ASCLS Annual Meeting 2012: Official Abstracts of Submitted Papers, Case Studies and Posters

Los Angeles, CA

The following abstracts have been accepted for presentation at the 2012 American Society for Clinical Laboratory Science (ASCLS) Annual Meeting and Clinical Laboratory Exposition to be held July 17 through July 21 in Los Angeles, CA. Abstracts are reviewed by members of the ASCLS Abstract Review Committee. They are the final authority in selecting or rejecting an abstract.

Papers, case studies and posters will be presented during the following times at the annual meeting.

POSTER PRESENTATIONS
Tuesday and Wednesday, July 17 and 18, 10:00am-4:30pm; Thursday, July 19, 9:30am-Noon at the Los Angeles Convention Center; Authors will be present on Wednesday, July 18, 2012 from 10:30am to Noon to discuss their work and answer questions.

ORAL RESEARCH PRESENTATIONS
Thursday, July 19, 2:30-3:30pm at the Los Angeles Convention Center, Friday, July 20, 2:30-3:30pm at the Millennium Biltmore Hotel

Poster Presentation Abstracts

Analysis of Adhesive and Biofilm Abilities of non-*albicans Candida*

April L. Harkins, PhD, Stephen Wright**,** Ryan Miskulin**,** Marquette University**,** Milwaukee, WI

Infections caused by *Candida spp.* have increased significantly due to the emergence of medical advances such as immunosuppressive therapies and prosthetic devices. In the United States, *Candida* infections are the 4th most common hospital acquired blood stream infection (BSI) due to the yeast's ability to adhere and form biofilms on implanted medical devices. In recent years there has been a paradigm shift of *Candida spp.* isolated from BSIs. Non-*albicans Candida* infections have significantly increased due to resistance to azole antifungal treatments, the misuse of azole treatments, and the prevalence of certain *Candida spp.* to particular clinical populations. Immmunocompromised patients with these infections suffer a very high mortality rate of approximately 23% to 53%. With this shift in *Candida spp.* there is a necessity to understand and treat these new threats. In this study, *Candida glabrata, Candida parapsilosis, Candida tropicalis, Candida krusei,* and *Candida dubliensis* were grown and examined for the ability to adhere to silicone squares and form efficient biofilms. Confocal microscopy and adherence assays were performed on multiple clinical isolates of each *Candida spp. C. parapsilosis, C. tropicalis* and *C. krusei* showed the highest amount of adherence in vitro compared to *C. albicans, C. glabrata* and *C. dubliensis*. Only *C. parapsilosis* was able to form a biofilm as robust as *C. albicans*.

Antimicrobial Regimen Modifications after PNAFISH Organism Identification

Holly Sanders, MHS-CLS,MLS(ASCP)CM, Georgia Health Sciences Health System, **Barbara Kraj, MS, MLS(ASCP)CM**, Rebecca Stone, MEd, MT(ASCP), Barbara Russell, EdD, MLS(ASCP)CM, SH(ASCP)CM, Georgia Health Sciences University, Augusta, GA

Bloodstream infections are a significant cause of morbidity and mortality. Prompt exclusion of contaminants, identification of pathogens, and communication of results encourage appropriately targeted drug therapy, which is associated with reduced length-of-stay and cost, reduced exposure to antimicrobials and decreased patient mortality rates, motivating clinical laboratories to implement rapid identification assays. Commercial peptide nucleic acid fluorescence in situ hybridization (PNA FISH) kits use nucleic acid analog probes for presumptive identification of organisms in hours rather than days required for traditional culturing and biochemical methods. This retrospective cross-sectional study investigated the impact of PNA FISH (AdvanDx, Woburn, MA) rapid identification by evaluating antimicrobial regimen modifications following availability of results, and examined the correlation between results notification by telephone of the hospital pharmacy and appropriateness of antimicrobial therapy. Data collected from laboratory and medical records of patients with bloodstream infections included time of phlebotomy, time of positive growth, Gram stain results, times and results of PNA FISH and traditional work-up identification. Also collected were data on pharmacy notification, existing antimicrobial prescriptions and regimen modifications within four hours of PNA FISH reporting. Analysis of correlation between

pharmacy notification and antimicrobial appropriateness was inconclusive. Antimicrobial regimens prescribed prior to the reporting of PNA FISH results were appropriate without modification in 82.6% of the cases. A statistically significant proportion of cases (14.3%, $p < 0.0001$) demonstrated improvement in the appropriateness of antimicrobial regimens following PNA FISH reporting, suggesting that physicians were utilizing PNA FISH results as a diagnostic resource in patient care.

Association between Neuroendocrine Hormones and Major Depressive Disorder (MDD)

VJ Patel, **Lester Pretlow, PhD**, Georgia Health Sciences University, Augusta, GA

Only psychological based tests such as the Hamilton Depression Rating Scale (HDRS) are being used to diagnose the major depressive disorder. Currently, there are no physiological tests to diagnose depression. Depression has been linked to high serum cortisol, low serum serotonin, and high serum epinephrine levels. The purpose of the study was to find whether there is a significant association between abnormal serum cortisol, epinephrine, and serotonin levels, and depression in a convenience population of patients. The hypothesis of the study was that there is an association between abnormal cortisol, epinephrine and serotonin levels and MDD. The researchers conducted a retrospective case-control study of 70 subjects. The subjects were divided into two groups: 35 subjects with MDD in case group and 35 subjects without MDD in control group. The medical records of the subjects in case and control groups were pulled using ICD-9 (International Statistical Classification of Diseases) code for MDD (296.2) and CPT (Current procedural terminology) code for serum cortisol (82533). epinephrine, and serum serotonin levels. None of the 70 subjects had serum serotonin or serum epinephrine tests done. Therefore, only serum cortisol values were used for the analysis. Logistic regression was used on the following predictor variables: Age, Gender, Race, and Cortisol. The mean cortisol values in both groups were normal (RR: 3-25 mcg/dl). (P value of serum cortisol = 0.283, odds ratio = ~1) Based on the P value cortisol was not associated with the risk of MDD.

Cellular Elements in Preserved Saliva Samples

Fang Yao Stephen Hou, PhD, MB(ASCP)QCYM, Andrew Dentino, PhD, DDS**,** Marquette University **,** Milwaukee, WI

This poster describes a reliable protocol using ethanol to preserve saliva for cellular analysis. Some cellular elements in fresh saliva will disintegrate due to the presence of various digestive enzymes. The preservation is critical for longitudinal studies. We were able to characterize large and small cellular elements, using a sensitive fluorescent nucleic acid dye (SYBR Gold). The large cellular elements include epithelial cells, mononuclear white blood cells, and polymorphonuclear neutrophils. The small cellular elements include various bacteria and cellular microparticles containing nucleic acid. There were more bacteria than white blood cells, at least a hundred-fold difference in the saliva. There was also a potential correlation between bacteria number and percentage of PMN. In addition, we could perform CD surface marker analysis on the preserved saliva samples. In this pilot study, four subjects were recruited to test the feasibility of this protocol. The data provided a personalized picture of cellular elements in oral mucosal environment for each individual. With the methodology presented here, the preserved saliva samples may become potential clinical specimens in the future. Importantly, subjects can be trained to collect first morning saliva, which are consistent and less affected by eating/drinking. With the available archived specimens, we may propose studies to detect cariogenic bacteria or oral cancer as early as possible. This will also be particularly useful in the era of personalized medicine.

Determining Erythrocyte Engraftment in Post-hematopoeitic Stem Cell ABO-incompatible Transplant Patients

Natalie K Case, MS, MLS (ASCP), Teresa S Nadder, PhD**,** Kimberly W Sanford, MD**,** Virginia Commonwealth University**,** Richmond, VA

The purpose of this study was to identify a laboratory parameter representing erythrocyte engraftment to be used as an indicator to change the recipient to donor ABO group and Rh type following an ABO incompatible hematopoietic stem cell transplant (HSCT). Studies have shown that ABO incompatibility does not have an effect on outcome of HSCT; however, the serological consequences of these ABO incompatible transplants can make it difficult to decide when to begin support with donor ABO/Rh type blood products. Unless a reticulocyte count is documented by the testing facility, erythrocyte engraftment may be difficult to determine. No studies were found attempting to determine a readily available laboratory parameter as an indicator of erythrocyte engraftment. This study explored the use of red blood cell distribution width (RDW), mean corpuscular volume (MCV), and hemoglobin (HGB) as regularly tested laboratory parameters that could be used as surrogate markers for RBC engraftment in 70 patients who received ABO/Rh incompatible HSCT. It was determined that the appearance of engrafted donor RBCs correlated with a peak in RDW ($p = 0.002$), suggesting that RDW may be an indicator of erythrocyte engraftment. High values of RDW likely result from a substantial proportion of large, young erythrocytes

from recent engraftment with smaller, older pre-transplant erythrocytes from the recipient. These findings may be used as a way to improve Transfusion Medicine policies when a decision to switch the ABO/Rh type is warranted.

Development of Lateral Flow Assay Based Direct Reading Field Monitors for Surface Contamination by Antineoplastic Drugs

Jerome P. Smith, PhD, Deborah L. Sammons, Shirley, A. Robertson,**, Barbara A. MacKenzie ,** D. Gayle DeBord, PhD**,** Thomas H. Connor, PhD**,** Jack R. Pretty, PhD**,** John E. Snawder, PhD **,** Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati, OH

The purpose of this study was to determine the useful response range of lateral flow based monitors which were developed to determine surface contamination by antineoplastic drugs (AD) at 1 ng/cm^2 or less. A number of studies have documented surface contamination by AD which may present a risk to workers in healthcare facilities since AD are carcinogenic, mutagenic, and teratogenic (Connor et. al. 2004). Surface detection techniques for 5-fluorouracil (5-FU), paclitaxel, and doxorubicin were developed that employ wiping the surface with a wetted swab, extracting the swab, and applying the resulting solution to a lateral flow monitor. Individual ceramic tile surfaces (10x10 cm) were spiked with known concentrations of each AD (0-500 ng) and evaluated with the detection techniques. Two ways of evaluating the response of these monitors were used: an electronic method where a lateral flow reader was used for measuring line intensities and a visual method where the intensity of the test line was visually compared to the control line. The 5-FU monitor is capable of detecting 0.1 ng/cm^2 using the electronic reader and 0.1-0.25 ng/cm^2 using the visual comparison method. The paclitaxel monitor can detect 0.25 ng/cm^2 with the electronic reader and 0.5 ng/cm^2 visually. The doxorubicin monitor can detect 0.05-0.1 ng/cm^2 with the visual comparison method but more work is ongoing to fully assess its capabilities. The electronic method was more sensitive than the visual method but the visual method is simpler and cheaper. Both methods can detect 1 ng/cm^2 for the AD studied.

Connor T.H., G.E. Burroughs, M.A. McDiarmid, K.R. Mead, L.A. Power and L.D. Reed. NIOSH Alert: Preventing occupational exposures to antineoplastic and other hazardous drugs in health care settings. DHHS (NIOSH) Publication Number 2004-165 (2004).

The Effect of Positive Notification on the Appropriateness of Patient Therapy

Kimberly Freyman, **Barbara Russell, EdD**, Jennifer Waller, PhD, Georgia Health Sciences University, Augusta, GA

Blood cultures are commonly ordered tests where a positive result is considered a critical value. Time and budget constraints question the efficacy of calling some critical value testing including blood cultures leading to uncertain therapy changes. This study's purpose was to investigate the influence of calling critical value blood culture Gram stain results on physicians' prescription of antimicrobial agents. This study included 410 patients with a positive blood culture result. Data, collected retrospectively by medical chart review, included Gram stain result, existing antimicrobial therapy, therapy modification after Gram stain result, time to modification, and demographic information. The overall prevalence of appropriate antimicrobial treatment at the time of Gram stain result was 68.8% (282 patients). The incidence of appropriate treatment within 24 hours following the Gram stain result was 39.8% (51 patients) leaving 60.2% (77 patients) on inappropriate or no treatment. There were no statistically significant differences between demographic variables by Gram stain type or in the incidence of appropriate treatment by Gram stain type among those on no or inappropriate treatment (Fisher's Exact p=0.1850). The mean time to appropriate antimicrobial therapy after Gram stain result was 16.95 hours with no statistically significant differences between times to appropriate treatment by Gram stain types. While this study shows a high prevalence (68.8%) of appropriate treatment prior to Gram stain result, only 39.8% of inappropriate or no treatment was modified appropriately. Further study should be done to determine why 60.2% of inappropriate treatment was not modified and why treatment modification time was lengthy.

Five Year Analysis of ABO/Rh Discrepancies with an Implemented Type Confirmation Policy

Kimberly Hesoun, MS, **Emily M. Hill, MS, MLS(ASCP)**, Kimberly Sanford, MD, Virginia Commonwealth University, Richmond, Virginia

In 2005, the Virginia Commonwealth University Medical Center (VCUMC) transfusion medicine department implemented a type confirmation policy for compatibility testing. The purpose of the policy was to aid in the prevention of ABO-incompatible transfusions by verifying the patient's identity through ABO/Rh typing on a second, independent sample. The VCUMC Harm Scale was used to characterize the wrong blood in tube (WBIT) errors reported during the 5 years following policy implementation. WBIT is defined as a blood specimen labeled with the intended patient's identifiers but contains blood from a different patient. Areas of interest included the event harm score, year of occurrence, patient location, and ABO/Rh compatibility

between the patient and WBIT. One hundred and ninety six WBIT errors were identified, resulting in a WBIT rate of 1.08/1000. The highest proportion of WBIT errors from any single location (33%) was the emergency department. The policy functions to protect patients who do not have a historical blood type. In this study, 54% of the patients involved in WBIT errors did not have a historical ABO/Rh on record. Without the type confirmation policy 15 WBITs would have gone undetected; 8 of which were ABO incompatible. The study concluded that despite the current strict labeling and patient identification policies, errors do occur. However, all WBIT errors that have occurred have not been associated with patient harm. Through the use of this protocol ABO-incompatible transfusions have been avoided. The study results will provide opportunities for focused educational initiatives to reduce errors and increase patient safety.

Functional Comparisons of mCRBPI and mCRBPIII and Their Impact on Retinoic Acid Biosynthesis from Vitamin A

Keely Pierzchalski, MLS(ASCP)^{CM}, Maureen Kane, PhD**,** University of Maryland-Baltimore**,** Baltimore, MD

Retinoic acid (RA), vitamin A's active metabolite, is critical in cell proliferation and apoptosis. Disrupting RA homeostasis is associated with aberrant proliferation and dysfunctional apoptotic programs in cancer. Cellular retinoid binding protein (CRBP) chaperones vitamin A, retinol, and its metabolite, retinal, and participates in regulating RA biosynthesis. CRBPI is the main chaperone for retinol and retinal and is severely diminished or absent in approximately 25% of human breast cancers that are associated with poor clinical outcome. Using a mouse mammary model, we show that there is ~40% decrease in RA in CRBPI-/- mammary compared to normal mammary. In the absence of CRBPI, studies show a homolog, CRBPIII, to compensate, but not to functionally replace CRBPI. This proposal is aimed at investigating the functional differences between CRBPI and CRBPIII in terms of ligand and metabolizing enzyme interactions. CRBP-ligand binding affinities were compared by fluorescence spectroscopy, and show that CRBPI binds significantly tighter to retinol than CRBPIII. Mouse mammary metabolizing enzymes were evaluated for activity in the presence of CRBPI or CRBPIII. These enzyme studies indicate that RA biosynthesis defects likely occur in the metabolism of retinol to retinal. CRBPI is shown to be necessary for RA homeostasis. Loss of CRBPI impacts retinol binding and metabolism in the RA biosynthesis pathway. This investigation provides potential leads to develop novel therapeutic strategies. Additionally, these results establish precedent for biomarker assay development, using CRBPI loss as a promising biomarker to identify this breast cancer phenotype and to personalize treatment options.

Rapid Identification of Methicillin Resistant *Staphylococcus aureus*

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Staphylococcus aureus (*S. aureus*) is an opportunistic bacterium known to cause a variety of diseases ranging from minor skin infections to septicemia. Most strains of *S. aureus* are killed using routine antibiotics; however, many strains have acquired mechanisms allowing them to become resistant. Methicillin resistant *S. aureus* (MRSA) are strains of *S. aureus* that are resistant to beta lactam antibiotics. It is important to have rapid identification of these bacteria to prevent misuse of antibiotics and to aid in the overall health of the patient. Conventional methods report accurate results; however, turnaround time is 24 to 48 hours. The purpose of this study was to compare the Oxoid™ PBP2a Latex Agglutination test kit to the Alere™ Lateral Flow assay for the rapid identification of MRSA. It was hypothesized that the Alere™ PBP2a assay would be more sensitive and specific, with a decreased turnaround time compared to the Oxoid™ PBP2a assay. A total of 90 isolates from wound, respiratory and blood, positive for *S. aureus*, were tested using both the Oxoid™ and the Alere™ assay (47 MRSA and 43 MSSA). Both the Oxoid™ and Alere™ were 100% specific, with sensitivities of 100% and 97.9%, respectively. The average turnaround time for 10 samples was as follows: 75 minutes (Oxoid™ assay) and 60 minutes (Alere™ assay). Other factors including, longer shelf life, ease of use and the ability to use the Alere™ assay on multiple benches, makes it a rapid and reliable assay for the identification of MRSA.

Sequential Assessment of Troponin I Levels in the Differential Diagnosis of Acute Myocardial Infarction

Brandon Edwards, Irsha Washington, **Lester Pretlow, PhD**, Georgia Health Sciences University, Augusta, GA

According to the American Heart Association, cardiovascular disease accounts for more than one third of all deaths in the United States (Straface et al., 2008). The purpose of this retrospective case-control study was to determine which sequential draw was most accurate in diagnosing an AMI based on the time it takes for the heart to release a critical amount of troponin I (cTnI) protein. The investigators hypothesized that the cTnI assay at six hours after presentation to the emergency department will be the most significant time for diagnosing an AMI using sequential cTnI assessment. All 100 subjects were selected from a convenience sample. Patients in the study were of ages 40-79, and the

collected laboratory data was from emergency department admissions in the Central Savannah River Area during the year 2010. Both race and gender covariants were selected equally for cases and controls. The "risk" of AMI diagnosis was modeled using binary multiple logistic regression on the following covariants: age, gender, race, and protocol (sampling $T_{initial}$, T_3, T_6, T_{8-12}). Overall, 77% (39 out of 50 cases) were diagnosed with an AMI at $T_{initial}$. However, 0% was diagnosed with an AMI at T_3. Further, 14% (7 out of 50 cases) were diagnosed with an AMI at T_6. The remaining 8% (4 out of 50 cases) were diagnosed with an AMI at T_{8-12}. Clearly, the initial cTnI assay was the most critical of the four sequential time points for the accurate assessment of the presence or absence of an AMI.

Oral Research Abstracts

Aspergillus terreus Recovered from a Corneal Scraping

Suzanne Campbell, PhD, MLS(ASCP)CM, Seward County Community College/Area Technical School **,** Liberal, Kansas

A 52 year old, healthy male presented to his optometrist complaining of redness, pain, and irritation in the right eye. A foreign body was removed from the eye. The patient was started on ophthalmic solutions of vigamox and systane. At 48 hours, the patient reported increased pain, redness, limited vision, and yellow discharge from the eye. The patient was referred to an ophthalmologist for evaluation. Physical assessment revealed a superlative central infiltrate and diffuse corneal haze and edema with a 3- to 4+ conjunctival injection and a 1 millimeter hypopyon. The patient was started on vancomycin, tobramycin, and natamycin ophthalmic eyedrops.

The ophthalmologist collected corneal scrapings that were submitted for aerobic, anaerobic, and fungal cultures. The aerobic and anaerobic cultures were negative. The initial report from the fungal culture indicated rare growth of mycelia fungal forms. The fungus was identified as *Aspergillus terreus* by phenotypic methods. No additional fungi were isolated after 4 weeks.

Aspergillus terreus is 1 of 20 *Aspergillus species* to cause opportunistic infections in humans and is found in soil, decaying matter, household dust, building materials and on plants. Risk factors for *Aspergillosis* include immunosuppression, host factors, and hospitalization. *Aspergillus terreus* from this culture source is not documented in the literature.

Upon receipt of the positive fungal culture findings, voriconazole eyedrops were added to the treatment regimen. The voriconazole treatment was continued for 10 weeks. At that time it was determined that the patient was a candidate for photo-therapeutic keratectomy (PTK) procedure to remove the dense scarring.

Hereditary Hemorrhagic Telangiectasia - A Case Study

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Hereditary Hemorrhagic Telangiectasia (HHT) also known as Osler-Weber-Rendu, is an autosomal dominant disorder involving blood vessel abnormalities. Although, most blood vessels in a person with HHT are normal, a small percentage is abnormal and the individual tends not to form capillaries. The blood vessel abnormalities are capable of causing telangiectasias and arteriovenous malformations (AVMs) in different organs throughout the body. This case study involves a female diagnosed with HHT during childhood who suffered a stroke at the age of 34 due to pulmonary AVMs. Previously her only symptom was frequent nosebleeds. The patient was successfully treated by embolization of six pulmonary AVMs; one AVM too small for treatment will be monitored. The patient has had no health concerns since the embolizations. Genetic testing indicated the heterozygous presence of a known mutation, c.263delA, in exon 3 of the ENG gene. Two of the patient's three children also tested positive for this mutation and were screened for the presence of pulmonary and brain AVMs. Screening procedures showed no AVMs in the children; however they will continue to be monitored because most pulmonary AVMs may not be detected until puberty. Genetic testing is important in children whose parents have HHT so they can be diagnosed at an early age and screened for the presence AVMs. These AVMs are treatable, but if left untreated they can cause death. Symptoms, diagnostic procedures including hypercoagulation studies, and gene sequencing of ACVRL 1, and ENG, genetic abnormalities known to cause HHT, will be discussed.

Implementation of the Illumigene® for the Detection of *Clostridium difficile* in a Long-Term Acute Care Hospital

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The purpose of this study was to evaluate the Illumigene® (Meridian Bioscience, Cincinnati, Ohio) for the detection of *Clostridium difficile* in stool specimens, and to perform a cost-benefit analysis six months after implementation. Microbiology laboratories have gone through changes diagnosing *C. difficile* infections (CDI). Toxigenic culture is too cumbersome, expensive, and time consuming to perform. The cytotoxin assay and the glutamate dehydrogenase

(GDH) were alternatives, but lacked the necessary sensitivity. Many clinical labs adopted enzyme immunoassays (EIAs) as they are rapid, easy to perform, and inexpensive. These EIAs, however, have reduced sensitivities, with some as low as 50 percent. Reductions in reimbursement and increasing rates of *C. difficile* infection necessitate the need to rapidly identify these patients. Our laboratory conducted an evaluation of the Illumigene® versus the reference method (EIA). The Illumigene® is a moderately-complex molecular assay specific for the pathogenecity locus, PaLoc present in toxigenic strains of *C. difficile*. Stool samples (n=61) were collected from patients on whom *C. difficile* tests had been ordered and tested using both methodologies. Overall, the performance of the Illumigene® was 95% sensitive compared to the EIA after resolution of invalid results. The laboratory, in collaboration with infectious disease and pharmacy, developed a diagnostic and treatment algorithm to reduce unnecessary testing for *C. difficile*. The laboratory was able to reduce the cost associated with testing for CDI by reducing the number of tests performed due to the implementation of evidence-based guidelines and reducing unnecessary repeat testing.

Interdisciplinary Model: Didactic, Service-Learning, Practice

Halcyon St. Hill, EdD, MLS (ASCP)^{CM}, Florida Gulf Coast University**,** Fort Myers, FL

Innovative curricular changes are needed to entice and better prepare students entering the revolutionizing healthcare workforce, address personnel shortages, and bolster the decreasing numbers of clinical placement sites. This new workforce is focused on cost, access, quality patient-centered care and interprofessional/interdisciplinary collaboration. A strategic interdisciplinary capstone was developed for these purposes. Didactic, real life clinical practice problems and a service-learning project reflective of participating disciplines (clinical laboratory science, health sciences, health service administration, and nursing) were integrated in the capstone. Accreditation standards or guidelines for disciplines were also utilized in capstone development. The interdisciplinary projects were selected from community healthcare agencies including hospitals, clinics and health departments. After implementing the capstone, assessment was done to determine the effectiveness of (a) integrating didactic with practice and service learning, and (b) resolving issues with viable and sustainable solutions using service-learning. A post capstone survey showed 99% of the students as better prepared to enter the workplace, problem solve and interact meaningfully and effectively with relevant professionals; 96% of the students indicated that the interdisciplinary agency team project enabled them to develop an understanding and appreciation of roles and contributions of other disciplines and practitioners. Implications of this study are relevant to practice innovations and benefit participating clinical sites from a service-learning, clinical problem solving perspective while incentivizing clinical sites with tangible solutions and promoting engaged citizenship among graduates. In this presentation, service-learning will be defined; the interdisciplinary capstone model, its applicability and benefits to clinical practice, and assessment findings will be addressed.

Learner-Centered Education: Strategies to Optimize Student Learning

Janelle M. Chiasera, PhD, University of Alabama at Birmingham**,** Birmingham, Alabama

Given the complex, fast paced and expanding nature of healthcare, some information University educators provide to their students will change by the time they are practicing professionals. Such quick environmental changes demand that we equip students with knowledge and skills that are long-lasting, useful, applicable, and transferable. However, current pedagogical practices center the education environment on the teacher, where the teacher is the active participant and the learner is the passive receptacle of knowledge. Current educational theory and the dynamic healthcare environment, however, argue for a learner-centered approach where the overarching purpose is to produce educated learners, learners equipped to transfer information from one context to another and apply it in a useful way to solve problems and construct new understandings. Learner-center education focuses on showing students how to locate information, evaluate the source of information, collaborate with others to produce meaningful learning, and solve global new problems. Strategies for incorporating this new paradigm into practice include designing instruction that enables students to learn "how to learn" and aids in the development of lifelong learning skills, creating classrooms with a redirected focus on communication, control, and responsibility to the students, and expanding the instructor's role from a knowledge-laden professor or preceptor to that of a learning mediator or facilitator. This presentation will differentiate teacher- versus student-centered education, provide strategies to incorporate this pedagogy into clinical and university environments, and provide clinical and university examples of learner-centered education.

Serial Procalcitonin Analysis in Intensive Care Unit Patients: Effects on Outcome and Cost in Sepsis and Other Comorbidities

Edwina B. Cariati, MS, Kaiwan Mirza, MS**,** Shashi Mehta, PhD**,** University of Medicine and Dentistry of New Jersey**,** Newark, NJ

Introduction: Sepsis is the second leading cause of death in

the intensive care unit (ICU) in U.S. hospitals. Early detection with appropriate antibiotic therapy increases positive outcomes. A biomarker of sepsis, procalcitonin is elevated early in bacterial infections while not in non-bacterial systemic responses. Our objective was to determine whether serial Procalcitonin (PCT) levels compared to lactic acid (LA) as a cost-effective biomarker of sepsis decreases length of stay (LOS) in the ICU, improves mortality, and shows cost reduction. A literature review showed little supportive research in comparisons of PCT and LA in sepsis with other comorbidities.

Methods: Patient medical charts were reviewed retrospectively for PCT analyzed on the BioMerieux VIDAS® and LA on the Beckman DxC 880i® in ICU patients with sepsis and other comorbidities for twelve month periods each. We assessed mortality, LOS, and costs of serial PCT compared to LA. Comparative analyses using the SPSS® software package for the independent t-test and chi-square test were performed.

Results: 48 patients (24 in each group) with sepsis were included in the study. Of those with PCT measured, mortality and LOS were decreased with savings of >$40,000 per patient. Also, decreases in LOS and costs were seen in septic patients with comorbidities of pneumonia (n=7), anemia (n=14), kidney disease (n=18), kidney disease and pneumonia (n=4), and kidney disease and anemia (n=9).

Conclusion: This pilot study demonstrated that PCT is a better cost-effective biomarker for sepsis when comparing mortality and LOS, which leads to significant cost reductions for patients in ICU.

A Simple and Inexpensive Method of HbF Measurement Using Acid Elution of HbS

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The purpose of this study was to determine if a method, previously developed in our lab, shown to selectively elute hemoglobin A from red cells can also elute hemoglobin S similarly as a means of indirectly measuring HbF levels to monitor sickle cell patients treated with hydroxyuria. Three different experimental designs using normal blood (HbA), cord blood (HbF) and a homozygous sickle cell sample (HbSS) were tested as follows: 1. Three tubes (AA, cord blood (F), and 50:50 AF mixture), 2. Three tubes (SS, cord blood (F), and 50:50 SF mixture), 3. Graduated mixtures of cord blood and a sickle cell patient sample (SS) in 10% increments as follows: 100% F, 90%F:10% S, 80% F: 20% S, etc ending in 100% S. Absorbance of the supernatant directly measures the HbA or HbS eluted from the sample. The difference between the total absorbance and the absorbance of the supernatant equals the HbF level. The linear regression (R^2= 0.947) indicated that as HbS concentration increases, the absorbance of the supernatant increases proportionately which is inversely proportional to the HbF concentration. This research successfully shows that this method can effectively measure HbS eluted from blood samples in individuals with sickle cell disease in the same manner as HbA using a similar citrate buffer solution as was used in the Kleihauer-Betke (K-B) test.