In the age of precision medicine, research is a team sport, and Vanderbilt Heart and Vascular Institute (VHVI) faculty continue to play a prominent role. The recognition that each person’s unique genetic makeup influences the development of disease and response to therapy has opened the possibility that treatments can be tailored in a way that maximizes benefit and minimizes harm for specific patients. Because important genetic variants can be rare or cause subtle effects, few individual centers have sufficient numbers of subjects to explore relationships between genetic variation and drug response. The scope and complexity of modern genomic research necessitates large, multi-institutional collaborations dedicated to making precision medicine a reality.

Vanderbilt University Medical Center researchers are now participating in two large national networks to better understand how patients respond to drugs and how that information can be incorporated into medical care. These initiatives are led by Dan Roden, M.D., an electrophysiologist specializing in genetic diseases and Assistant Vice Chancellor for Personalized Medicine. Dr. Roden is also a member of the National Human Genome Research Institute’s Advisory Council. Josh Denny, M.D., M.S., Associate Professor of Biomedical Informatics and Medicine (and member of the advisory group for the NIH’s Precision Medicine Initiative) and Elizabeth Phillips, M.D., Professor of Medicine, are also spearheading components of this comprehensive program.

Vanderbilt is one of only three organizations nationwide to receive a “P50” grant from the NIH. The grant supports the vision of the NIH Pharmacogenomics Research Network (PGRN), and provides nearly $13 million over five years for the creation of specialized research centers for pharmacogenomics and personalized medicine. These centers of discovery are intended to comprehensively investigate mechanistic questions about drug responses. Vanderbilt’s multidisciplinary team, led by Roden, Denny and Phillips, will use a variety of techniques including stem cells, cellular immunology and immunogenetics, and large-scale data mining in electronic health record (EHR) data to explore inter-individual variation in drug response and toxicity. The program also includes outreach activities to enhance public understanding of pharmacogenomics.

Roden and Denny also lead Vanderbilt’s participation in the Electronic Medical Records and Genomics (eMERGE) network, a national collaboration supported by the National Human Genome Research Institute, part of the NIH. Participating institutions link large DNA biorepositories, such as Vanderbilt’s BioVU DNA bank, and EHR data to conduct large-scale genetic studies. The current focus of the eMERGE network is to understand the clinical impact of genetic variation in approximately 100 medically-relevant genes. Further, eMERGE investigators are developing protocols to return genetic information to patients and clinicians and to develop best practices for decision support. The network will also address cost-effectiveness, and important issues related to the ethical, legal, and social implications of incorporating genetic information into the medical record.

Providing personalized care requires an integrated, patient-centered medical system, and Vanderbilt is part of two large
collaborative efforts to improve health care delivery. The Mid-South Clinical Data Research Network (CDRN), led by Vanderbilt investigators, is linking sites of health care delivery across the Southeast USA to create a large research network to support pragmatic trials and comparative effectiveness research. The CDRN was established in 2014 by a grant from the Patient-Centered Outcomes Research Institute (PCORI), and was one of only 11 centers selected during the first round of funding.

The CDRN includes sites from the Vanderbilt Health Affiliated Network (VHAN), which includes more than 45 community hospitals and 350 practices in the Mid-South region, Greenway Health, with access to 1,600 clinics in the national PrimeResearch network, and the Carolinas Collaborative, which consists of the University of North Carolina at Chapel Hill, Duke University, and Health Sciences South Carolina (Clemson University, Medical University of South Carolina, University of South Carolina, and 7 other health systems). More information can be found at midsouthcdrn.mc.vanderbilt.edu/about. Ongoing research includes a PCORI-funded pragmatic trial on aspirin dosing.

In September 2015, Vanderbilt University was awarded a four-year, $28 million contract from the Centers for Medicare and Medicaid Services (CMS) to participate in the Transforming Clinical Practice Initiative. One of 39 sites, the Mid-South Transforming Clinical Practice Initiative (Mid-South PTN) is a partnership between Vanderbilt, VHAN, and the Safety Net Consortium of Middle Tennessee. It is using informatics tools developed at Vanderbilt to help over 4,000 clinicians “transform” their practice by improving quality outcomes and reducing unnecessary testing. A major goal of the Mid-South PTN is to reduce unnecessary testing or treatments by 5 percent and hospital readmissions by 20 percent.

Fully realizing the potential of precision medicine requires not only identification of clinically important variants and rigorous study of underlying mechanisms, but also translation into clinical practice – including a framework for engaging providers and patients and providing quality care. Vanderbilt is joining with institutions from across the country to create networks of research teams to address these challenges. The goals of this new model of team science, based on more structured collaboration and sharing of best practices, are to accelerate the pace of discovery and to make the promise of precision, patient-centered care a reality.