An increasing body of evidence links variability in response to drug therapy to common DNA polymorphisms. In some cases, such DNA variants occur in genes known to be responsible for drug action. Examples in cardiovascular therapy include polymorphisms in the drug metabolizing enzymes CYP2D6 contributing to variable propafenone or metoprolol responses or CYP2C19 contributing to variable clopidogrel responses; in the drug efflux transporter ABCB1 contributing to variable digoxin responses; in the beta-adrenergic receptor gene ADRB1 contributing to variable responses to beta-blockers in heart failure and hypertension; and in genes encoding potassium channels contributing to QT prolongation and drug-induced torsades de pointes. Increasingly, the field of pharmacogenomics is turning to newer tools such as genome-wide association analysis and next-generation sequencing to discover DNA variation linked to beneficial and adverse drug effects, and examples will be presented. Discovery of genetic variants with large effect sizes on variable drug responses is a first step in ushering in an era of personalized medicine. One vision that is being tested at Vanderbilt University Medical Center is to embed genotype data in an Electronic Medical Record system prior to drug prescription, thereby allowing the healthcare system to efficiently use genomic information to improve healthcare outcomes.

Keywords: personalized medicine, Electronic Medical Record, variable drug response