ASCLS 2007 Annual Meeting: Official Abstracts of Submitted Papers, Case Studies, and Posters

SAN DIEGO, CALIFORNIA

The following abstracts have been accepted for presentation at the 2007 American Society for Clinical Laboratory Science (ASCLS) Annual Meeting and Clinical Laboratory Exposition to be held July 17 through July 21, 2007 in San Diego CA. The preliminary meeting program was published in the Spring 2007 issue of *Clinical Laboratory Science*. Abstracts are reviewed by appropriate representatives 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. Room assignments will be listed in the final program.

ORAL RESEARCH AND CASE STUDY PRESENTATIONS

Wednesday, July 18, 2007, 2:00 p.m. – 3:30 p.m. and 3:45 p.m. – 5:15 p.m., Convention Center; Friday, July 20, 2007, 10:45 a.m. – 12:15 p.m., Westin San Diego Hotel.

POSTER PRESENTATIONS

Tuesday and Wednesday, July 17 and 18, 2007, 9:30 a.m. – 5:00 p.m.; Thursday, July 19, 2007, 9:00 a.m. – 11:30 a.m., Convention Center.

Authors will be present on Wednesday, July 18, 2007 from 12:30 p.m. – 1:30 p.m. to discuss their posters.

ORAL RESEARCH ABSTRACTS

Development of an Online German Hematology Atlas

Andrea R. Pitkus, MT(ASCP) CLS(NCA), *University of Minnesota, Minneapolis MN.*

This project entails the development of the Onkodin German National Oncology website Hematology atlas. Online hematology atlases often lack patient history and pertinent test results, require technical training in case compilation, and feature cases from a single institution. The Onkodin Bildatlas addresses many of these issues by using a ZOPE/ZMS software foundation that allows physicians from across Germany to contribute unique cases to this resource.

We describe the assembly of acute myeloid and lymphoid cases from the University of Heidelberg, utilizing ZOPE/ZMS software to compile and upload cases to the Bildatlas with little technical training. Cases contain the patient presentation, history, and laboratory findings such as morphology, cytochemical staining, cytogenetics, molecular diagnostics, and flow cytometry, including digital photographs and scatterplots.

These comprehensive cases, in English and German, contribute to medical personnel education, knowledge, and research in the international hematology community, and integrate attractive aspects found in other online atlases. Furthermore, this resource serves as a passive decision support tool aiding clinicians and students in distinguishing features of challenging cases, while more active decision support in the form of user quizzes and a chat feature will be integrated in the future. Hematology experts continue to develop and contribute to this information resource.

Does Continuing Education Make a Difference?

Anne Ranne, MS MT (ASCP), *Medical College of Georgia, Augusta GA.*

For recertification, members of laboratory professional organizations must complete continuing education (CE) units. The professional associations, independent providers, employers, and universities or professional schools provide continuing education programs. Beyond the time and cost, the larger question is what makes effective continuing education? A survey of laboratory professionals highlights the most widely selected formats for continuing education and the reasons for the selection. This presentation will review these results and provide current research on what type of continuing professional education transfers knowledge to practice. Continuing education should be a lifelong learning process especially with the constantly evolving technology and testing innovations. How can we become reflective practitioners? The presentation will provide information on knowledge translation and interprofessional collaboration utilized by other healthcare professionals. Lastly, we will consider how to bring this

learning process into the laboratory setting and create interaction between the laboratory professional and other members of the healthcare team.

Effects of Varying Doses of Brown Recluse Spider Venom on the Coagulation System in a Rabbit Model

David L McGlasson MS CLS(NCA), *Hugh H Harroff DVM, Jackie Sutton, Edward Dick DVM, Dirk M Elston MD, 59th Clinical Research Division, Lackland AFB TX.*

This study was designed to determine if a dose response exists between the amount of Brown Recluse Spider venom (BRSV) and observed coagulation effects in New Zealand white rabbits. Thirty-six rabbits were divided into three groups: a control group (saline injection); a low dose group (4.0µg BRSV); and, a high dose group (10.0µg BRSV). Injections were given intradermally into the skin of the back. Blood samples collected at baseline, 24, 48, and 72 hours were analyzed for CBC, platelets, PT, APTT, fibrinogen, factors II-XII, prekallikrein (PK), HMWK, anti-thrombin, alpha-2 antiplasmin, Protein C (PC), mixing studies, and plasminogen. WBC and platelet counts decreased at 24 hours in BRSV groups (p<0.05). BRSV produced a dose related prolongation of the APTT, elevations of fibrinogen, FV, VII, VIII, IX, X, anti-thrombin, and alpha-2 antiplasmin (p<0.05), and decreased protein C (p<0.05). No significant changes were noted in other parameters. Mixing studies corrected the APTT indicating a factor deficiency even though a deficiency of coagulation factors tested was not evidenced. Further studies should be performed to determine the mechanism associated with prolonged APTT values and BRSV. Further studies should be performed to determine if this rabbit model will apply to the human species.

Evaluating Distance Education in Clinical Laboratory Science

Barbara L Russell EdD MT(ASCP)SH, *Elizabeth Leibach EdD CLS(NCA) MT(ASCP)SBB, Lester Pretlow, PhD CLS(C)(NCA) NRCC(CC), Barbara Kraj MS CLS(NCA), Medical College of Georgia, Augusta GA.*

Little research on distance learning in allied healthcare education has been published, and even fewer studies have compared distance learning students' academic performance to traditional on-campus students in CLS. The purpose of this study was to document and disseminate possible differences in academic performance between distance students and on-campus students in clinical laboratory science (CLS). A quantitative causal comparative research design was used to analyze a total of 155 sets of student data from 133 on-campus and 42 distance students. The analysis revealed that there was no significant difference in the mean final grade point averages (GPAs)and certification scores between the two groups. Sub-categorical certification exam scores revealed that distance students performed significantly better than the on-campus students in only one area, urinalysis. Correlation studies of previous academic performance, final GPA, and certifications scores showed significant positive relationships when distance and on-campus data were combined. The correlations studies performed within the separate groups of distance and on-campus students showed similar results. The findings document the success of a CLS distance program to train entry level scientists.

Novel Hemoglobin Solubility Test Method to Determine Zygosity in Sickle Cell Patients

Tim R Randolph MS CLS(NCA), *Saint Louis University, St. Louis MO.*

The purpose of this study was to develop a testing method based on the hemoglobin solubility test that is rapid, inexpensive, simple, and reliable for use in developing countries to both screen patients for sickle cell and confirm their zygosity. Testing is not available in many underdeveloped countries where the prevalence of sickle cell is high. Confirmatory testing is particularly rare due to methods that are slow, expensive, complex, and require specialized instrumentation. Therefore, patients with sickle cell disease go undiagnosed and untreated and succumb to their disease in early childhood. The new method exploits the differential solubility of HbA and HbS, separating the two by simple filtration allowing for spectrophotometric quantitation of HbA in the filtrate to determine sickle cell zygosity using absorbance measurements. Ninety four EDTA blood samples were tested using the new method and absorbance ranges to determine sickle cell zygosity were established. Absorbance readings of <0.4 suggest homozygous sickle cell disease, 0.4-0.8 suggest heterozygous sickle cell trait, and >0.8 are considered normal. Of the 76 samples with known sickle cell status, 65 of 76 were correctly categorized using the new method (5/7 homozygotes, 12/16 heterozygotes, 48/53 normals). Experiments are ongoing to optimize the new method.

Rabies Transmission via Solid Organ Transplant: A Review

Rodney E Rohde MS SV (ASCP), *Texas State University-San Marcos, San Marcos TX.*

This presentation will review the 2004 transmission of rabies virus from an organ donor to multiple recipients. Four recipients of kidneys, a liver, and an arterial segment from a common organ donor died of encephalitis of an unknown cause. The presenter will use the *New England Journal of Medicine* article depicting this event and his extensive public health background in rabies to illustrate the critical components of this rare human rabies transmission event. Learning objectives for this presentation will be to: (1) describe the progression of events in the recent case history of rabies transmission via solid organ transplant with respect to the original donor and the subsequent four recipients; (2) recognize the risks and possible solutions for the current practices involved with solid organ transplant with respect to rabies donor screening; (3) understand the critical importance of the laboratory with respect to the investigation and positive detection of this event; and (4) recognize the value of a collaborative effort between multiple agencies during this event. It is important for the clinical laboratory scientist and other clinicians to understand the challenges of preventing and detecting transmission of unusual pathogens through transplantation.

Reality Lab: Teaching Students to Detect, Prevent, and Avoid Errors

Barbara G Sawyer PhD CLS(NCA) CLSp(MB), MT(ASCP), *Robert Collins MS CLSp(MB) MT(ASCP), Texas Tech University Health Sciences Center, Lubbock TX.*

Instruction in the provision of a quality laboratory product is a critical component of laboratory science education. This educational aspect has taken on greater importance with the integration of evidence-based laboratory practices in the clinical laboratory. To address this, we provide our students with a lesson in laboratory reality prior to their applied clinical education. The faculty of the TTUHSC CLS program organizes an annual "Mock Lab" that involves set-up of all laboratory sections, including phlebotomy, in our teaching laboratory. Specimen types and specific analyses are selected, requisitions are prepared, samples and "patient" volunteers are located, and students choose a manager and laboratory assignment. Staff members act as physicians calling for results. The critical aspect of the exercise is the inclusion of built-in errors that students must detect and repair, including poorly written requisitions, malfunctioning equipment, inappropriate specimens, and a dysfunctional reporting system. Students must know correct order-of-draw when performing phlebotomy and demonstrate telephone courtesy. Faculty members also serve as laboratory directors, observing and grading the students on their performance, dress, and ability to find and fix errors. Students consistently provide strong positive feedback at the conclusion of their reality laboratory experience.

Results of a Quiz Evaluating Clinical Laboratory Scientists' Knowledge of Statistics

Mary Hotaling MS MT(ASCP) DLM, Stony Brook *University, Stony Brook NY; David Plaut, Plano TX.*

Over a number of years, the authors have presented a number of workshops and courses on quality control, method validation and linearity. Recently wondering whether the correct assumptions were made about participants' baseline knowledge when planning our course material, the authors developed a quiz which was hosted in 2006 at the ASCLS web site. The quiz was completed by nearly 500 clinical laboratory scientists. The quiz consisted of ten multiple choice questions covering analytical errors, CV, SD, correlation, and linear regression. For example, one question was "The CV is a measure of a) accuracy, b) precision, c) correlation, or d) systematic error). Scores ranged from 20% correct to 78% correct. From these data, the authors concluded that there is a gap in both understanding and applying commonly encountered statistics. To increase baseline knowledge, more fundamental material must be provided to students during training and more continuing education be made available to those working in the field. Additionally, a survey question with neither a right nor wrong answer indicated that the majority of laboratorians still adhere to re-running controls if one control exceeds two SD.

CASE STUDY ABSTRACTS

Computerized Case Studies for Competency Assessment

Sandra Latshaw MA MT(ASCP)SM, *University of Nebraska Medical Center, Omaha NE.*

Demonstration of competency is often a challenge for clinical laboratory managers, supervisors, and educators. This challenge is even more overwhelming when the skill to be taught or assessed is not performed at the education or clinical site. Development of computerized case studies is one approach to overcome this problem. Computerized case studies allow the simulation of realistic laboratory scenarios, where patient information and test results are provided for decision-making. Pictures, videos, or other graphics of microscopic slides, media, or biochemical tests can be inserted where appropriate for interpretation. An individual completes the case by answering pre-set questions directly into the computer. Immediate feedback is given in the form of an 'expert opinion'. All user-entered answers can be captured and sent to the instructor or manager to assess knowledge and confirm successful completion of the case. Since these cases are completed independently, they are appropriate for standardized assessment at either distance or on-site locations. Computerized case studies can have a positive impact on workload since they require a minimum of managerial or faculty time. A demonstration of computerized case studies as applied to the teaching of tuberculosis laboratory skills will be provided in this presentation.

Development of anti-D in an Allogeneic Stem Cell Transplant Patient

Linda A Smith PhD CLS(NCA), *The University of Texas Health Science Center, San Antonio TX.*

Patients who undergo intensive chemotherapy for solid tumors may develop post-therapy-related diseases such as leukemia. This case is that of a 61-year-old male who developed chronic myelomonocytic leukemia (CMML) presumably as a result of multiple rounds of chemotherapy for a brain tumor approximately eight years prior. He was aggressively treated with chemotherapy for the CMML and chose to have an allogeneic stem cell transplant. The patient was Group AB, Rh positive. He received an HLA-identically matched (eight antigen) transplant from a relative who was Group A, Rh negative. Post-transplant the patient developed complications including graft-vs-host disease and a relapse of CMML. He subsequently received a second stem cell transplant from the same donor. This transplant was also considered a failure when the patient demonstrated a dual cell population of both Group AB positive and Group A negative cells, with only four percent of the cells representing donor cells (Group A, Rh negative). The donor cells then began producing anti-D in response to the patient's Rho(D) antigen. The patient subsequently developed an additional alloantibody and must receive routine red cell and platelet transfusions to maintain his hemoglobin and platelet count.

Group G *Streptococci* Septic Shock Due to Contaminated Transfused Platelets: A Case Study

Christina Thompson EdD CLS(NCA), *Texas A&M University-Corpus Christi, Corpus Christi TX.*

Despite improved methods for detecting bacterial contamination of blood products, bacterial sepsis remains a significant risk particularly with platelet transfusions. This case describes a 70-year-old male admitted for ischemic changes to the right foot and a diagnostic angiogram. Pre-angiogram, the patient was treated with six units of pooled platelets. Post-operatively the patient developed high fever and chills and was treated with Tylenol and Benadryl. The next day he developed minimal chest congestion so he was transferred to ICU and blood cultures were ordered. He developed shortness of breath, acidosis, and hypotension and was placed on respiratory support. Blood cultures and the platelet pooling set used for transfusion were positive for Group G *Streptococci.* The patient was treated with Vancomycin and Rocephin. During the next two days, the patient developed hypokalemia, hypoglycemia, increased liver enzymes, and increased ammonia with encephalopathy. Four days after surgery, the patient developed DIC. After the family withdrew respiratory support, the patient expired.

Protein S Deficiency Case Study

Katherine Karas MS MT (ASCP), *Volunteer State Community College, Gallatin TN; Beverly Franklin, CLT (NCA), Cookeville Regional Medical Center, Cookeville TN.*

A Caucasian woman with a history of smoking and hormonal birth control was diagnosed, age 22, with thrombophlebitis. Twelve years and two children later, the patient developed a deep vein thrombosis and was placed on coumadin. After a year, the patient sought treatment from a hematologist. Preliminary coagulation tests (aPTT, PT, and INR) fluctuated slightly between high, normal, and low. Tests for thrombotic conditions were ordered (Lupus Anticoagulant, Factor V Leiden, Prothrombin DNA, Antithrombin III, Homocyteine, Anticardiolipin antibody, Protein S and C functional assays, C4BP). Results were normal except Protein S (Functional- 17%, RR 60-145%; Free- 24%, RR 56-124%) and Factor VIII (214%, RR 50-

150%). Protein S testing begins with a clot-based mixing study (patient + Protein S-depleted normal plasma) and confirmed by enzyme immunoassay (total and free Protein S antigen). Protein S stabilizes activated Protein C (APC) which then inactivates factors Va and VIIIa. In this case, decreased Protein S resulted in an accumulation of Factor VIII. Procoagulation and anticoagulation pathways were destabilized by coumadin (it prevents formation of vitamin K-dependent proteins VII, IX, X, and proteins C and S), possibly explaining her fluctuating PT and aPTT. The patient was taken off coumadin and removed other thrombotic risk factors.

The Real Cost of Noncompliance

Cheryl R Caskey MA CLS CLSpIH(NCA), *Omega Diagnostics, L.L.C., Shreveport LA.*

This case will quantify the cost of a procedure breach in dollars and include potential clinical and customer service impact. Associates are expected to be knowledgeable of and compliant with written procedures. A procedure breach such as losing a specimen by inadvertently knocking it into the trash, leaving a specimen in a courier car, or not accounting for all specimens on a specimen manifest can result in high cost to an organization. Worst case scenario would include the salary cost to research the problem, leadership meetings to address procedure loopholes and how to strengthen processes to prevent a recurrence, re-writing procedures, and re-educating all associates. In a 100 FTE laboratory the salary cost alone can be substantial. In addition, there is the impact of delayed results to the physician or client and the potential effect on patient outcomes. If the patient has an untoward event as a result of the delayed results, the legal costs incurred will also be substantial and the potential settlement or award could be significant. Other costs would include the damage or potential damage to the organization reputation and other customer service fallout.

Recurrent Pneumonia with Multiple Pathogens

Linda J Laatsch PhD MT(ASCP)SM, *Dennis C Sobush MA DPT, CCS, Marquette University, Milwaukee WI; Randolph J Lipchik MD, Medical College of Wisconsin, Froedtert Memorial Lutheran Hospital, Milwaukee WI.*

This case study involves a 62-year-old woman with pulmonary fibrosis and bronchiectasis superimposed on idiopathic scoliosis. She has survived 13 confirmed and 16 probable episodes of bacterial pneumonia since being intubated and on long term mechanical ventilation at home for 18 years. All pathogens isolated have been gram negative bacteria, alone or in combination: *Morganella morganii, Moraxella catarrhalis, Pasteurella multocida, Proteus mirabilis, Pseudomonas aeruginosa* (most frequent isolate), and *Stenotrophomonas maltophilia*. On several occasions, two phenotypically distinct strains of *Pseudomonas aeruginosa* were isolated from her sputum. At other times, in the absence of pulmonary infiltrates, she appeared to be colonized with *Pseudomonas aeruginosa*. Treatment of the *Stenotrophomonas* pneumonia was especially difficult due to its extensive antimicrobial resistance. Despite the presence of numerous neutrophils in her sputum direct smears, this patient's peripheral WBC has rarely been elevated. She has experienced bouts of diarrhea associated with antimicrobial use, but stools have consistently been negative for *C. difficile* toxins. Even with multiple hospitalizations and infections, this patient's quality of life and functional status have been preserved, in large part due to early detection of lower respiratory tract infections, promptness in specific treatment intervention, and exceptional patient compliance with prescribed therapies.

POSTER PRESENTATION ABSTRACTS

Anti-G in a Prenatal Patient

Anne Rogers MT (ASCP), Rachel Cunha CLS (NCA), Diane Ragsdale MT (ASCP), Angela Young, MT (ASCP), ***Paula Szuflad MS MT (ASCP) SBB,*** *Newton-Wellesley Hospital, Newton MA.*

A patient pregnant with her second child presented at our hospital for a prenatal visit. Historical records indicated her to be group A, D and weak D negative, antibody screen negative. The ABO and Rh type were confirmed, but the antibody screen was now positive. Initial panel results demonstrated strong anti-C and weak anti-D reactivity. The first child had been typed group A, D and weak D negative. The weak anti-D in the mother's plasma at this time put the D typing results on that cord sample in doubt. The patient had no history of any Rh immune globulin injections. Further testing was performed, which included phenotyping the father, titration studies, and selected cell panels on the maternal plasma. These tests showed that the antibody

initially identified as anti-D was actually anti-G. The patient then received an antenatal Rh immune globulin injection and this passively acquired anti-D complicated subsequent testing. At delivery, a cord blood sample from the second baby typed as group A, D and weak D negative, C positive. The DAT was 2+, and anti-C and anti-G were recovered in the eluate. The baby did not require transfusion and was discharged with a normal bilirubin level.

Crisis in Waiting: Analysis of West Virginia's Clinical Laboratory Workforce

Jean M Chappell MS, *Marshall Community and Technical College, Huntington WV; Sharon Cibrik, West Virginia Office of Laboratory Services, Charleston WV; Terri A Scott, Johns Hopkins Hospital, Baltimore MD; Henry Taylor MD, Johns Hopkins Bloomberg School of Public Health, Baltimore MD.*

In West Virginia the incidence of cardiovascular disease, obesity, and diabetes consistently ranks among the highest in the nation. However, there is a decrease in professionals trained to process the laboratory tests required for diagnosis and treatment of these conditions. A study was undertaken to evaluate the clinical laboratory workforce currently employed throughout the state. A survey was developed in partnership with Marshall Community and Technical College (MCTC), West Virginia Society for Clinical Laboratory Sciences (WVSCLS), West Virginia Office of Laboratory Services (WVOLS), and West Virginia Higher Education Policy Commission (HEPC). Questions included facility demographics, age, wage, licensure status, education level, and position vacancies. Analysis revealed disturbing facts concerning the future of the clinical workforce. Although larger hospitals had the luxury to hire personnel formally trained in NAACLS-accredited institutions, the laboratories in the most rural regions of the state were forced to hire non-CLS graduates. Furthermore, in some areas of West Virginia vacancies in clinical laboratories remained unfilled for over two years despite a competitive compensation package. Most disturbing was the finding that in some of the most rural areas, 75% of the workforce is over 55 years old. Multi-institutional strategies to address these shortages are currently being discussed.

Development and Implementation of Hybrid Education for Clinical Laboratory Science Interns

Karen McRae CLS MT(ASCP), *John Muir Health, Walnut Creek CA; Geraldine M Albee MA CLS (NCA), San Francisco State University, San Francisco CA.*

Changes in the clinical laboratory science (CLS) internship program at San Francisco State University (SFSU) have forced modifications in its curriculum. The time spent on campus for pre-clinical training was shortened to allow for alignment with the university's academic schedule. This challenged the program in continuing the delivery of an adequate foundation for the interns to build upon during clinical training. The use of hybrid education was introduced as a way of maintaining content that might otherwise be omitted. Hybrid education includes the use of online/computer instruction in concert with traditional classroom instruction. The hybrid approach was used to retain and enhance the body fluid analysis instruction, as previous interns had suggested a training disparity regarding this topic during their clinical phase of training. The program was implemented in spring semester, 2006. Evaluations by this cohort of interns indicated the hybrid program was simple to use and helped increase their knowledge and confidence in performing body fluid analysis. The lessons learned through this experience will be utilized during the implementation of hybrid modules that encompass other components of the CLS curriculum.

Ethics In Healthcare – 2007

Jo Anne Koch MS, *Margie Weissgerber MS, Health Central, Ocoee FL; Alicia Zuniga PhD, Barry University Miami Shores FL.*

This study develops a set of questions that address a wide range of bioethical and moral issues related to healthcare. Three cases that focus on the challenge of maintaining scientific integrity; moral values in the study of life sciences; underlying questions and the implications of regulatory norms and laws that apply to science; and objectives, applications, techniques that are allowed under determined circumstances resulting in ethical issues are reviewed: Case one, the hospital charged with dumping a homeless patient; Case two, when life ends and organ donation begins; Case three, research involving human subjects. Understanding moral and ethical considerations is critical. Meeting the psychosocial needs of patients and families, not just the physical need requires a broad theoretical foundation. In conclusion, an understanding of the importance of integrating bioethical issues in healthcare practices (HCP) requires the dissemination of knowledge and policy making in order to ensure safe, effective, efficient, equitable, and patient-centered health care.

Evaluation of Negative Test Results Based on Age and Specimen Type on the Binax NOW® Influenza Test Kits

Anya Sears, MHS CLS(NCA) MT(ASCP), *Stephanie Blackburn MT(ASCP), Lynda A Britton PhD CLS(NCA) MT(ASCP)SM, David Irwin PhD, Louisiana State University Health Sciences Center, Shreveport LA.*

Based on immunity, there are differences in virus titers between specimen source and patient age that affect sensitivity of influenza rapid test kits. We retrospectively compared negative Binax NOW® Influenza test kit results between nasopharyngeal swab or nasopharyngeal aspirate and patient's age with culture. We calculated the negative predictive value (NPV) by comparing test kit to culture results and then used chi-square analysis to directly compare the swab to the aspirate. The chi-square expected value was set at 99% (α=0.05) because the reported NPV for the combination kit versus the individual test kit's NPV is 100%, while the combination kit's reported NPV is 99%. There were no statistically significant differences for influenza A based on either variable between groups or overall. However, there were statistically significant differences between age groups for influenza B, likely due to small sample size, when comparing the swab to the aspirate specimen ($p < 0.05$) and when comparing the swab in the oldest age group ($p < 0.05$). Overall when all groups were combined, there was no statistically significant difference in test kits testing accurately negative results for influenza A and/or B ($p > 0.05$). On the Binax NOW® influenza tests the swab appears adequate in comparison to the aspirate.

Implementation of Six Sigma Statistical Quality Control Design

William C Miller MT(ASCP), *Rogue Valley Medical Center, Medford OR.*

The arbitrary application of the traditional Westgard multirule on large multi-test general chemistry analyzers does not take into account differences in the performance characteristics and quality requirements for each method controlled on the instrument. Some methods are over-controlled, triggering failure when no medically significant error is occurring. Other methods may not be sufficiently controlled to provide adequate error detection when a clinically significant amount of error is present in the method. We used techniques described in *Six Sigma Quality Design and Control* by Dr James Westgard (2006) to calculate a numeric "sigmametric" which grades each method based on total error allowable for the method, and the stable imprecision and inaccuracy of each test at a specific control level. By grouping methods into three categories, high sigmametric methods, moderate sigmametric methods, and low sigmametric methods we were able to identify distinct groups which needed different rule sets and number of controls per 24-hour-run to provide an efficient strategy against over or under controlling methods which are diverse in sigmametric value. Finally, the effect of altering the statistical QC strategy for the general chemistry tests was evaluated using a test yield analysis to track efficiency monthly for each method.

Improving Patient Outcomes through Unit Dedicated Phlebotomists

Luisa M Ruiz CLS(NCA), *Florida Hospital Altamonte, Altamonte Springs FL.*

The purpose of this project was to improve clinical laboratory outcomes in our critical care unit on the following key quality indicators that were consistently not meeting established goals by our medical staff standards: patient identification, blood culture contamination, testing turnaround time, and hemolysis. Over a period of six months, phlebotomists were stationed in the critical care unit 24/7 equipped with supply carts and collection managers (which identified patients through barcoded arm bands). The results of this pilot exceeded expectations. The pilot showed 100% accuracy of patient identification, 0% blood culture contamination rate, significant improvement of turnaround times, and 0% hemolysis. In summary, this pilot showed improvement on the key quality indicators but also on the following: retention of phlebotomy, improved relationships between nursing and laboratory staff, and improved patient satisfaction.

Improving Patient Satisfaction Scores in Outpatient Phlebotomy

Eleonora Powers PBT, *Suzanne Pennell CT (ASCP), Ann Herman MA, Rebecca Cantor MA, Meaghan Vanalstyn PBT, Nancy Gird, Paula Szuflad MS MT SBB, Newton-Wellesley Hospital, Newton MA.*

Patient satisfaction scores in outpatient phlebotomy are routinely measured using a standardized evaluation tool (Press-Ganey™). In August 2006, the score of 87.3% placed our department in the thirtieth percentile. Several initiatives were subsequently enacted in an effort to increase patient satisfaction and achieve a score of 90%. These initiatives included: introduction of the bruise card which explained what a bruise is and how to treat it; thank you cards for selecting

the hospital as a care provider; service recovery coupons for extended waiting periods; and scripting to ensure that all key elements of the encounter were met. Phlebotomy staff received specialized education in pediatric phlebotomy techniques. Patient education materials explaining the basic components of phlebotomy and blood tests in general were placed in the waiting areas. Regular staff meetings were held to explain the various initiatives and training was provided as necessary. Patient satisfaction scores were posted so that staff could track any progress. As a result of these initiatives, the patient satisfaction score achieved for early January 2007 was 94.2%, which placed the department in the 95% percentile.

Making Use of Intranet Tools to Improve Procedure Manual Use and Maintenance

Leslie Kay Smith MT(ASCP), *Intermountain Laboratory Services, Intermountain Healthcare, Murray UT.*

The purpose of this project was to: 1) improve access to laboratory procedures, and 2) allow immediate and consistent updating of procedure manuals at the workbench.

The source for consistent procedure information for quality laboratory service is an accurate and complete procedure manual. We have developed an online system-wide standard procedure manual to overcome the difficulties of access and consistency within our laboratory system.

Improved access to laboratory procedures is facilitated by:

- procedure manuals on the computer terminals already being used.
- a menu structure that allows access to procedures specific for facility and department.
- a search function that allows a search of the system for key words.

Immediate and consistent updating of procedure manuals is possible through:

- electronic signatures by delegated pathologists on electronic procedures.
- security protection through ADMIN functions within the system.
- a web-based tool for SOP manual organization, assignment of effective dates, review of procedure distribution, and research of some procedure history.
- the ability to download a "backup" copy of the procedure manual to PC desktops to ensure SOP access during computer downtimes.
- currently document control is handled by other means.

A Micro-level Approach to Identifying Retention Issues

Wanda H Burrell MSPH MT (ASCP), *Layla Bonner, Iris Johnson, Dhiren Chatterji, Rosalyn Word, Stephen Carey, Tennessee State University, Nashville TN.*

The purpose of this study was to look at student satisfaction with a number of areas and program completion rates. This information will serve as indicators of what might contribute to attrition if students are not satisfied. The dean of the College of Health Sciences (COHS), asked to identify and discuss potential issues related to student satisfaction and attrition, assembled an ad hoc Retention Task Force Committee to conduct a "micro-level" study. The committee developed and disseminated a survey to gain a student perspective on issues of concern.

Data were collected from undergraduate and graduate students in physical therapy, health information management, speech language pathology, dental hygiene, cardio respiratory care, occupational therapy and medical technology, and the orientation class of the college. The students completed a survey designed to measure their perception on several facets and entities crucial to successful academic achievement and "university life". Results from 25 questions related to academics, admissions, advisement, financial aid, registration, and safety will be presented.

Data indicate that students in COHS exhibit varying levels of satisfaction in all areas surveyed. Academically, 68% felt confident that they would be prepared for life after graduate school and 67% report being challenged and satisfied with courses in their COHS major.

Multiplexed Measurement of ANAs in Sera from Lupus Patients

Barbara A MacKenzie, *Raymond E Biagnini PhD, Christine G Parks PhD, Jerome P Smith PhD, Deborah L Sammons, Shirley A Robertson, Belinda C Johnson, Christine A Toennis, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati OH.*

The purpose of this study was to evaluate the precision and accuracy of a commercial multiplexed kit (AtheNA) for the measurement of nine anti-nuclear antibodies (ANAs; anti-SS/A, anti-SS/B, anti-Sm, anti-RNP, anti-Jo-1, anti-Scl-70, anti-dsDNA, anti-Centromere B, and anti-Histone) and compare these results to a subset of ANAs measured by enzyme-linked immunosorbent assays (ELISA). Sera were

obtained from 22 systemic lupus erythematosus (SLE) patients, 12 controls, and 5 others (commercial source) with various autoimmune diseases. The AtheNA inter-assay coefficients of variation (CVs, N = 39, performed in duplicate; replicated 3X) ranged from 6.2% – 16.7% (mean = 9.8%) while the intra-assay CVs ranged from 5.8% – 14.3% (mean = 10.8%). There was significant agreement (p-values ranging from 0.0001 to 0.03) when analytes co-analyzed by AtheNA and ELISA were evaluated using Cohen's kappa (K values ranging from 0.376 to 1.000). No false positive ANA results were observed for either the control or commercial source autoimmune disease sera. These results indicate the AtheNA assay is a precise and accurate alternative to performing multiple ELISAs for the diagnosis of autoimmune diseases and that the AtheNA assay may identify positive ANA specificities which are missed by ELISA techniques.

The findings in this abstract have not been formally disseminated by NIOSH and should not be construed to represent any agency determination or policy.

Procedures 101: Less is Best

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The UIHC Clinical Pathology Laboratories implemented the Quality System Essentials with the development of an Error Management System (EMS). Analysis of the EMS data identified the laboratory's written procedures as a potential source of laboratory error. Characteristics of the procedures that contributed to the errors included: lengthy procedures with large blocks of text; information missing or not in the best location; poor readability caused by formatting. Through a brainstorming session, the management team determined the "best" intervention was to hire a consultant to teach technical writing to laboratorians. A local resource, Kirkwood Community College, was awarded the contract to provide 24 contact hours for 15 staff members. Learning activities included teaching the fundamentals of technical writing followed by the application of these skills on existing laboratory procedures. Key points learned were that procedures should: be written for the people using them; include only necessary information; use active voice and imperative commands; effectively make use of white space; use pictures and icons when helpful. Additionally, CLSI GP2-A5 for procedure writing allows the user to apply these key points in a more concise format. The course evaluation received outstanding marks. Staff immediately found it easier and faster to write and revise procedures.

Proficiency Test Performance and Personnel Credentials

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The role of competent personnel in the increasingly complex and diverse laboratory is a significant concern. This was a retrospective study of existing proficiency testing (PT) results (2002 & 2003) to determine the relationship of PT performance to the credentials of the testing personnel. Predictor variables included the practitioner's major area of study, degree certification, and years of laboratory experience. There were 14,326 valid PT results and 359 practitioners in the study of which 245 (68.2%) had a clinical laboratory major. Those with a clinical laboratory major produced a statistically significant increase in percentage (chi square = 11.348, p <0.05) of acceptable results when compared to those individuals without a clinical laboratory major. Further, those without a clinical laboratory major were almost twice as likely (exponential beta = 1.849) to produce an unacceptable result when compared to those individuals with a clinical laboratory major. These data suggest that the profession will be negatively impacted by declining numbers of graduates from clinical laboratory programs.

Scoping Out Clinical Laboratory Career Opportunities

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Background: Staffing Mayo hematopathology laboratories with qualified personnel has become increasingly difficult due to the nation-wide shortage of clinical laboratory scientists (CLS). While BS biology degree employees can be trained to perform laboratory tests, limited background in hematology concepts, morphology, and clinical correlation prevents complete understanding of testing responsibilities. Training takes longer as they lack theoretical education and clinical internship experience. **Methods:** Mayo Clinic, in collaboration with the University of North Dakota (UND), developed a unique program for individuals with BS degrees in biology. This 16 week program provided a blended model of didactic courses combined with on-the-job training and laboratory experience resulting in national board hematology

categorical certification eligibility. The program was piloted by two Mayo employees with BS degrees in biology. **Results:** Four hours each day were spent studying "didactic" UND distance education courses and four hours were engaged in laboratory application. Both employees completed the 16 week program by passing coursework requirements, gained necessary knowledge and skills to perform essential hematology laboratory functions, and passed the National Credentialing Agency (NCA) CLS Hematology Categorical Examination. **Conclusion:** This collaborative program provides hematopathology laboratories an alternative pathway to produce certified employees to help meet the shortage