because of serving to wide spread multiple primary health care units including transportation process, Public Health Laboratories have some spesific preanalytical risks. An independent statistical analysis of errors in primary health care laboratories within SRC reports would be more effective for managing risk analysis and preventive actions for preanalytical process.
Key words: Pre-analytical process, risk analysis, safety reporting system

PP-058
LIPEMIA INTERFERENCE IN IMMUNOASSAY METHODS

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Objective: Today, preanalytical errors account for more than 70% of total medical laboratory errors. The majority of preanalytical errors are preparation of the patient, collection of samples, transportation, preparation for analysis and storage.
In this case report, the problem of identifying and resolving the error in the test results of a patient incompatible with the clinical findings is discussed.
Materials and Methods: The blood sample of 73-year-old male patient was tasted on DXI800 autoanalyzer and the results obtained were 0.01 ng/ml for free-PSA and <0.01 ng/ml for Total-PSA. The patient's outcome was assessed as incompatible with the clinic and previous results. The current internal quality control results for the relevant device were within acceptable limits. The test repetition was deemed appropriate.The sample was run on a different DXI800 at the second time.Possible preanalytical errors were emphasized because the results were compatible with each other. The sample was authenticated. The macroscopic examination of the sample revealed that the amount was sufficient, there was no hemolysis, and there was slight cloudiness in the serum. TG was measured to confirm lipemia, it was 600 ng/ml. It was understood that the patient did not blood samples at absolute fasting. Results of the following day were Free-PSA:3.44 ng/ml, Total-PSA:17.96 ng/ml. These results were consistent with the patient's clinic and previous results.
Results: This case is a striking example of the fact that preanalytical errors affect laboratory results significantly. To minimize errors, preanalytical factors should be determined and pre-analysis conditions should be standardized as much as possible.
Keywords: Preanalytical errors, Interference, lipemia.

PP-059
A TALE OF RED BEET

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Objective: Some laboratory tests may be affected by food intake. In this case report, a patient with a discordance between urine strip and microscopy results is presented and the workup to find the cause of the discordance is discussed.
Materials and Methods: The urine sample of a 51 year-old male patient was analysed and automated urine strip analysis showed 50 Ery/µl (++). Microscopic fields seen on the automated device contained approximately 1-2 erythrocyte. Manual microscopic examination showed approximately 1 erythrocyte per field. The patient said that his only complaint was sudden color change in urine. A deeper inquiry revealed that he had consumed red beet the evening before, urine color had turned to red that night. The patient had given a urine sample for analysis in the morning, when he saw that the color change sustained. Food interference due to red beet was considered as the cause of the discordance between urine color, strip analysis and urine microscopy results. Urine analysis was repeated on the next day and the strip result was 5-10 Ery/µl (+). No erythrocyte was seen in fields on the device and upon manual microscopic examination.
Conclusion: Peroxidase enzyme found in red beet can react with the urine strip hemoglobin analysis and cause false positivity. While evaluating the urine test, items that can interfere with clinically incompatible conditions should be considered and anamnesis should be questioned in more detail.
Keywords: Interference, urine analysis, urine strip

PP-060
EFFECT OF CENTRIFUGAL FORCE ON COAGULATION TESTS

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Objective: Clinical Laboratory Standards Institute (CLSI) H21 A5 guideline recommends centrifugation conditions for coagulation tests to obtain citrated plasma samples with an RCF of 1500 xg, for <15 minutes at room temperature for plasma samples and plasma samples' platelet count should be <10 X 109/L. The aim of this study is to evaluate whether routine centrifugation conditions of our laboratory affect coagulation tests (protrombin time, PT; activated partial trombin time, APTT and fibrinogen) compared with the conditions recommended in the CLSI guideline.
Materials and Methods: 37 patients (24 female, 13 male) were included in the study. Three citrated blood samples were collected from each patients. First tubes were centrifuged with our routine laboratory centrifugation procedure (procedure A, 2500 xg at room temperature for 10 minutes), second tubes were centrifuged with CLSI recommendations (procedure B, 1500 xg at room temperature for 10 minutes) and citrated plasma from third tubes were prepared with double centrifugation procedure (procedure C, 1500 xg at room temperature 10 minutes). Platelet count, PT, APTT and fibrinogen tests were analyzed in all plasma samples on Stago STA-R Max coagulation analyser. Significance of the difference between results were analyzed with ANOVA test.
Results: Mean platelet counts were different between A - C and B - C procedures ($p < 0.05$). A, B and C procedures platelet counts were 9.45±15.75 10^9/L, 10.29±19.32 10^9/L and 0.48±0.55 10^9/L respectively. However no differences were found among procedures for PT, APTT and fibrinogen levels ($p > 0.05$).
Conclusion: There was no statistically significant difference between the coagulation tests in citrated plasma obtained with different centrifugation conditions. Our routine centrifugation procedure is suitable to obtain citrated plasma for coagulation tests.

PP-061
THE IMPORTANCE OF QUANTITATIVE HEMOGLOBIN MEASUREMENT IN PREANALYTICAL STAGE

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Objective: Hemolysis is the most common problem in the preanalytical phase in Medical Biochemistry Laboratories. When the Ministry of Health examines the error codes in the "Laboratory Error Classification System (LHSS)" which is reported monthly, the feedback about the hemolysis is in the first place. Therefore, it is important to determine the presence of hemolysis in the samples coming to the laboratory. In general, hemolysis is detected by hemolysis index -semi-quantitative metod or subjectively -in visual method observed. In visual hemolysis evaluation, margin of error is high as well as it is difficult to determine the presence of hemolysis (namely free hemoglobin) in invisible hemolysis. Assessments made by hemolysis index are semi-quantitative methods, and there is uncertainty and lack of standardization on how to implement quality control and cut-off points. The aim of our study is to determine whether there is a difference by making quantitative hemoglobin determinations in samples from two different areas (intensive care and routine outpatient clinics) and non-visible haemolysis. Materials and Methods: Hemoglobin concentrations were measured in a total of 60 samples, 30 from Intensive Care Units and 30 from outpatient clinics of Haseki Training and Research Hospital that were not identified as hemolysis by the eye.
Hemoglobin levels of the samples were quantitatively determined by the cyanomethhemoglobin method using the commercial kit (TECO Diagnostic Hemoglobin, Anaheim, USA). Mann Whitney-U test was used for statistical

evaluation. Statistical significance was accepted as $p < 0.05$.
Results: When the hemoglobin concentrations of the samples of outpatients and Intensive Care Patients were compared, the hemoglobin levels of the ICU patients were significantly higher (medians and minimum-maximum levels respectively: 0.198 (0-0.11) g/dL; 0.217 (0-0.81) g/dL; $p<0.05$).
Conclusion: This preliminary study suggests that there may be a difference in hemolysis between the samples from various units. In the next stage, evaluating the hemoglobin level with a more sensitive method and reinforcement of the study by increasing the number of samples with a method that can be adapted to economic and automation in the findings light to be obtained is planned.
Key Words: Hemolysis, interference, preanalytical errors

PP-062
THE PREANALYTIC ANALYSIS OF STORAGE CONDITIONS AND WAITING-PERIOD ON SPOT URINE IODINE LEVELS

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Objective: Urine is often preferred as the biofluid for metabolomic investigations due to the ease of sample collection and its metabolite rich nature. Because the patients themselves often collect urine specimens, urinalysis is very susceptible to preanalytical issues. Thus, inadequate sample transfer, storage conditions and the waiting period of the sample can lead to significant preanalytical errors.
The aim of this study is to investigate the effect of storage conditions and waiting time on iodine measurement in spot urine.
Materials and Methods: Urinary iodine levels of 15 volunteer participants were measured by Sandell-Klothoff method. Spot urine was analysed fresh within 2 hours. The samples were also stored +4°C and -20°C. These specimens at + 4°C and -20°C were analyzed after one day and after a week. Thus, spot urine collected from volunteers was studied fresh and at +4°C and -20°C after one day and one week later, and the results were compared.
Results: Fresh spot urine, samples stored at +4°C and -20°C investigated one day and one week later, iodine results were 8.62±4.34, 10.25±5, 8.52±3.92, 10.2±5.11, 8.45±4.37 respectively. There was a statistically significant difference ($p = 0.001$) between the iodine values of fresh urine and samples stored at +4 °C. The iodine values of samples stored at +4°C and -20°C were significantly different between themselves ($p=0.003$ after one day , $p=0.002$ after one week).
Conclusion: According to average iodine results that we have obtained from our study, it was found out that the results of samples kept at +4°C were high in comparison with those kept at -20°C. It was observed that there was no difference between iodine values and fresh spot urine values of samples stored at -20°C. It was interpreted the reason of the highness at +4°C belong to unsuitable storage condition at +4°C.
Keywords: Storage conditions, iodine in urine, Sandell-Klothoff Method