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P-01

A CASE OF CONGENITAL HYPOTHYROIDISM WITH PERIPHERAL PRECOCIOUS PUBERTY

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Precocious puberty is suspected when secondary sexual characteristics develop before the age of 8 in girls and 9 in boys. Congenital hypothyroidism is one of the rare causes of precocious puberty. Here we report a case of congenital hypothyroidism with peripheral precocious puberty. We present a 7-year-old girl diagnosed with congenital hypothyroidism secondary to thyroid agenesis. Her cord blood thyroid stimulating hormone (cord TSH) was 696.3 mIU/L (2.6-20.0 mIU/L) and the family history revealed no thyroidal problems. Repeated thyroid function test on day 3 of life showed high TSH level 737 mIU/L (0.3-7.7 mIU/L) and free thyroxine (fT4) was 8.9 pmol/L hence started on levothyroxine. Her TSH level was fluctuating from (12-52 mIU/L) despite levothyroxine therapy. Her mother noticed the child was having breast development and examination showed no pubic and axillae hair. Her pubertal development is B3P1A1 with reference to Tanner stage and height acceleration of 7.2cm/year. Bone age was 6.4 years (chronical age 5.8 years) using Greulich-Pyle atlas. The skeletal survey showed no bone dysplasia and the pelvic ultrasonography revealed prepubertal uterus and ovaries. Hormonal investigations showed normal prolactin 75 mIU/L (59-619 mIU/L), high oestradiol 266 pmol/L, suppressed luteinizing hormone (LH) <0.1 IU/L and follicular stimulating hormone (FSH) was 3.5 IU/L. The gonadotropin releasing hormone (GnRH) stimulation test resulted in no LH peak elevation of pubertal range, with peak LH was 2.6 IU/L (<5 IU/L). In prolonged primary hypothyroidism, pubertal and growth are delayed, but a minority of children do develop precocious puberty. The pathophysiology of this condition is uncertain yet however, it could be due to cross reactivity of TSH with FSH receptor causing gonadal stimulation leading to precocious puberty 1. In this case, a child had long standing hypothyroidism causing her to develop peripheral precocious puberty as the other causes have been excluded.

P-02

MONOCLONAL GAMMOPATHY IN A CHILD WITH ISOLATED LEFT EYE CRANIAL NERVE VI PALSY DUE TO POST VIRAL INFECTION

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Monoclonal gammopathy is a rare occurrence in children and its presence can be seen in various disease processes. Here we present a case of monoclonal gammopathy in a child. Following the report of Type 5 pattern in CSF isoelectric focusing on an 8-year-old girl, the complete relevant clinical information was gathered. A healthy child, after a three-day history of fever, presented with double vision associated with left eye squint, headache on bilateral frontal area, aggravated by turning head and gait abnormality. Examination revealed left eye convergent squint with left horizontal nystagmus, lateral gaze palsy and no evidence of papilledema. A diagnosis of isolated left eye cranial nerve VI palsy was made. To rule out the cause, CT and MRI brain/orbit and CSF analysis were done, and the results were normal. However, CSF isoelectric focusing showed Type 5 pattern (monoclonal gammopathy). Laboratory investigation showed normal full blood count, renal/ liver function test, electrolytes, and coagulation screen, except that her C-reactive protein and ESR were elevated. CSF biochemistry, cytology and culture were unremarkable. Autoimmune markers were negative. Diagnosis of post viral infection causing cranial neuritis was made. Monoclonal gammopathy is infrequently observed in paediatric patients. Studies suggested without underlying immune deficiencies, the gammopathies in children are usually transient, lasting less than one year, and do not lead to an increased risk of malignancy. The monoclonal gammopathy was diagnosed due to post viral infection. Patient was treated with steroids for two months and her symptoms had subsided completely. Knowledge of this rare laboratory finding is essential in order to minimise the extensive investigations.

P-03

COMMITMENT TO SUSTAINABILITY FROM LABORATORY MEDICINE

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According to McGill University, sustainability means "meeting our needs without compromising the ability of future generations to meet their own needs". Sustainable environmental practices improve water and air quality, reduce landfills, and increase renewable energy sources in the long term. In response to the growing urgency of global sustainability challenges, the healthcare industry is taking a step forward to reduce its environmental impact. University of Malaya Medical Centre (UMMC) is a government-funded teaching hospital and medical institution, which processes about 3.95 million chemistry and 371,000 immunoassay tests per year. This study aims to evaluate the sustainability aspects of Atellica Solution, focusing on water usage, power consumption, carbon dioxide emissions and plastic waste generations. Power and water consumption for the analysers Advia Chemistry 2400 & XPT and Advia Centaur XPT were obtained from Atellica Solution using 2022 test volumes and it was compared with Siemens legacy system for the year 2019 test volumes. In addition, the reduction of plastic usage was also assessed for the year 2019 and 2022. With innovative Atellica Solution replacing Siemens legacy system, the data showed reduction in water and energy consumption by 36.44% and 47.74% respectively, whereas the annual throughput increased by 13.7%. Using Atellica INTELIQ QC management, fewer aliquot tubes were used and thus reduced plastic waste by 168 kg. These reductions combined to lower CO2 emissions by about 16 tons. Atellica Solution is designed for high throughput and sustainability, reducing water and energy consumption while also avoiding CO2 emissions. Furthermore, it enables faster, streamlined quality control management with Atellica INTELIQ. UMMC is strongly committed to minimizing laboratories' environmental footprint and providing better access to care and contributes to the well-being of patients.

P-04

AUDIT ON FOLLOW UP OF PATIENTS WITH INCREASED HBA_2 DURING HbA_1C ANALYSIS

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HaemoglobinA1c (HbA_1c) is used to diagnose diabetes mellitus and monitor glycaemic control. Detection of HbA_1c by the capillary electrophoresis (CE) utilises the principle of electrokinetic separation of molecules in buffer-filled silica capillaries. The HbA_1c programme on Capillarys 3 could provide a rapid and reliable separation of HbA_2. Quantification of HbA_2 is a well-established screening test for beta-thalassemia trait (BTT). Other causes of elevated HbA_2 include antiretroviral therapy, vitamin B12/folate deficiency, and hyperthyroidism. We did a retrospective analysis of HbA_1c results that was performed during the period of March to May 2023. The reports with elevated HbA_2 (>3.0%) were identified. For the patients with elevated HbA_2, the additional laboratory investigations such as full blood count, serum ferritin, vitamin B12, folate and thyroid function test were also retrieved from the laboratory information system. A total of 19321 samples were analysed for HbA_1c during this period of three months. Of this, we noted 267 samples had high HbA_2 results. HbA_2 was elevated in 126 males and 141 females. The age group of the patients ranged from 13 to 86. Of the 126 male, based on the full blood count, 50 had hypochromic microcytic anaemia. Whereas in the female group, 81 had hypochromic microcytic anaemia. As part of hypochromic microcytic work up, ferritin was requested only for 20 female and 9 male patients respectively. Haemoglobin electrophoresis to rule out beta thalassemia trait was not performed in any of these patients. Other causes of raised HbA_2 were not ruled out for these patients. The laboratory comments "Elevated HbA_2 is suggestive beta-thalassemia trait, please perform haemoglobin electrophoresis if not done before". Our audit shows that despite the comment, there is no adequate follow up to rule out the cause of raised HbA_2.

P-05

PERFORMANCE VERIFICATION OF SEBIA CAPILLARYS 3 (TERA AND OCTA) IN DIVISION OF LABORATORY MEDICINE IN UNIVERSITY MALAYA MEDICAL CENTER (UMMC)

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As a high prevalence country with diabetes mellitus (DM), it is crucial for Malaysia to have a comprehensive diagnostic structure which ensures accuracy in quantification of HbA1c. With this indication, we evaluated the performance of Capillary Electrophoresis (CE) as a new method an effective replacement of the currently used Biorad Variant II High Performance Liquid Chromatography (HPLC) in our laboratory. The objective is to verify the analytical performance of Sebia Capillarys 3 Octa and Tera (CE) for routine HbA1c quantification. Performance verification was carried out in accordance with the CLSI guidelines. For the precision study, samples used were the normal and high level controls. For the correlation study, sixty patient samples were analysed using both the methods in parallel. All data were recorded and analysed using MedCalc software for statistical calculations. The CE analysers showed good precision for the measurement of HbA1c with 0.077 and 0.059 of total imprecision for Cap 3 Tera and Cap 3 Octa, respectively. There was good correlation between both Sebia Capillarys 3 and HPLC (Biorad Variant II) analysers with r 2 = 0.989 while that of Cap 3 Tera and Bio rad is 0.989 and 0.998 between Cap 3 Octa and Bio rad. The correlation between Cap 3 Tera and Cap 3 Octa, was also good with r 2=0.990. The mean bias showed all the three analysers having low mean bias with the values of 0.00%, 0.05% and 0.07% for Cap 3 Tera vs Bio rad, Cap 3 Octa vs Bio rad and Cap 3 Tera vs Cap 3 Octa, respectively, which are also less than that of RCPA analytical performance specifications (< 2%) for both analysers and showed good correlation with the current method. Therefore, Sebia Capillarys 3 CE systems serve as a good screening method for DM.

P-06

A STUDY ON OPERATOR ERRORS IN THE HANDLING OF POINT-OF-CARE DEVICES (POCT) IN THE EMERGENCY DEPARTMENT

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Demands for POCT in Emergency Department (ED) have increased as POCT provides faster turnaround-time for test results that allows rapid decision making. With this trend, quality assurance is paramount to manage the challenges associated with ensuring the quality of results and patient safety. Our aim is to identify the common errors implicated in the pre-analytical phase and apply this information to establish appropriate quality indicators (QI) in POCT. Error messages from the Siemens RapidPoints 500 Blood Gas Systems for the period June 2023 and ROCHE ACCU-CHECK Inform II glucometers during the period May to June 2023 were retrieved. Messages related to instrument error were excluded. A total of 2959 blood gas analysis and 8840 glucose analysis were performed during the study period. Clot detection in the sample (N=230, 7.8%) was the only non-compliance reported for blood gas analysis. In glucose analysis, defective strip (N=258, 2.9%), insufficient samples (N=201, 2.3%), untimely application of strip (N=96, 1.1%), contamination of glucometer's sensor (N=5, 0.06%) and incorrect sample and control (N=20, 0.2%) were reported. The errors reported are operator-manageable errors which can be minimized or removed through continuous operator training and compliance to the respective testing procedures. This study highlighted three potential QIs for POCT: sample collection errors, reagent strip error and unidentifiable samples. Adoption of these QIs is valuable in the monitoring and maintaining the pre-analytical quality in POCT services so that the actual purpose of POCT is achieved.

P-07

SHEEHAN'S SYNDROME IN A DENGUE SHOCK SYNDROME: A CASE REPORT

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Sheehan's syndrome (SS) is hypopituitarism caused by necrosis of the pituitary gland usually secondary to severe postpartum haemorrhage with subsequent hypotension. Meanwhile, dengue haemorrhagic fever is characterized by vascular permeability, coagulation-disorders, and thrombocytopenia, which can culminate in hypotension subsequently dengue shock syndrome. Dengue infection, an arboviral illness, is endemic in Southeast Asia. Hypopituitarism arising as a complication of dengue is extremely rare. We gathered relevant clinical information of a 45-year-old female for whom an array of endocrinology tests had been ordered. She is married with three children with history of hysterectomy due to postpartum haemorrhage 23 years ago during her last childbirth. She was started on levothyroxine for hypothyroidism in a health clinic where thyroid function tests are suggestive of central hypothyroidism (low levels of thyroxine and triiodothyronine with low normal thyroid stimulating hormone). No appropriate investigations to rule out central hypothyroidism were not done at that time. She presented with three days of high-grade fever associated with chills and rigor, severe myalgia, and arthralgia. She was initially diagnosed with severe dengue with rhabdomyolysis. Her serum cortisol was low normal (152nmol/L). Laboratory investigation showed positive dengue profile, haemoconcentration, thrombocytopenia, transaminitis and acute kidney injury. Further investigation on endocrine profile revealed low level of adrenocorticotropic hormone, luteinizing hormone, follicle stimulating hormone, oestradiol, and prolactin. Diagnosis of SS in a dengue shock syndrome was made. Sheehan's syndrome and pituitary apoplexy can result in varying degrees of panhypopituitarism. SS often evolves slowly and hence is diagnosed late. History of postpartum haemorrhage, which could have rendered the patient more vulnerable to pituitary necrosis, is an important clue to the diagnosis. Results suggestive of central hypothyroidism had warranted further investigations. Once the diagnosis of SS was made, patient was managed appropriately.

P-08

ANALYSIS OF EXTERNAL QUALITY ASSURANCE (EQA) PERFORMANCE PROGRAM BY HEALTH CLINIC LABORATORIES IN MALAYSIA – A TWO YEAR REVIEW

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For over 15 years, Bahagian Pembangunan Kesihatan Keluarga (BPKK) established a program to monitor the quality of services provided by health clinics laboratories using External Quality Assurance (EQA) analytical performance as an indicator tool. The monitoring covers 3 analytical schemes; Clinical Chemistry, Full Blood Count (FBC) and HbA1c. Five Public Health Laboratories (PHL) were appointed as program coordinators in facilitating quality testing, analysing EQA data and providing comprehensive reports to relevant stakeholders. This study aims to review the trend of EQA performances of Malaysia Health Clinic Laboratories and identify the cause of any unsatisfactory performance to improve the service quality. We collected 26,759 data derived from Health Clinic Laboratory 2021 and 2022 EQA supervisory reports including the monthly percentage performance data from PHL coordinators representing all 724 health clinic laboratories. The analytical performance percentages were classified into 5 suggested terms, ranging from 'Excellent' to 'Very Poor'. Additionally, the percentage of EQA sample submissions and participants' response to any unacceptable performances were analysed for both cycle years. Overall results showed there was an increase in satisfactory performance ranging from good to excellent over the 2 years (from 74% to 79%). However, a slight decrease in HbA1c performance was observed even with the increased number of 2022 data. Majority of poor performances were caused by analytical issue (77%), followed by post analytical (13%) and pre-analytical (10%). Melaka, Perak, and Perlis were the states that demonstrated high satisfactory performances. Meanwhile, percentage of result submissions was improved across all schemes. By regular monitoring the analytical performance in these areas, we can objectively evaluate proficiency of the health clinics laboratories and disseminate focused plan for improvement. This commitment to quality not only benefits individual patients but also contributes to the overall public health services in Malaysia.

P-09

DETERMINATION OF PRELIMINARY CUT OFF FOR THYROID STIMULATING HORMONE IN NEWBORN DRIED BLOOD SPOT: AN ALTERNATIVE SAMPLING METHODOLOGY FOR CONGENITAL HYPOTHYROIDISM NEWBORN SCREENING IN MALAYSIA

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Congenital hypothyroidism (CH) is the most common congenital endocrine disorder and is also the most common preventable cause of mental retardation in children due to the deficiency of thyroid hormone present at birth. The disorder can be prevented through newborn screening using cord blood and prompt treatment with levothyroxine. Dried blood spot has arisen as a promising alternative sampling methodology to cord blood for CH newborn screening due to its convenience in transport, collection, and storage. An appropriate cut off point is necessary to minimize false result and for optimal treatment outcome. To establish a preliminary cut off for TSH in dried blood spot as an alternative sampling methodology for CH newborn screening. Dried blood samples from healthy newborns (n=176 male, n=157 female) were analysed using Neonatal hTSH kit with time resolved fluoroimmunoasssay (FIA) methodology on Victor 2D analyser. The calculation to estimate the preliminary cut off was executed using CLSI EP28 A3C and Guidelines of Method Verification of Quantitative Measurement in Medical Laboratories MOH, Malaysia (2015) by estimating the reference interval (RI), and subsequently the upper limit of the RI as cut off. All the data obtained from the experiment were in non-Gaussian distribution and testing for outliers was executed. Overall, 333 data were included contributing to 99% confidence. No partitioning between both genders were needed after comparing mean (Z test) value, as not exceeding the critical z value calculated. Using the RI from 2.5 to 97.5 percentile, the upper limit of RI, 9.4μU /mL is the preliminary cut off. The preliminary cut off obtained could be used to validate the actual cut off for study of dried blood spot as an alternative sampling methodology to cord blood for CH newborn screening. Furthermore, the comparison study between dried blood spot and cord blood as sampling methodology should be conducted in order to find the most suitable sampling methodology for the optimum treatment for CH in Malaysia.*

P-10

EVALUATION OF SERUM 17-HYDROXYPROGESTERONE MEASUREMENT ON AUTOMATED PLATFORM IN IMPROVING THE ANALYTICAL QUALITY AND TIMELINESS

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The 17-hydroxyprogesterone (17OHP) is an important diagnostic marker to diagnose a genetic disorder of the adrenal glands, congenital adrenal hyperplasia (CAH). Previously, analysis was done using a 96-well plate using manual techniques which was laborious and produced long turn-around time (TAT). There is a necessity to improve the TAT without scarifying the accuracy and quality of the test. This is especially important in the management of CAH with 'salt wasting crisis' to avoid delay in treatment and it can be fatal if not treated in a timely manner. In view of this we evaluated the analytical performance and timeliness of fully automated testing of serum 17OHP by comparing with manufacturer's claim and analytical performance specification (APS). The precision and linearity experiments were done using Maglumi® 17-OHP (CLIA) reagent on Snibe Maglumi 2000 analyser according to Clinical Laboratory and Standards Institute (CLSI) guidelines EP15-A3 and Guideline for Method Verification of Quantitative Measurement in Medical Laboratories 2015. The precision and linearity experiments showed a good analytical performance in comparison to manufacturer's claim or selected APS. The precision studies at the concentration of 12.01 nmol/L and 36.3 nmol/L showed within-run CV of 3.28% and 2.47%, between-run CV of 3.90% and 1.90%. The total CV were 4.88% and 2.91%, respectively. The linearity study showed good agreement (y=1.0153x; r 2=0.9984) with no significant deviation for each concentration measured. The time taken for the processing of sample and the analysis is 1.5 hours which is less than compared to previous manual methodology, which took 5.5 hours. Serum 17OHP measurement using Maglumi® 17-OHP (CLIA) reagent on Snibe Maglumi 2000 platform showed good analytical performance and met the manufacturer's claim or APS. It also shortens the period of measurement, speed up the delivery of reliable results to the clinicians.

P-11

ESTIMATING MEASUREMENT UNCERTAINTY FOR MEDICOLEGAL REPORTING OF DRUG OF ABUSE TESTING IN DRUG AND TOXICOLOGY LABORATORY, HOSPITAL KUALA LUMPUR

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The key indicator of quality in an analysis is its measurement uncertainty (MU). MU provides an interval value with a stated probability within which the true value lies, serving as a benchmark of a measurement's accuracy. In medical laboratory quality and competency certification ISO15189, MU is a part of the requirements. Therefore, the aim of this study is to fulfil the MU requirement in Drug and Toxicology Laboratory, Hospital Kuala Lumpur (DTLHKL) by using MU in the reporting. The measurands were the drug of abuse analytes and the target level for MU to be implemented was the drug analytes indictment cut-off levels. The cut-off level for ATS, opiates, ketamine, benzodiazepines, mitragynine analytes were at 250 ng/mL, 200 ng/mL, 150 ng/mL, 100 ng/mL and 50 ng/mL respectively. The calculation was done based on Graham White's measurement uncertainty estimation in clinical samples. The intermediate imprecision (Uimp) is expressed as the Standard Deviation (SD) of all the analytes representing the uncertainty of random error. Quality control data were collected no less than 6 months at near or at cutoff levels depending on the levels provided by the commercial controls' supplier or the certified reference material used. The calculation for variance (SD2) was calculated for tests analysed on more than one analyser. The bias of measurement (Ubias) and Uncertainty of Calibrator (Ucal) were included if available in the calculation and ignored if it is <10%. The combined uncertainty was calculated and expanded by times two. The value of expanded MU was converted to a percentage and expressed as the cut-off of the analytes plus the expanded uncertainty. In summary, MU estimation was included for results interpretation for the reporting of drug abuse tests in the DTLHKL in order to fulfil the ISO15189 requirements.

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EVALUATION OF SERUM SEPARATOR TUBES (SST) AS AN ALTERNATIVE TO SODIUM FLUORIDE (NaF) TUBES FOR LABORATORY-BASED GLUCOSE MEASUREMENT

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Sodium fluoride (NaF) tubes were previously considered the standard for glucose analysis, but studies have reported their limited efficacy in immediately inhibiting glycolysis, particularly within the first 1 to 4 hours after blood collection. In our laboratory, serum separator tubes (SSTs) have become the tubes of choice for most biochemistry tests due to their practicality and ease of use, however NaF tubes remain the traditional choice for measurement of blood glucose. This study aimed to investigate whether SSTs could serve as a suitable replacement for NaF tubes in laboratory-based glucose measurement. A total of 50 paired random blood glucose samples collected separately in NaF tubes and SSTs were obtained from adult volunteers at the Pathology Department of Hospital Sultan Haji Ahmad Shah (HoSHAS). All samples underwent centrifugation two hours after blood collection and were analysed using the hexokinase method on a Roche Cobas C501 automated chemistry analyser. Glucose measurements obtained from SSTs demonstrated a strong correlation with results from NaF tubes (R2: 0.989). Linear regression analysis indicated no significant bias between glucose results from SSTs and NaF tubes, with negative biases of only 0.44% and 0.06%, respectively, at the medical decision limits (MDLs). The MDLs used were 7.0 mmol/L and 11.1 mmol/L, respectively, based on diabetes mellitus diagnostic criteria, while the Allowable Performance Specification (APS) for glucose measurement, defined by the Clinical Laboratory Improvement Amendments (CLIA), is ±8%. This study establishes that SSTs can yield comparable glucose results to NaF tubes when samples are separated and analysed within 2 hours. Consequently, SSTs offer a viable alternative to NaF tubes for laboratory-based glucose measurement, presenting practical advantages such as cost-effectiveness and reduced blood volume drawn when employing a single blood collection tube for glucose and other biochemistry tests.

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FLUCTUATION OF ALPHA FOETO PROTEIN (AFP) RESULTS IN ADVANCED HEPATOBLASTOMA: A CASE REVIEW

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Hepatoblastoma (HBL) is the most common primary liver tumour in children and is usually diagnosed during the first 3 years of life. Most HBLs are sporadic, but some are associated with constitutional genetic abnormalities and malformations, such as the Beckwith-Wiedemann syndrome and familial adenomatous polyposis. NAS, an 8-year-old girl with a one-year history of advanced hepatoblastoma, and had completed palliative chemotherapy, was admitted to the hospital for recurrent fever and epigastric pain. Serial alpha fetoprotein (AFP) levels were monitored for this patient, and it showed fluctuating levels that were inconsistent with the expected outcome in the patient's treatment. Since there were no concerns from the clinicians regarding the results, the laboratory did not suspect "hook-effect". Hook effect is a well-recognized problem that can occur in immunoassays, including AFP. The presence of extremely high serum AFP concentration in some hepatoblastoma patients showed that the hook effect remains a problem and can generate erroneously low AFP results despite assay reformulation by manufacturers. Therefore, constant vigilance by laboratory staff is still needed particularly in samples where such high concentrations may occur. Although generally robust, immunoassays remain vulnerable to occasional analytical errors that may have serious implications for patient care.

P-14

EMBRACING THE FUTURE OF CLINICAL LABORATORY TECHNOLOGY: A HSNZ EXPERIENCE TOWARDS IMPROVING THE CHEMICAL PATHOLOGY SERVICES

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A vast majority of medical decisions are influenced by clinical laboratory results. It is very important to deliver the results in a timely manner for proper patient management. Automation is considered one of the most important breakthroughs in the recent history of laboratory diagnostics. The objective of this study was to determine the impact of total laboratory automation (TLA) on the clinical laboratory workflow, efficiency, and effectiveness. A cross-sectional study based on TLA workflow was carried out and effects in term of workflow processes, lab turnaround time (LTAT), cost reduction, sample quality and accuracy of the result produced were observed. Post TLA implementation, there is reduction in LTAT for routine chemistry sample from 48 to 38.3 minutes starting from pre-analytical step towards result verification. Adoption of TLA has significantly decreased the manual steps in the pre-analytical phase, thereby reducing error and allowing staff to focus more on quality control and quality assurance. Significant cost reduction in vacutainer usage had been shown in anaemia profile testing which consists of Iron, UIBC, TIBC and Ferritin analytes as only one sample is required. Previously, the identification of haemolysis, icterus or lipemia (HIL) interference for an average of 236,970 routine chemistry samples was performed by visually inspecting for changes in the colour and clarity of serum or plasma by laboratory staff. Post TLA, HIL indices are performed automatically by the system and more accurate results can be delivered to clinicians. TLA significantly improved the laboratory performance by creating more efficient and stable management of the workflow which impact the timeliness and quality of test results, outlier rate, staff safety and clinician satisfaction.

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USER EVALUATION OF URINALYSIS COBAS U411: HOSPITAL QUEEN ELIZABETH II EXPERIENCE

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Urine analysis is an important component of patient assessment used in screening, diagnosis, and monitoring in clinical laboratories. We aimed to study precision verification, correlation, and carryover studies of Cobas U411. In this study, 3 levels of commercial control solution i.e. Biorad Lypocheck Quality Control Level 1 (Normal), Biorad Lypocheck Quality Control Level 2 (Pathological) and the mixture of Biorad Lypocheck Quality Control Level 1 and Level 2 were used to perform precision with 5 runs (within run) for 5 days (between run). Eleven parameters were evaluated including: specific gravity (SG), pH, leucocytes (Leu), nitrate (Nit), protein (Pro), glucose (Glu), ketone (Ket), urobilinogen (Uro), bilirubin (Bil), erythrocytes (Ery) and colour (Col). Comparability study was performed by running a total of 102 patients' samples on 2 analysers, i.e. existing Cobas U411 (SN: 10767) and new Cobas U411 (SN: 15307). For precision, the data obtained shows consistency over 25 runs of each level of controls. The results for each of the 3 control levels were within the acceptable criteria. Comparability results matched well between the 2 analysers, with ±1 block agreement (%) was ≥ 96%. In terms of the agreement for pH 5-6, it was 96% whereas for pH 8-9, it was 100%. Carryover study showed no carry over. In conclusion, the correlation between the existing and new Cobas U411 meets the defined acceptance criteria, therefore it helps and guides a laboratory personnel on reporting reliable daily urinalysis results.

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BREAKING THE SILENCE: ENHANCING PATIENT SAFETY IN TRANSFUSION MEDICINE SERVICES THROUGH INCIDENT REPORTING BY MEDICAL LABORATORY TECHNOLOGISTS

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Incident or error reporting identifies risk factors and drives toward measures to decrease risks, ultimately reducing patient harm. Clinical laboratories form a crucial component in healthcare delivery, and in transfusion medicine, cases of incorrect blood component transfused were discovered to be more common in laboratories than in wards. This study focused on the Medical Laboratory Technologists (MLTs) working in blood bank laboratories. The aim is to determine the factors that influence incident or error reporting in the past 12 months. It was a cross-sectional study. Data were collected during the period of October to November 2020 using an online Hospital Survey of Patient Safety Culture questionnaire that was distributed to all MLTs working in blood bank service. MLTs who worked in blood donation mobile team were excluded. One-way ANOVA and multinomial logistic regression tests were used. In total, there were 420 responses. Predominantly, 63.3% of respondents did not file any report, 32.9% reported one to five events and 3.8% reported more than five events in a year. Significant mean differences existed between the composites "Frequency of events reported" and "Staffing" and the reported number of events or errors in a year. Stepwise regression showed that "Teamwork within units" (OR: 1.2, 95%CI: 1.02 – 1.41, p=0.026), the "Frequency of events reported" (OR: 0.8, 95%CI: 0.61 – 0.96, p=0.022), and "Staffing" (OR: 1.3, 95%CI: 1.07 – 1.63, p=0.011) predict the number of incident or error reports in the past year. Strengthening team dynamics, optimizing human resources in the workplace, and encouraging open and unprejudiced communication about error impact how often MLTs report their mistakes or events errors surrounding them. Risks can be substantially reduced, and patient safety can be improved in transfusion medicine services by establishing targeted strategies to bolster reporting culture.

P-17

LABORATORY TURNAROUND TIME (LTAT) IMPROVEMENT WITH AUTOMATED DECAPPING AND RECAPPING ON ATELLICA INTEGRATED AUTOMATION (AIA) IN PATHOLOGY DEPARTMENT HOSPITAL SHAH ALAM

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The laboratory practiced manual decapping, recapping and manual tube loading onto the legacy Advia system prior to Atellica Integrated Automation (AIA) installation. Laboratory turnaround time is significantly impacted by these manual workflows which is time-consuming. It also carries risk such as staff exposure to biological hazard and sample contamination which may contribute to further delay. Atellica Integrated Automation (AIA) is a clinical chemistry and immunoassay instrument that automates and streamlines the sample decapping process, noticeably reducing the time and effort required for this task. With Atellica Archive Rack, post analytical samples can be kept in the dedicated rack and archived with a systematic identification. The objective of this study was to evaluate the time saving and improvement of laboratory turnaround time (LTAT) after the implementation of Atellica Integrated Automation (AIA) in Pathology Department in Hospital Shah Alam. Time saving from decapping and recapping tasks were assessed in legacy system, Advia Chemistry and Advia Centaur with comparison to newly installed Atellica Integrated Automation. In addition to timesaving study, LTAT comparison were measured on four assays (Total Bilirubin, Creatinine, Cholesterol, Troponin I) to evaluate improvement after utilization of Atellica Integrated Automation AIA. Data was taken from the LIS. The study showed two hours of daily time saving for decapping and recapping after implementation of AIA. On average, a remarkable 24%-time reduction in LTAT was observed despite having significant workload increment. In conclusion, the successful implementation of AIA in Department of Pathology in Hospital Shah Alam has positively saves time in laboratory operation and improved overall LTAT. Through increase sample processing throughput, reduced laborious manual work and reduced risk to biological hazard exposure, laboratory personnel can now focus on more valuable task that bring impact to improve the overall laboratory quality and workflow.

P-18

DETECTION OF 11-NOR-Δ9-TETRAHYDROCANNABINOL-9-CARBOXYLIC ACID (DELTA-9THC-COOH) IN HUMAN URINE USING SOLID PHASE EXTRACTION (SPE) AND GAS CHROMATOGRAPHY MASS SPECTROMETRY (GC-MS)

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Drug abuse is destructive and excessive drug usage is a nationwide problem. Currently, cannabis remains one of the main drugs being abused in Malaysia. However, the confirmatory testing method in urine sample remains mainly using thin layer chromatography (TLC), which can be very laborious, time consuming and requires highly skilled personnel to conduct the analysis, validate and report the result. Therefore, a quantitative method to determine the presence of Delta-9-THC-COOH in urine sample is of utmost importance in drug toxicology. High-end analytical analysers such as LC-MS and GC-MS offers such capabilities. However, under the Ministry of Health (MOH) Pathology Department, regional laboratories that analyses drug of abuse are only outfitted with GC-MS. For this reason, method for determination of Delta 9- THC-COOH in urine samples using GC-MS is imperative. Urine sample underwent basic hydrolysis and then sample cleaned up using a mixed mode solid phase extraction column. Afterwards the samples were derivatised using BSTFA with 1% TCMS before it was injected into GC-MS for detection. Delta-9-THC-COOH was determined using a 30-meter low polarity column on an Agilent 7890B – 5977A GC-MS system. Delta-9-THC-COOH detection was successfully achieved by using an Agilent J &W HP 1 column within 8 min. The optimized GC-MS conditions showed good linearity of r 2 for derivatised Delta-9-THC-COOH standard in methanol and spiked blank urine > 0.995 in the calibration range between 5 - 150 ng/ml. However, further experiments are on-going in order to validate the method. A novel method of Delta-9-THC-COOH detection using a simple and fast SPE-GCMS has been developed. This optimized procedure will be suitable for routine cannabis drug of abuse testing that meets Malaysia drug of abuse testing cut-off limit of 15 ng/ml and to replace the qualitative TLC method currently use.

P-19

IMPROVED LABORATORY EFFICIENCY VIA THE IMPLEMENTATION OF AUTO-VERIFICATION

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Auto-verification (AV) is a process of verifying test results using predefined computer-based algorithms without the need of manual intervention. These rules allowed the identification of results that required further attention, including critical values and results that failed delta check. It improves the turnaround time (LTAT) by allowing staff to focus on a handful of problematic samples. The objective of this study is to evaluate the effectiveness of AV in improving the LTAT. AV was implemented for most of routine serum biochemistry tests in Jan 2017. LTAT data before (Jan 2016) and after AV implementation (Jan 2022) was extracted from laboratory information system of 2 laboratories, namely A and B for analysis. AV setting in site A required staff to click a button to execute the release of results via AV. Hence, only 30-70% of the results were released via AV, whereas site B automated the process fully without the need of execution by the staff. On average (80-95) % of biochemistry results in site B were released via AV. Despite higher % of results released via AV, site B didn't improve much as compared to site A. Data showed that the LTAT reduction from 115 to 103 minutes for site B as compared to LTAT reduction of 75 to 57 minutes for site A. As AV decreased the number of manual interventions, it improves the laboratory efficiency and increased the customer satisfaction.

P-20

QUICK PERFORMANCE EVALUATION OF VARIOUS RAPID INFLUENZA DIAGNOSTIC TESTING (RIDT)

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Results from the laboratory investigation impacts clinical decision making. Result accuracy is important in ensuring patient safety. Restrictions to curb the spread of COVID-19 markedly blunted the spread of other respiratory illnesses in the past few years. With COVID-19 become endemic, these viruses are coming back with a vengeance. Rapid Influenza Antigen Tests (RIDT) have been widely use in the laboratory. However, result accuracy has not been evaluated. This study aims to compare % positivity of 4 antigen detection tests and one rapid molecular assay compared to multiplex PCR method. Retrospective data on patients suspected infected with acute respiratory infections in 2022 was extracted from laboratory information system. A total of six kits detecting influenza was compared, namely CARTEST and GENEDIA (colorimetric chromatographic immunoassay), Quidel Sofia and SD Biosensor (immunofluorescence-based lateral-flow technology) and ID Now (Loop-mediated isothermal amplification) and BioFire respiratory panel (Multiplex PCR). Influenza data from 25094 specimens was extracted and analyzed. 9349, 4446, 3624, 3478, 1072, and 3125 specimens were collected for CARTEST, GENEDIA, Quidel, SD Biosensor, ID Now and BioFire, respectively. Influenza A % positivity was found to be 11.7%, 16.7%, 17.8%, 20.3%, 20.8%, 21.1% for Cartest, SD Biosensor, BioFire, Quidel Sofia, Genedia, and ID Now respectively. As for influenza B, % positivity ranged widely between the kits. Influenza B detection rate was lowest in ID Now 0.75%, followed by BioFire 1.57%, SD Biosensor 2.09%, Genedia 3.64%, Cartest 3.74% and Quidel Sofia 8.33%. BioFire was selected as gold standard as PCR is claimed to have high sensitivity. Comparatively, CARTEST under reporting influenza A with false negative results. On the other hand, ID Now has high false positive. As for influenza B, ID Now has the lowest sensitivity whereas Quidel Sofia over sensitive in detecting influenza B. SD Biosensor performance was comparable to BioFire. Further studies are needed correlate clinically these kits.

P-21

MAURIAC SYNDROME – A RARE COMPLICATION IN UNCONTROLLED TYPE 1 DIABETES MELLITUS: A CASE REPORT

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Hepatic glycogenosis (HG) is a complication of poorly controlled type 1 diabetes mellitus (T1DM), characterized by glycogen accumulation in hepatocytes. HG is one of the components of Mauriac syndrome (MS), characterized by growth failure, delayed puberty, cushingoid appearance, hepatomegaly with elevated liver enzymes, and hypercholesterolemia. Wide fluctuations in plasma glucose levels, with periods of hyperglycaemia and hyperinsulinism, appear to be essential to the pathophysiology of HG. However, complete remission of clinical, biochemical, and histological abnormalities in MS could be achieved with adequate glycaemic control. A three-year-old presented with severe hyperglycaemia and ketoacidosis and the diagnosis of T1DM was made. Subsequently, she had multiple admissions to hospital due to episodes of diabetic ketoacidosis (DKA), recurrent abdominal abscess and hypoglycaemia due to non-compliance to insulin therapy and poor socio-economic status. Her HbA1c level ranged from 12.5 – 14.4%. She developed hepatomegaly with mildly elevated transaminases, dyslipidaemia, and deceleration of linear growth after the diagnosis of T1DM. At pubertal age, she developed delayed puberty with short stature. Tests for viral & autoimmune hepatitis, hereditary hemochromatosis, Wilson's disease, biliary tract disease, and drug toxicity were negative. Liver ultrasonography revealed homogenous liver enlargement with no mass seen. No liver biopsy had been performed. Delayed puberty is confirmed with absence secondary sexual characteristics with suppressed Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH). MS is diagnosed in this patient by evidence of chronic uncontrolled T1DM, hepatomegaly with elevated liver enzymes, coupled with growth failure and delayed puberty. The patient requires strict glycaemic control for complete remission of the syndrome. Currently, HG is a well-recognized disease that occurs at any age and can be present without the full spectrum of features initially described for MS. In the era of insulin therapy, this entity represents a rare complication, caused by low therapeutic compliance. The syndrome is potentially reversible with the optimisation of insulin therapy and strict glycaemic control.

P-22

THE MARKEDLY HIGH PANCREATIC CYST FLUID OF CARCINOEMBRYONIC ANTIGEN AND AMYLASE IN A POSTNATAL WOMAN

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Many pancreatic cysts lesions (PCL) are found accidentally during abdominal imaging with unrelated procedures. A large spectrum of clinical characteristics and imaging render challenges in assessing PCL. This was a case report of a 32-year-old woman presented with an abdominal mass one month postnatal with uncomplicated spontaneous vaginal delivery. CT abdomen showed a retroperitoneal cystic lesion with differential diagnoses include mucinous cystadenoma of the pancreas, pancreatic pseudocyst, and cystic lymphangioma. The pancreatic cyst fluid levels for carcinoembryonic antigen (CEA) and amylase were markedly high, 4216 ng/ml and 3232 U/L, respectively. The serum amylase and CEA levels, however, were normal. The patient subsequently underwent distal pancreatectomy with splenectomy. The histopathological examination (HPE) revealed a mucinous cystadenoma of the distal pancreas with no evidence of malignancy. Pancreatic cystic fluid amylase and CEA levels helps to distinguish non-mucinous, non-malignant pancreatic cysts from mucinous cysts. Higher concentration of carcinoembryonic antigen and amylase in pancreatic cyst fluid is suggestive of mucinous cyst, however test results should be correlated with the imaging studies and histopathological reports.

P-23

IMPACT OF HIGH FOETAL HAEMOGLOBIN ON THE ACCURACY OF HBA1C AS GLYCEMIC CONTROL MARKER: CASE SERIES

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Haemoglobin A1C (HbA1c) is a common glycaemic marker used in diagnosing and monitoring diabetic patients. High-performance liquid chromatography (HPLC) is recognized as one of the methods to detect HbA1c in clinical practice. However, the results of HbA1c by HPLC are susceptible to haemoglobinopathy. Here, we described two cases to illustrate the challenge in HbA1c utility as glycaemic control indicator in patient with high foetal haemoglobin (HbF). Case 1: A 60-year-old male was diagnosed to have diabetes mellitus after persistent reading of high blood glucose level. He was found to have normal HbA1c levels (5.6%) despite poor glycaemic control reading during regular follow up. Looking back at the component of patient's HbA1c revealed high levels of HbF (15.1%). Case 2: A 75-year-old male was admitted for acute ischaemic stroke with atrial fibrillation. HbA1c was done as part of diabetic screening. The chromatogram showed HbA1c level of 5.6% with high HbF level of 22.5%. The presence of elevated foetal haemoglobin can interfere with the methodological measurement of HbA1c due to the cross-reactivity of HbF with the methods used in routine HbA1c assays. In our setting, HbA1c was measured by ion exchange HPLC (Variant II Turbo BIO-RAD). Interference studies conducted by manufacturer stated that HbF more than 5% should be suspected of having haemoglobinopathy. In individuals with high HbF, the HbA1c results may underestimate glucose level and potentially lead to suboptimal management decisions and treatment. Awareness of this potential limitation is crucial to ensure appropriate interpretation of HbA1c values in such cases.

P-24

THE POWER OF AUTO-VERIFICATION IN BIOCHEMISTRY LAB: IMPROVING EFFICIENCY AND QUALITY

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Biochemistry laboratories play a critical role in clinical diagnostics, requiring efficient and accurate processing of a large numbers of patient samples. Manual procedures for verifying results can be time consuming, inconsistent in reporting test results and prone to error. This study explores the design, implementation, and effectiveness of an auto-verification system in a biochemistry laboratory, with the goal of improving the efficiency and quality of the patient results. This study involved 31 routine clinical chemistry tests. All algorithms were integrated into the LIS system and designed according to CLSI Auto-10 guidelines. This was based on HIL interferences, critical values, delta check and mid-point limit ranges. The performance of each rule and analyte was validated against previously verified sample in a real-life simulation. The key performance indicators of laboratory turnaround time and auto-verification rate in percentage (%) were used to evaluate the effectiveness of auto-verification. Following implementation of auto-verification algorithm, the percentage of reported results up to two hours improved in both inpatient and outpatient settings, from 97.0% to 98.5% and 14.3% to 96.6%, respectively. Moreover, statistical analysis using the Mann-Whitney U test shown that the laboratory TAT significantly decreased from the median 38 min to 30 min in inpatient and 4017 min to 42 min in outpatient ($p<0.001$). The overall auto-verification passing rate was 83.5%, with TIBC, Total Cholesterol, Direct Bilirubin, and Total Bilirubin having the highest rates of auto-verification (98.8%, 98.3%, 95.5%, and 93.2% respectively). The effective auto-verification system demonstrates its potential as a useful tool in biochemistry laboratories by improving turnaround times, maintaining consistency and accuracy of reported results, and allowing the laboratory staff to focus on critical cases. Future review measures including error rates and common causes of auto-verification failure, are essential to be considered.

P-25

AN INVASIVE MOLE WITH 'NEGATIVE' URINE PREGNANCY TEST

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Qualitative urine human chorionic gonadotropin (hCG) test is routinely performed in emergency departments to screen patients of childbearing age for pregnancy. At instances, the test results may be inconsistent with patient's real clinical status, thereby jeopardizing the patient's care. A 46-year-old female presented to emergency department with abdominal pain, vaginal bleeding, and abdominal distension. Examination revealed an abdominal mass corresponding to a 24-week gravid uterus. She had right thyroid swelling but was otherwise asymptomatic. Investigations revealed weak positive qualitative urine hCG result, biochemically hyperthyroid, and mild anaemia. Transabdominal ultrasonography discovered an intrauterine mass with snowstorm appearance. Repeated urine hCG tests showed similar result. Provisional diagnosis of molar pregnancy with hyperthyroidism was made and quantitative serum hCG estimation came to be 1,991,711 IU/L. Total abdominal hysterectomy with bilateral salpingo-oophorectomy was done and tissue pathology report confirmed an invasive complete hydatidiform mole. hCG is a heterodimer composed of α- and β-subunits. Degradation of hCG results in a variety of hCG degradation products. hCG tests are immunoassay based on "sandwich principle" that utilise two antibodies directed against different sites on hCG molecule. Qualitative urine hCG tests mainly detect intact hCG, while quantitative serum hCG assays commonly use a combination of various antibodies and hence capable of detecting various hCG degradation products. Production of high levels of hCG and significantly more hCG degradation products are typical in complete mole, which may result in 'high-dose hook phenomenon' and 'variant hook phenomenon', respectively, by hindering the "sandwich" formation. Urine hCG test is susceptible to 'high-dose hook phenomenon' and 'variant hook phenomenon' in molar pregnancy which causes confusion in results interpretation. These can be overcome by appropriate sample dilution or using a different urine test kit. When in doubt, laboratory specialists should be consulted.

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IMPROVING LABORATORY PROCESS WITH HBA_1C AUTO-VERIFICATION

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The purpose of the study is to evaluate the effectiveness of auto-verification (AV) implementation for HbA1c testing on Bio-Rad D-100 analyser starting from July 2019 in terms of (i) laboratory turnaround time (LTAT) and (ii) time for chromatogram review. Methods: This is a retrospective study where all HbA1c results from July 2018 to June 2022 were extracted and compared to determine the performance impact of AV on the percentage of LTAT and the time needed for chromatogram review. A total of 168930 HbA1c results were analysed. The mean and median number of HbA1c tests per month were 3519 tests and 3261 tests respectively. After AV implementation, the percentage of HbA1c results auto-verified ranged from 83-93%. The percentage of HbA1c results validated within 1 hour increased from <5% to 20-57% and the percentage of HbA1c results validated within 4 hours increased from <12% to 64-93 % after AV implementation. Moreover, the mean and median time taken for HbA1c results validation after AV implementation reduced significantly from 594 to 76 minutes and 364 to 68 minutes respectively. After AV implementation, only 2-5% HbA1c chromatograms required manual review by technical staff. The duration required for a manual chromatogram review is 30 seconds, hence the total time needed to review all chromatograms manually without AV ranged from 1631-1760 minutes (27-29 hours) per month which equals to 1 hour per day. By implementing AV, the time taken to review only the abnormal chromatogram ranged from 31-144 minutes (0.5-2.4 hours) per month which equals to <5 minutes per day. This study proved that Bio-Rad D-100 Advisor system facilitates the HbA1c validation work process and is capable of AV. Moreover, AV implementation help in improving LTAT and saving time for chromatogram review subsequently allowing staff to focus and concentrate on other tasks or functions.

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PSEUDOHYPERKALEMIA ASSOCIATED WITH POST-SPLENECTOMY THROMBOCYTOSIS

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Pseudo hyperkalaemia is defined as a difference between serum and plasma potassium concentration of more than >0.4 mmol/L, in the absence of clinical manifestation. It can be due to several factors including prolonged tourniquet application, haemolysed sample, and increased cell count such as thrombocytosis or hereditary spherocytosis. Method: We describe a case of discrepant serum and plasma potassium levels in a middle- aged man with underlying prefibrotic primary myelofibrosis, who underwent emergency splenectomy for traumatic splenic injury. His serum potassium levels in plain tubes ranged from 5.5 to 6.1mmol/L, while plasma potassium levels in lithium heparin tubes ranged from 3.6 to 4.6mmol/L. All his blood samples reached the laboratory without delay, centrifuged using our laboratory standard procedure and were not haemolysed (H-index <10). His highest platelet level was 568 x 109 /L while white cell count was 27.92 x 103 /µL. He was treated with oral sodium polystyrene sulphonate despite being clinically stable and normal electrocardiogram. Serum potassium remained high while plasma potassium remained within normal range. Diagnosis of pseudo hyperkalaemia was made. Pseudo hyperkalaemia in patients with thrombocytosis can be seen in serum sample due to the tube constituents. Serum tube containing silica promotes coagulation, where platelet aggregates will degranulate and cause release of intracellular potassium. More intracellular release of potassium occurs in case of thrombocytosis. Whereas in a heparin tube, clotting does not occur therefore, intracellular potassium is not released and reflects the true potassium level. We highlighted the case of pseudo hyperkalaemia due to thrombocytosis, detected on serum samples. Lithium heparin tube should be used in patients with thrombocytosis instead of plain tube to avoid the diagnosis of hyperkalaemia.

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URINARY COPROPORPHYRIN ISOMERS IN HIGHLY SUSPECTED DUBIN-JOHNSON SYNDROME, A CASE REPORT

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Dubin-Johnson syndrome is a rare benign autosomal recessive genetic disorder. In this condition, mutation of the ABCC2 gene caused a defect in the transporter protein MRP2 which acts as a pump to transport substances out of the liver, kidneys, intestine, or placenta. Thus, causing an impaired transport of bilirubin into bile and excretion of bile acids. This causes accumulation of bilirubin, and patients typically present with jaundice as the only symptoms. Although this benign disorder does not usually progress to chronic liver disease, correct diagnosis is crucial. A 13-year-old boy born term and healthy to non-consanguineous parents presented with mild jaundice with no other symptoms. Other than scleral jaundice and pectus excavatum, his relevance physical examinations were remarkably normal. There was no organomegaly and no stigmata of chronic liver disease. Biochemically, he was notable to have raised total bilirubin, predominantly conjugated hyperbilirubinemia with normal liver enzymes. Complete blood count and renal function were normal and there were no signs of haemolysis biochemically. His infective screenings were non-reactive. A more extensive liver panel investigations (autoimmune and metabolic) was also negative except slightly low caeruloplasmin level; however, his urine copper was normal and no Kayser–Fleischer ring. Urinary porphyrin analysis done in Institute for Medical Research showed elevated total urine coproporphyrin with predominance of coproporphyrin I isomer (70% of total) which is a diagnostic biomarker for Dubin-Johnson syndrome. Radiological imaging excluded biliary obstruction. Mutation analysis for ABCC2 gene has not been carried out for this patient. However, the abnormal distribution of coproporphyrin I and III is the characteristic of this condition. This case highlights the characteristic distribution of coproporphyrin isomers pattern to aid in the diagnosis of this disease and reassurance to the patient and his family, as it is a benign condition and to avoid unnecessary investigations.

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LABORATORY APPROACH IN ELUCIDATING THE CAUSE OF HYPOKALEMIC PERIODIC PARALYSIS IN A COVID-19 PATIENT

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Hypokalaemic periodic paralysis is characterised by recurrent abrupt onset of limb weakness associated with laboratory finding of hypokalaemia. In a patient with existing thyrotoxicosis, Covid-19 infection could be a precipitating factor. We report a case of thyrotoxic hypokalaemic periodic paralysis (THPP) in a Covid-19 infected patient. A 25-year-old Malay gentleman presented with bilateral lower limb weakness and numbness for one day. He claimed to have a similar episodes before. He had flu like symptoms one day prior to hospitalisation. Vital signs were normal. Examination of lower limbs revealed power of 2/5 with normal sensation, reflex, and tone. There was a diffuse anterior neck swelling. Otherwise, there was no exophthalmos, no lid lag, and no clubbing. His Covid-19 rapid test kit was positive. Laboratory investigation revealed the presence of hypokalaemia (potassium of 2.0mmol/L). Point-of-care venous blood gases measurement were normal. Subsequent thyroid function test showed a high thyroxine (free T4) (71pmol/L) with a suppressed thyroid stimulating hormone (TSH) level (<0.005 U/L). He was diagnosed as THPP precipitated by Covid-19 infection. His symptoms improved following potassium correction and initiation of Carbimazole. His thyrotoxic state was later confirmed due to Graves' disease following thyrotropin receptor antibody (AntiTSHR) positivity. Cases of THPP in Covid-19 infection have been reported particularly in the Asian population. The mechanism is unknown but is postulated to be due to direct immunological effect of covid-19 on thyroid gland and sodium-potassium ATPase pump at cellular level. Hypokalaemia with normal acid-base status, and biochemically confirmed hyperthyroidism were useful laboratory findings to aid the diagnosis. Covid-19 infection could trigger THPP in hyperthyroidism patient. In an undiagnosed hyperthyroidism state, assessment of acid base status and thyroid function tests are useful laboratory tools in determining THPP.

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A CASE OF DISCORDANT TFT IN LUPUS NEPHRITIS PATIENT

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The thyroid function test (TFT) is easy to interpret provided that the clinical assessment, thyroid-stimulating hormone (TSH), and free-T4 (fT4) levels were concordant with each other. Herewith, we present a case of discordant TFT assumed to be due to assay interference. A 43-year-old woman with underlying lupus nephritis for 20 years presented with painless anterior neck swelling over three years duration. Clinically, she was euthyroid without any symptoms of thyroid gland compression. Series of TFT were requested to rule out hyperthyroidism, showing low normal fT4 ranging between 9.83 - 12.76 pmol/L (9 - 19.05 pmol/L) with suppressed TSH of 0.05 - 0.18 µIU/ml (0.35 - 4.94 µIU/ml), biochemically consistent with subclinical hyperthyroidism. The reflex free-triiodothyronine (fT3) test was normal at 3.85 pmol/L (2.63-5.7pmol/L) with negative anti-thyroglobulin and antithyroperoxidase antibodies. A neck ultrasound revealed four insignificant thyroid nodules. No hyperthyroid treatment was commenced except prolonged steroid therapy and azathioprine for the underlying autoimmune disease. An initial assumption was made clinically that the TFT result might be possibly due to assay interference. The TFT results led to several differential diagnoses: subclinical hyperthyroidism, nonthyroidal illness (NTI), recent hyperthyroid treatment, drug, or assay interference (biotin, antistreptavidin antibodies, macro-TSH, anti-ruthenium antibodies, thyroid hormone autoantibodies, and heterophilic antibodies). The patient's normal fT3 rules out NTI. Furthermore, the patient was not on any anti-hyperthyroid medications to explain it as the cause. Chronic glucocorticoid therapy reduces TSH secretion and inhibits thyroxine-binding globulin (TBG) synthesis, but steroids rarely result in thyroid dysfunction. Our laboratory method was a nonbiotinylated chemiluminescent assay using the Abbott Allinity system, which is devoid of biotin-streptavidin interaction. The patient's results disagree other assay interference (macro- TSH, anti-ruthenium antibodies, thyroid hormone autoantibodies, and heterophilic antibodies); as they result in falsely high TSH and fT4 in most literatures. Nonetheless, sample treatment with heterophile binding receptors can help to further confirm the provision whether the patient's TFTs are consistent with true subclinical hyperthyroidism.

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EXPLORING COMPARATIVE ANALYSIS AND CORRELATION OF TRIGLYCERIDE/HIGH-DENSITY LIPOPROTEIN CHOLESTEROL RATIO ACROSS AGE, GENDER, BODY MASS INDEX, AND CARDIOMETABOLIC MARKERS IN HYPERCHOLESTEROLAEMIC INDIVIDUALS

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The triglycerides (TG)/ High density lipoprotein cholesterol (HDL-C) ratio is used to assess cardiovascular risk and is often considered a better predictor of heart disease risk than individual measurements of triglycerides or HDL-C alone. The ratio TG/HDL-C is an atherogenic index proven to be a highly significant independent predictor of myocardial infarction, even more potent than total cholesterol (TC)/HDL-C and low-density lipoprotein cholesterol (LDL-C)/HDL-C. This study aimed to compare the TG/HDL ratio in different categories of gender, age, BMI, and LDL-C and correlate the TG/HDL-C ratio between age, gender, body mass index (BMI), total cholesterol, LDL-C, fasting plasma glucose, and HbA1c in hypercholesterolaemic individuals. Treated hypercholesterolaemic patients were recruited from the Specialist Lipid Clinic UiTM. Demographic data and laboratory results were retrieved through electronic medical records. Both demographic and clinical data were analysed through descriptive analysis. The TG/HDL-C ratio's comparative analysis was measured through independent samples T-tests and ANOVA, while the correlation study was measured through Biserial Correlation and Pearson Correlation. The study comprised 210 patients (mean age ± SD: 54.5 ± 8.9 years; 51.0%females). The average TG/HDL-C ratio was 1.4 ± 1.7. The lipid profile mean ± SD was as follows: TC (4.8±1.3mmol/L), LDL-C (2.7±1.1mmol/L), TG (1.5±0.8 mmol/L), and HDL-C (1.4±0.4mmol/L). Other averages mean + SD; included weight (77.1±16.9kg), BMI [29.5±5.5kg], FPG [6.2±2.4mmol/L] and HbA1c [6.6±3.8%]. Comparative analysis revealed a significant difference (t208=2.743, p= 0.007) in the TG /HDL-C ratio between male (1.7±2.2) and female (1.1±0.8). In terms of correlation, there was a noteworthy weak linear relationship between the Triglycerides/HDL-C ratio and age ($p < 0.05$), gender ($p < 0.01$), fasting plasma glucose ($p < 0.01$), and weight ($p < 0.01$). The TG/HDL-C ratio holds potential as an indicator for evaluating cardiometabolic risk. Further research with larger sample sizes is necessary to validate this association. Future studies can help solidify the role of this ratio in assessing cardiovascular health.

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ABNORMAL SERUM SEPARATION: AN INDICATOR OF HEMATOLOGICAL MALIGNANCY?

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Blood collection tubes containing separator gel are widely used in many clinical laboratories due to its advantages including increase in serum yield, ease of storage and transport. However, it is not free from limitation whereby abnormal and incomplete separation can occur. We describe an unusual case of incomplete serum separation in a serum separator tube, with a history of repeated sample rejection, failing to obtain biochemical profile. The blood sample was collected from a 68-year-old man subsequently was diagnosed with IgG Lambda myeloma. Incomplete serum separation was observed after 2500g centrifugation for 5 minutes, whereby the gel separator remained at the bottom of the tube. The sample was centrifuged again at the devices` maximum centrifugal force and longer duration (5500g for 10 minutes) which successfully separated the serum. After centrifugation of the tube, the inert acrylic gel at the bottom of the tube normally occupies the middle position between the cells and the serum, due to differences in density. However, in our case, high sample viscosity due to elevated protein concentration (98g/dl) may have contributed to the failure of complete serum separation. At high concentrations, immunoglobulins may aggregate with each other and interact with blood cells, causing red cell aggregation. Thus, it gave us a false appearance of polycythaemia despite low haemoglobin concentration (6 g/L). As the gel must move around the clot and along the wall of the SST tube, the viscous serum and blood clot mixture might have prevented this movement in our patient resulting in incomplete serum separation. Serum viscosity, however, was not measured in our case. We believe that all tubes in the clinical laboratory must be visually screened for any abnormal serum separation after centrifugation. If detected, such samples should be centrifuged at a higher speed and longer duration for effective separation of sample particles. Other option, repeated samples can be sent using a non-separator-based tube.

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EVALUATION OF AUTOVERIFICATION SYSTEM FOR HIGH SENSITIVE TROPONIN T IMPLEMENTATION IN HOSPITAL SEBERANG JAYA

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High sensitive cardiac troponin (hs-cTn) is a reliable and commonly used biomarker in diagnosing myocardial infarction. 90% completion time from sample registration to result validation of <60 minutes is suggested as an initial goal for acceptable laboratory turnaround time (LTAT) for hs-cTn. High Sensitive cardiac troponin T has been introduced in Hospital Seberang Jaya since April 2022 on a single unit of Cobas e801 analyser. Auto verification (AV) for hs-cTnT was implemented for a consistent and achievable LTAT. The purpose of this study is to evaluate the effectiveness of AV in achieving more than 90% result reporting within 60 minutes. This is a retrospective cross-sectional study where LTAT of all hs-cTnT without any exclusion from April 2022 to June 2023 were extracted and evaluated. A total of 4421 samples of hs-cTnT were analysed during this period. Percentage of samples that successfully validated within 60 minutes falls within the range of 91.4% -100%. Mean and median LTAT within 60 minutes is ranging from 20.2 to 51.1 minutes and 19 to 27 minutes respectively. In contrast, the percentage of samples validated within 30 minutes falls within the range of 61.2%-94.4%. This study demonstrated effective result reporting time within 60 minutes. The implementation of AV has led to successful achievement of LTAT within 60 minutes despite using a single analyser. Rapid verification of result allows the clinical team in fast receiving data which improve patient outcomes. AV also optimizes staff utilization and allows them to allocate time for other critical result.

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GLUCOSE-6-PHOSPHATE DEHYDROGENASE DEFICIENCY SCREENING: UMBILICAL CORD BLOOD SPOT OR PERIPHERAL BLOOD SAMPLE?

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The use of umbilical cord blood spot in the neonatal screening for glucose-6-phosphate dehydrogenase (G6PD) deficiency is a popular method for most of the hospitals in Malaysia, but poor sampling of blood spot has been continuously giving issues to the laboratory and the possibility of giving false results due to this pre analytical factor has yet need to be studied. We carried out a study to compare G6PD results from analysis using umbilical cord bloodspot against peripheral blood in EDTA tubes. All samples were analysed using the semi-quantitative fluorescent spot test described by Beutler (1966). Three levels of quality control materials (normal, intermediate & deficient control) were being used while carrying out the study. 243 abnormal G6PD results of umbilical cord blood from samples received from January 2021 to December 2022 were being used in this study. Additional peripheral blood samples in EDTA tubes were requested and analysed for comparison. Among the 243 abnormal G6PD results, there were 110 deficient neonates and 133 intermediate neonates. Exact match agreement for deficient results using umbilical cord blood against peripheral blood was 86.36% while the exact match agreement for intermediate results was not as good as for the deficient results. Sensitivity of cord blood in screening for G6PD deficiency for this study was 58%. In this study, there was a significant difference between the umbilical cord blood and peripheral blood samples in discriminating between G6PD deficient and intermediate neonates using semi-quantitative spot test. Although this method using cord blood is generally inexpensive and easy to carry out but another review or modifications to sample types used in screening is warranted to avoid prolong ward stay of babies with abnormal screening G6PD results.

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A CASE REPORT: CHALLENGES IN IgD LAMBDA PARAPROTEIN DETECTION

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Immunoglobulin D (IgD) MM is a rare subtype associated with poorer prognosis, and accounting for about 2% of MM cases worldwide. Moreover, IgD MM is often misdiagnosed because of the small amount of the monoclonal protein, or mistaken as light chain type MM. We report a case of IgD Lambda multiple myeloma which was diagnosed as light chain myeloma initially. We report a case of Mr BH, a 58-year-old, smoker, presented with constitutional symptoms of lethargy, significant weight loss and back pain for 1 month. He was anaemic, hypercalcaemic and had an acute kidney injury and was subsequently dialysed. Multiple myelomas work up was done as the peripheral blood film showed hyperleukocytosis and lymphoplasmacytoid cells with no blast. Serum protein Electrophoresis (SPE) and immunofixation (IF) detected two bands which was first was identified as free Lambda light chain of 7.5g/L at mid-gamma region and an IgD at the fast-gamma region (near to beta-region) was detected without corresponding light-chain. The Serum free lambda chains level was 5640 mg/L and κ/λ ratio was > 100. The case was reported as lambda light chain myeloma. The bone marrow trephine biopsy showed areas of prominent plasma cells, with CD 138+ and tiny aggregates showing lambda clonality. On follow-up of the patient, the SPE and IF after 2 months showed the fast-gamma region band to be a discrete IgD band of 3 g/L with a weak corresponding lambda light chain with the free lambda light chain. The revised diagnosis was IgD lambda multiple myeloma. The IgD lambda was not detected in the first IF due to the difference in the intensity of the IgD antisera which was more sensitive than lambda antisera. In view of the rarity of IgD myeloma and its low paraprotein level which may escape detection due to the lower sensitivity for detection of the lambda light chain compared to the heavy IgD, careful interpretation and extended IF need to be done and users need to be familiar with the methods and limitations in immunofixation.

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IMPLEMENTATION OF RESULTS AUTO VERIFICATION IN TUMOUR MARKERS TESTS IN HOSPITAL KUALA LUMPUR

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Auto verification (AV) is a process of using computer-based rules to verify clinical laboratory test results without manual intervention. It is a computer-released results based on established rules. According to CLSI AUTO-10A, rules decision can be made based on delta check, reference range or critical values to control the release of results automatically. In order to auto verify test results for Tumour Markers (TM) tests performed in HKL (AFP, BHCG, CA 125, CA 153, CEA & CA 19-9 & Total PSA), AV implementation began by using reference range rules. Starting from April 2022, results that are within reference range will be auto verified by the system, while results that are outside reference range will be held for manual validation. The purpose of this study is to investigate the efficiency of newly implemented AV system in Tumour Markers testing. AV efficiency is evaluated by investigating the passing rate of AV system using six months' data (from June- December 2022) and comparing laboratory turnaround time (LTAT) before and after AV implementation. AV implementation demonstrated a passing rate of 85% for AFP, 81% for CA 153, 69% for CEA, 67% for CA 125, 63% for CA 19-9 & TPSA and 27% for BHCG tests results that are auto verified by the system. On average, the overall AV passing rate is 65%. This indicates more than half of all TM tests are automatically validated by the system. A significant decrease in LTAT by 87% was predictably observed from an average of three days LTAT before AV implementation to an average of 10h 39m LTAT after AV implementation. For TM tests, the targeted LTAT is five working days. AV system is a safe and reliable tool to be used to release results automatically. This study enables targeted LTAT for Tumour Markers tests to be reduced from five to three working days. Since data indicates greater passing rates when employing reportable range for TM tests, continuous evaluation, and review of AV rules (from reference range to reportable range) will be conducted to further improve AV efficiency.

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THE CHARACTERISTIC OF BIOMARKERS FOR METHYLMALONIC AND PROPIONIC ACIDURIA ON HIGH-RISK SCREENING BY TANDEM MASS SPECTROMETRY

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Methylmalonic aciduria (MMA) and Propionic aciduria (PA) are a group of organic acid disorders which can be detected by elevated propionylcarnitine (C3) on high-risk screening, but it is not specific. Here, we evaluate C3, C3/C2, C3/C16 ratio and other additional biomarkers on the detection of MMA/PA. We studied 16,113 dried blood spot high risk screening data received at Institute for Medical Research from 2020 to 2022. Cases with increased C3 were identified and the diagnosis was confirmed with clinical history, urine organic acid and/or molecular study. All biomarkers' data were reviewed, and statistical analysis was performed on SPSS v26. Among 110 cases with elevated C3, 38 were true positive (MMA=26, PA=12) and 72 were false positive. C3 has a 25.5% positive predictive value (PPV). When the C3/C2 and/or C3/C16 ratios were included, the PPV increased to 43.2% with a specificity of 30.6%; when both ratios were included, the PPV increased to 80.0% with a specificity of 87.5%. The distribution of C3, C3/C2, C3/C16 were significantly different between the true and false positive group ($p<0.05$). Comparison between MMA and PA groups showed no significant difference of C3 ($p=0.283$) and C3/C16 ($p=0.447$) values. However, C3/C2 and glycine values were significantly higher in PA than MMA ($P<0.05$) Other ratios such as C3/C0, C3/C4 and C3/Met showed significant differences between the true and false positive group ($p<0.001$) but not significant between PA and MMA. Combined interpretation of C3 and its ratios raised the confidence for prompt distinction of affected MMA/PA from unaffected patients for early treatment commencement when confirmatory diagnosis is not immediately available.

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Zingiber zerumbet ETHYL ACETATE EXTRACT PREVENTED ALUMINUM CHLORIDE-INDUCED ALZHEIMERISM IN RATS: BEHAVIORAL AND BIOCHEMICAL STUDY

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Alzheimer's disease (AD) is a neurodegenerative disorder characterized by brain cell death causing memory loss and cognitive decline. Several studies suggested that there are association between the usage of aluminium chloride (AlCI3) and incidence of AD. AlCI3 is a non-redox metal yet promoting oxidative stress. Zingiber zerumbet Smith also known as 'lempoyang' has been proven scientifically for its antioxidant, ant inflammation, anticancer and antimicrobial properties. This study focused on neuroprotective effects of Z. zerumbet on AD. Thirty adult male Sprague Dawley rats were divided into five groups with 6 rats/group each: 1st group: negative control group in which rats were given daily oral dose of 1 ml of normal saline, 2nd , 3rd , 4th and 5th groups: rats were given normal saline, N-acetyl cysteine (NAC) (20 mg/kg/day) and Z. zerumbet ethyl acetate extract (200 and 400 mg/kg/day) respectively, then followed by combination of each treatment with AlCl3 for another four successive weeks. Following that, behavioural test on memory impairment, oxidative stress markers (8-isoprostane and protein carbonyl), antioxidant level (Superoxide dismutase), hyperphosphorylated tau protein level, acetylcholinesterase activity, neuron number and histological study was done. The behavioural study using open field test, in which central time spent were measured, are done at baseline (before induction of AD), before and after treatment with Z. zerumbet extract. The treatment with AlCl3 alone demonstrated significant changes ($p<0.01$) in memory impairment, increased in acetylcholinesterase activity, phosphorylation of tau protein, oxidative stress, neuronal cell death and decreased in antioxidant level. However, administration of Z. zerumbet extracts was able to combat the AlCI3 effects and showed significant ($p<0.01$) effects in improving memory impairment, ameliorating the antioxidant level, reducing the oxidative stress markers, phosphorylation of tau protein, acetylcholinesterase activity and neuronal cell death. The Z. zerumbet ethyl acetate extract demonstrated a very good potential as neuroprotective agent in preventing the AlCI3 induction of Alzheimer in rats.