The Veterans Affairs (VA) is one of the first health care systems to recognize the need to develop multicentered clinical trials to evaluate therapeutic effectiveness independent of pharmacological support. The VA Cooperative Studies Program has been highly successful and has produced some of the sentinel findings that have altered clinical practice worldwide. Our department and greater UNMC have been involved in multiple VA cooperative studies which have given both the VA and UNMC national recognition. Our department was previously the organizational center for a large co-op study evaluating the usefulness of tight glucose control in type-2 diabetics. Currently, Internal Medicine and other departments are involved in active studies that should guide the delivery of health care across the nation.

James O’Dell, MD, professor and chief of the Rheumatology and Immunology Division, chairs the multicenter study, Rheumatoid Arthritis: Comparison of Active Therapies in Patients with Active Disease Despite Methotrexate Therapy (RACAT). Dr. O’Dell designed this first-of-its-kind study comparing the cost effectiveness of two commonly prescribed drug regimens, one combination costs approximately 15 times less than another combination including etanercept, a costly biologic. This $14 million VA Cooperative Study Program (CSP) project includes 15 VA sites, 10 sites in Canada and 10 sites in the Rheumatoid Arthritis Investigative Network (RAIN). The study began enrolling patient in July 2007 and currently has 265 patients enrolled with a target enrollment of 600 patients. The trial is planned to continue to April 2011. The results of this study could save patients and the government millions of dollars each year.

Kenneth Follett, MD, PhD, professor of Neurosurgery at UNMC, co-chaired a CSP project that included 255 Parkinson’s patients from seven VA sites and six university hospitals. The study
From the Chair

The Department of Internal Medicine continues to be involved in cutting-edge activity and programs that will significantly change how medicine is practiced both in Nebraska and across the nation in the future. As illustrated in this newsletter, our participation in VA cooperative trials has in the past and continues to bring national recognition to us as we evaluate therapies that will result in the best outcomes for our patients. The RACAT study, initiated by Dr. James O’Dell, is a sentinel study that might well radically change the way rheumatoid arthritis patients are treated. Our continued contributions to other ongoing studies - evaluating renal disease and diabetes and the appropriate therapy for prostate cancer - provide us with important interactions at the national level and offer state-of-the-art therapies today for our patients both at UNMC and at the VA.

Another of our ground-breaking activities is the innovative, new Physician Hand-Off Tool developed by our Chief Resident Matt Lunning, M.D., in close collaboration with David Gannon, M.D., which will be used to transfer patient care when health care providers change within our system. This will allow us to provide effective longitudinal care for patients in the hospital in an economic manner. This project was successful through assembly of a group of individuals - including Chad Vokoun, M.D., and Tom Tape, M.D. - who each brought a necessary component of expertise to the team to allow the successful completion of this product. This product will now be used by the Department on a daily basis, as we deliver care to our patients.

I call your attention to our feature on molecular genetics and its future role in delivery of more personalized care to our patients. The Department has realized the importance of this approach in understanding disease epidemiology, pathophysiology and therapeutic responses by developing our own core faculty for mutation and methylation analysis. The interactive nature of this facility brings MDs and PhDs, as well as researchers in multiple medical subspecialties, together to better understand how we can utilize genetic polymorphisms to better take care of our patients.

This newsletter illustrates the multiple ways in which the Department is taking innovative approaches to enhance the health and treatment of our patients. I am delighted that the Department uses a wide variety of tools – cooperative studies, electronic sign-out tools, molecular genetics - to directly enhance the care of our patients.

Lynell Klassen, MD
Chair, Department of Internal Medicine
Internal Medicine Leads the Way to Electronic Sign Out

Just a week after arriving at the UNMC in July, Dr. David Gannon of the Pulmonary, Critical Care, Sleep and Allergy (PCCSA) Medicine Division and Dr. Steven Smith, chief medical officer of The Nebraska Medical Center, discussed what it might take to implement an electronic sign-out tool.

Dr. Gannon previously implemented a time-saving sign-out tool at the Maine Medical Center in Portland, where he was the director of the Internal Medicine Residency Program. The tool worked with the hospital’s electronic medical record system, which is similar to our Centricity Enterprise system.

When residents end their hospital shifts, they “sign out.” The incoming residents need to be informed about what took place with the patients during the prior shift and about issues they need to resolve. This was previously done by paper notes and face-to-face, which was not always efficient and can produce varying quality. “This has been a long-standing problem at most hospitals,” Dr. Gannon said.

Physician Hand-Off Tool
Improves Physician Workflow

- Consolidates hospital-stay information
- Information entry and viewing from any computer with Centricity access
- Viewed available to anyone with Centricity access and involved in that aspect of the patient’s care
- Contains high-yield information
  - who is managing care, contact information
  - why patient is in the hospital
  - medications
  - allergies
  - most recent lab results
- Information can be built upon over the course of a hospital stay
- Entries are more likely to be made closer to time of an occurrence
- Helps eliminate duplicate work
- Provides synopsis of patient’s problems and hospital course to consultants
- Replaces the sign-out lists, and helps create transfer notes, off-service notes and discharge summaries

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Soon after the initial meeting with Dr. Smith, a group of interested parties was formed that included Dr. Gannon; Dr. Tom Tape, chief of the General Internal Medicine Division; Dr. Matt Lunning, chief resident, Department of Internal Medicine; and Dr. Chad Vokoun, General Internal Medicine Division. In order to create a useful tool within Centricity, a free text field was needed. Dr. Tape remembered a potential field that might work, one of the few places in the system that allowed free text entry.

Dr. Lunning recruited the help of Katie Sorrentino, IT system consultant. Together, Lunning and Sorrentino quickly mapped out and implemented a physician overview screen that could contain high-yield information regarding a patient’s hospital stay. The draft tool was tested by the Critical Care team in August and was so well received, it was rolled out to the rest of Internal Medicine in September. Dr. Gannon said he has the highest parise for Lunning and how he spearheaded the project and got this accomplished in such a short time.

Drs. Gannon, Lunning and Vokoun have presented information about the tool to the Graduate Medical Education Committee, at Dr. Smith’s request. Smith would like to see everyone in the hospital be able to utilize the tool. The information is now being presented to other departments, and training sessions for their residents are being scheduled.

Dr. Vokoun has also been a avid supporter of the system, Dr. Gannon said. Vokoun recognized how useful this tool could be for creating discharge summaries. The process of creating the summary might have previously taken up to 45 minutes. The discharge summary is required at the time a patient is discharged from the hospital, but sometimes when residents are on busy services, they may not get to the summary until the end of their rotation.

Because the tool can be used to create a summary of the patient’s hospital course, residents are able create the discharge summary by simply dictating right from the physician overview screen, which takes about five or ten minutes. Residents are being trained to input information in a consistent manner, Dr. Lunning said. This should not only shorten the time it takes to get the summaries in the hands of the primary care physicians, but also make the coding compilation easier as well.

The tool has recently been named the Physician Hand-Off Tool.
SNP Genotyping: Technologies That Keyed a Revolution in Medicine

By Tricia LeVan, PhD

To realize the promise of genetics in research and medical practice, the Department of Internal Medicine established the CORE “Facility for Mutation and Methylation Analysis.” I direct the facility located in the Durham Research Center II to provide services for detection of SNPs (Single Nucleotide Polymorphisms) using a candidate gene approach. Millions of human SNPs have been discovered in recent years — over 6 million from The International HapMap Project alone in its first three years. SNPs are the most common form of genetic variation between individuals and occur once every 1,000 bases or so. This new post-genomic era provides excellent opportunities to identify genes and genetic changes that will increase our understanding of how such changes cause disease. In the clinical arena, it is becoming possible to utilize the emerging genetic and genomic knowledge to diagnose and treat patients, the path towards personalized medicine. The knowledge of the genetic basis of human disease is also ushering a new era in drug development that is focused on targeted drug development and correlating individuals with their response to specific drugs.

Dr. Ted Mikuls, rheumatologist, leads an investigative team (Karen Gould Fang Yu and Tricia Levan) studying the effects of polymorphisms in four drug metabolizing genes (GSTM1, NAT1, NAT2 and EPHX) on rheumatoid arthritis. We found there was a gene by environment interaction of the GSTM1-null genotype, HLA-DRB1 shared epitope and smoking in the pathogenesis of anti-citrullinated protein antibody positive rheumatoid arthritis. A recently-funded grant (PI: Dr. Mikuls; co-Investigator: Dr. LeVan) will investigate the impact of genetic variation in CD14 and Toll-like receptor pathways in rheumatoid arthritis. This grant proposes to determine if variation in these genes will mediate the detrimental effect of tobacco exposure on rheumatoid-specific autoantibody production, disease severity, prevalence of extra-articular disease and pulmonary symptoms.

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aimed to determine if electrical stimulation of the brain, although riskier, might hold significant benefits for those who no longer respond well to medication alone. The results of the six-year-long trial, the largest of its kind at the time, appeared in the Jan. 7, 2009, Journal of the American Medical Association.

The RACAT study and the deep-brain stimulation study are good examples of how powerful the VA Cooperative Study Program can be. The program was initiated in the 1940s when thousands of veterans suffered from tuberculosis, and researchers enrolled them in VA studies to evaluate drug therapies. With approximately 120 VA facilities across the U.S., the size and scope of the Veterans Health Administration makes it an exceptional arena for conducting large-scale clinical trials. Investigators with at least a five-eighths VA appointment may seek this funding.

The CSP is made up of five coordinating centers, a clinical research pharmacy, four epidemiological research and information centers, and a health economics resource center. The Program allows flexible proposal development with an extensive matrix of support ranging from biostatisticians to programmers to pharmacists. Participation in these multifacility trials can yield far better results than those achieved from a single site.

Nancy Egr, RN, BSN, MA, CCM, administrator/manager of the Omaha VA Clinical Research Unit (CRU), said research is a strong component of the overall VA mission and agrees that the VA is an excellent place to conduct trials, because they have such a good subject base. Although VAs are seeing fewer World War II veterans, they do have a large elderly population with multiple health problems. VAs are now also seeing younger veterans including more women.

Egr also reminds anyone interested in participating in CSP trials of one thing the government is good at, collecting data. Investigators not only have exposure to a large patient population with more severe problems, but to the multiple databases available through the VA health system.

The VA CRU was created in 2006 especially for conducting clinical trials. The CRU has six exam rooms with computers and access to VA electronic records in all rooms, space for coordinators on a rotating basis, a supply/storage room, a break/meeting room and a patient waiting room. Protocols must be approved by the VA IRB, but Egr says she does not believe the process is much different than at any other facility conducting clinical trials. Questions about the CRU can be sent to Egr at nancy.egr@va.gov, or she may be contacted by phone at 402-995-4356.

Announcements for ongoing studies are posted on the VA web site. Frequently, there are also seminars and other how-to information posted on the web site. Patients interested in participating in studies can also look at the web site to see what is available in their area. Go to www.hsrdrresearch.va.gov to obtain more information.
Dr. Kathleen Grant, MD, a specialist in addiction medicine, studies the risk and protective factors for methamphetamine dependence. Recently, we have incorporated a genetic element into this study and are collecting DNA samples to generate preliminary data for a R21 application titled “Genetic Basis of Methamphetamine-Induced Psychosis”.

In yet another clinical arena, COPD and agriculture exposure, Drs. Susanna von Essen and Debra Romberger, pulmonologists, and I have collaborated since 2001 in a research effort focused on polymorphisms in the CD14 gene and lung function. We found that polymorphisms in the CD14 gene were associated with pulmonary function in farmers. This study formed the basis of a much larger, funded genetic investigation establishing an agricultural cohort with COPD at the Omaha VAMC. This study clearly is relevant to Nebraska because agriculture is vital to the economy of Nebraska and is a risk factor for COPD.

In summary, genetic profiling in candidate genes and the subsequent association with disease is a powerful tool in understanding disease susceptibility, which can be applied to all areas of clinical studies.

These services are available for academic researchers worldwide. The laboratory operates a Sequenom iPLEX system based on MALDI-TOF mass spectrometry.

For additional information or questions call Dr. LeVan at (402) 559–3985.

**Faculty Hires**

Kiran Gangahar, MD
Assistant Professor, Cardiology
Start Date: 1/1/2010

Dr. Gangahar is a graduate of UNMC. She completed a Cardiology Fellowship at Creighton and a Nuclear Cardiology Fellowship at the University of Virginia.

Dr. Gangahar will see patients at Clarkson West on Monday, Wednesday and Friday. Her interests are in cardiac imaging.

Robert Boissy, PhD
Assistant Professor, Administration
Start Date: 1/4/2010

Dr. Boissy received a PhD in Biochemistry and Molecular Biology from the University of British Columbia in Vancouver, Canada. He comes to UNMC after being assistant professor and Director of Bioinformatics at the Center for Genomic Sciences, Allegheny -Singer Research Institute, Allegheny General Hospital, Pittsburgh, Pa.

Dr. Boissy will support the bioinformatics initiative on campus

**Separations**

Vinaya Rao, MD
Nephrology
1/10/2010

**Reminder**

Summer Undergraduate Research Program (SURP)
Applications are due March 1, 2010 available at www.unmc.edu/summerresearch

Deadline for Faculty to request a SURP student February 1, 2010
Honors, Awards and Recognition

James Armitage, MD, professor, Oncology/Hematology Division, received the Laureate Award at the Nebraska Chapter of the American College of Physicians Annual Meeting held in the fall of 2009.

Marcel Devetten, MD, adjunct associate professor, Oncology/Hematology Division, was included in a feature on the local news Channel 7 KETV on Jan. 10. Dr. Devetten is the physician caring for leukemia transplant recipient, Doug Taylor. Taylor was about six months post transplant when the story aired.

David O’Dell, MD, professor, General Internal Medicine Division, received the LeeRoy Meyer Dedicated Teacher Award at the fall Nebraska Chapter of the American College of Physicians Annual Meeting.

James O’Dell, MD, professor and chief, Rheumatology/Immunology Division, was appointed secretary of the American College of Rheumatology at the group’s Annual Scientific Meeting in October. The ACR is the largest professional organization of physicians, scientists and health professionals devoted to the study and treatment of rheumatic diseases. The Annual Scientific Meeting is attended by thousands of rheumatologists and arthritis health professionals from around the world.

Jane Potter, MD, professor and chief, Geriatrics and Gerontology Division, assumed the presidency of the National Association of Geriatric Education in November. NAGE provides guidance to U.S. public health services and other organizations in development of programs to enhance the education of health care providers and others regarding geriatric care.

Jason Shiffermiller, MD, MPH, recently received his Masters in Public Health degree from Harvard School of Public Health. The three-year, summer-only program had an emphasis in quantitative methods mainly epidemiology and biostatistics. Shiffermiller will use the degree for inpatient and perioperative outcomes research, of which several projects are already underway in the Division of General Internal Medicine.
Honors, Awards and Recognition (continued)

Susan Swindells, MBBS, professor, Infectious Diseases Division, was selected to serve on the NIH National Institute of Allergy and Infectious Diseases Research Advisory Committee through October 31, 2013. The Committee advises the director on issues regarding HIV/AIDS biomedical research.

Julie Vose, MD, professor and chief, Oncology/Hematology Division, was elected to the Board of Directors of the American Society of Clinical Oncology. ASCO sets the standards for patient care in cancer worldwide, as well as research to improve prevention, diagnosis and the treatment of cancer. Dr. Vose will begin a four-year term on the Board in June.

Clinical Translational Research Mentored Scholars Program

The deadline to apply for the fourth cohort of K12 Scholars - The Clinical Translational Research Mentored Scholars Program is on April 30, 2010.

This is a program open to any junior faculty who are interested in formal mentored training in clinical or translational research.

For more information, you can contact Fausto R. Loberiza Jr., MD, MS, program director, at 402-559-5166 or at floberiza@unmc.edu. Or by looking under the Research Education tab on the web site at www.ctsa.unmc.edu.

Four of the 14 current participants are from the Department of Internal Medicine

Apar Ganti, MD, assistant professor, Oncology/Hematology Division, and Deborah Darrington, MD, assistant professor, Oncology/Hematology Division, are from the first cohort. Their expected graduation is in 2010.

Troy Plumb, MD, associate professor, Nephrology Division, and Amy Cannella, assistant professor, Rheumatology/Immunology Division, are in the third cohort and have an anticipated 2012 graduation date.
New Grant Awards

#2161 (Other-Extramural; National Marrow Donor Program; PI is Vose) Initial systemic treatment of acute GVHD: A phase II randomized trial evaluating Etanercept, Mycophenolate Mofetil (MMF), Denileukin Diftitox (Ontak), and Pentostatin in combination with corticosteroids (supplement to #1506). 12/18/2009-12/17/2010 (Year 1) Direct Costs: $16,350.

#2218 (Industry; Novartis Pharmaceuticals, Inc.; PI is Dumitru) A Multicenter, Randomized, Double-Blind, Parallel Group, Active-Controlled Study to Evaluate the Efficacy and Safety of Both Aliskiren Monotherapy and Aliskiren/Enalapril Combination Therapy Compared to Enalapril Monotherapy, on Morbidity and Mortality in Patients with Chronic Heart Failure. 10/1/2009-9/30/2010 (Year 1) Direct Costs: $140,306.

#2224 (Industry; Vertex Pharmaceuticals Inc.; PI is Murphy) A Study of VX-770 in Children with Cystic Fibrosis. 10/15/2009-10/14/2010 (Year 1) Direct Costs: $44,907.

#2225 (Industry; Nabi Biopharmaceuticals; PI is Rennard) A Phase 3, Multi-Center, Randomized, Double-Blind, Placebo-Controlled Study of Access Efficacy, Immunogenicity and Safety of 3’AminomethylNicotine-P. Aeruginosa R-Exoprotein A Conjugate Vaccine (NicVAX) as an Aid to Smoking Cessation. 10/19/2009-10/18/2010 (Year 1) Direct Costs: $164,176.


#2231 (Industry; Celgene Corporation; PI is Vose) Phase I/II Study of Lenalidomide Maintenance Following BEAM (+/-Rituximab) for Chemo-Resistant or High Risk Non-Hodgkin’s Lymphoma. 11/12/2009-11/11/2010 (Year 1) Direct Costs: $175,333.


NIH Sub-Contracted

#1890 (Southampton General Hospital; PI is Rennard) A Proteomics Approach in the Study of Novel COPD Markers - Subcontract with Southampton General Hospital. 12/1/2009-11/30/2010 (Year 2) Direct Costs: $15,942.

#2043 (University of Massachusetts; PI is Thiele) Mechanisms of Alcohol-Mediated Organ and Tissue Damage. 12/1/2009-11/30/2010 (Year 3) Direct Costs: $20,000.

#1614 (Univ of South Florida; PI is Lane) Natural history study of the development of type I diabetes. 11/1/2009-10/31/2010 (Year 5) Direct Costs: $9,372.

Omaha VAMC

#1823 (VA; VA-Merit Review; PI is Kharbanda) Alcoholic liver injury: treatment by betaine. 10/1/2009-9/30/2010
Internal Medicine Grant Activity—4th Quarter 2009 — continued


#1671 (PI is Wyatt) Protein kinase C regulation of airway epithelial cell ciliary decreases. 10/1/2009-9/30/2010 (Year 4) Direct Costs: $42,875.

Other Extramural

#1809 (National Marrow Donor Program; PI is Vose) Phase III Rituxan/BEAM vs Bexar/BEAM with autologous hematopoietic stem cell transplantation for persistent or relapsed chemotherapy sensitive diffuse large b-cell NHL. 11/15/2009-6/30/2010 (Year 4) Direct Costs: $.

#2110 (NE DHHS; PI is Swindells) HOPWA Mental Health/Substance Abuse Service for Ryan White Criteria. 11/1/2009-6/30/2010 (Year 2) Direct Costs: $.


Industry Grant Awards

#897 (Lilly Research Laboratories; PI is Larsen) The global hypopituitary control and complications study (HypoCCs). 10/1/2009-9/30/2010 (Year 8) Direct Costs: $.

#1723 (GlaxoSmithKline; PI is Rennard) Laboratory testing services related to clinical study SCO104960. 11/14/2009-11/13/2010 (Year 4) Direct Costs: $55,058.

#1264 (Genentech, Inc.; PI is Vose) Microarray analysis of patients with diffuse large B-cell lymphoma treated with-


#1757 (Centocor, Inc.; PI is Rennard) A multicenter, observational study of the long term safety of Infliximab (Remicade) in subjects with moderate to severe chronic obstructive pulmonary disease (COPD): Results COPD: Remicade safety under long term study in COPD. 10/25/2009 -10/24/2010 (Year 4) Direct Costs: $.

#1519 (Ovation Health Care Research/Centocor; PI is Young) Crohn’s Therapy Resources Evaluation & Assessment Tool (TREAT) Registry. 12/2/2009-12/1/2010 (Year 6) Direct Costs: $.

#2081 (Abbott Labs; PI is Young) A 5-year registry study of Humira (Adalimumab) in subjects with moderately to severely active Chron’s disease. 10/13/2009-12/12/2010 (Year 2) Direct Costs: $15,071.

#2055 (Celgene Corporation; PI is Vose) CC5013-NHL-002: A multicenter, single-arm, open-label study to evaluate the safety and efficacy of single-agent Lenalidomide (Revlimid. CC-5013) in subjects with relapsed or refractory indolent NHL. 12/23/2009-12/31/2009 (Year 5) Direct Costs: $.

#2127 (Bayer Corporation; PI is Hauke) Phase II Dose Escalation Study of Sorafenib in Patients with Metastatic Renal Cell Carcinoma (supplement to #1836). 10/1/2009-4/15/2010 (Year 2) Direct Costs: $.


#1836 (Bayer Corporation; PI is Hauke) Phase II Dose Escalation Study of Sorafenib in Patients with Metastatic Renal Cell Carcinoma. 11/8/2009-11/7/2010 (Year 4) Direct Costs: $.
#2182 (Industry; GlaxoSmithKline; PI is Vose) An Open-Label, Single-Arm, Multi-Center Phase 2 Trial with Ofatumumab in Patients with Relapsed Diffuse Large B-Cell Lymphoma (DLBCL) Ineligible for Transplant or Relapsed after Autologous Transplant. 11/17/2009-11/16/2010 (Year 2) Direct Costs: $.


#1112 (Industry; Celgene Corporation; PI is Maness-Harris) A multicenter, single-arm, open-label study of the efficacy and safety of CC-5013 monotherapy in RBC transfusion-dependent subjects with myelodysplastic syndromes associated with the Del (5g) cytogenetic abnormality. 12/1/2009-11/30/2009 (Year 6) Direct Costs: $.

#1325 (Industry; Corixa Corporation; PI is Vose) A multicenter study to examine the pharmacokinetics, whole body and organ dosimetry, and biodistribution of fusion-delivered Iodine I 131 Tositumomab for patients with previously untreated or relapsed follicular or transformed follicular non-Hodgkin’s lymphoma. 11/23/2009-9/30/2010 (Year 6) Direct Costs: $.


#1978 (Industry; Allos Therapeutics, Inc.; PI is Vose) A Phase 1/2a Open-label Study of Sequential Pralatrexate and Gemcitabine with Vitamin B12 and Folic Acid Supplementation in Patients with Relapsed or Refractory Lymphoproliferative Malignancies. 11/1/2009-9/30/2010 (Year 3) Direct Costs: $.

#1795 (Industry; Enzon Pharmaceuticals, Inc.; PI is Freifeld) A multicenter, open-label, randomized, phase 1B study evaluating the safety and tolerability of intravenous recombinant human mannose-binding lectin (rhMBL) in liver transplant recipients. 12/1/2009-6/30/2010 (Year 4) Direct Costs: $.

#1551 (Industry; Pfizer, Inc.; PI is Kessinger) A SU011248 treatment protocol for patients with cytokine-refractory metastatic, renal cell carcinoma who are ineligible for participation in other SU011248 protocols and may derive benefit for treatment with SU011248. 11/15/2009-9/30/2010 (Year 5) Direct Costs: $.


19874565 Freifeld AG, Meza J, Schweitzer B, Shafer L, Kalil AC, Sambol AR. Seroprevalence of West Nile virus infection in solid organ transplant recipients. Transplant infectious disease : an official journal of the Transplantation Society, 2009


19863189 Gaikwad NW, Yang L, Weisenburger DD, Vose J, Beseler C, Rogan EG, Cavaliere EL. Urinary biomarkers suggest that estrogen-DNA adducts may play a


20026058 Osna NA, White RL, Donohue TM, Beard M, Tuma DJ, Kharbanda KK. Impaired methylation as a novel mechanism for proteasome suppression in liver cells. Biochemical and biophysical research communications, 2009


The size and scope of the Veterans Health Administration makes it an exceptional arena for conducting large-scale clinical trials.

Because the tool can be used to create a summary of the patient’s hospital course, residents are able to create the discharge summary by simply dictating right from the physician overview screen, which takes about five or ten minutes.

In the clinical arena, it is becoming possible to utilize the emerging genetic and genomic knowledge to diagnose and treat patients, the path towards personalized medicine.