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(71) Applicant: **ELEVATED CAPITAL GROUP LLC** [US/US]; 104 Shongaloo Lane, Mandeville, LA 70741 (US).

(72) Inventors: **MASSEY, Bill, W.**; 3 Woodland West, Heber Springs, AK 72543 (US). **ZIMMER, Richard**; 104 Shongaloo Lane, Mandeville, LA 70471 (US). **MONEY, Jason**; 11340 Lenox Lane, Frisco, TX 75034 (US). **ST. PIERRE, Christopher**; 102 South Drive, Fairhope, AL 36532 (US).

(74) Agent: **LIZARRAGA, Juan, J.**; 909 Poydras Street, Suite 2300, New Orleans, LA 70112 (US).

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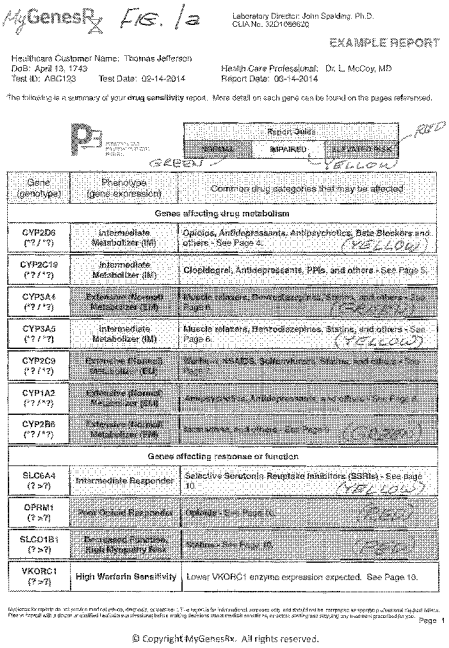
(54) Title: METHOD FOR ASSIGNING A QUALITATIVE IMPORTANCE OF RELEVANT GENETIC PHENOTYPES TO THE USE OF SPECIFIC DRUGS FOR INDIVIDUAL PATIENTS BASED ON GENETIC TEST RESULTS


MyGenesRx FIG. 1a

Laboratory Director: John Spalding, Ph.D.
CLIA No.: 52D1066620

EXAMPLE REPORT

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123
Test Date: 02-14-2014
Health Care Professional: Dr. L. McCoy, MD
Report Date: 06-14-2014

The following is a summary of your drug sensitivity report. More detail on each gene can be found on the pages referenced.

Report Guide: NORMAL (GREEN) | IMPAIRED (YELLOW) | ELEVATED RISK (RED)

Gene (genotype)	Phenotype (gene expression)	Common drug categories that may be affected
Genes affecting drug metabolism		
CYP2D6 (*? / *?)	Intermediate Metabolizer (IM)	Opioids, Antidepressants, Antipsychotics, Beta Blockers and others - See Page 4. (YELLOW)
CYP2C19 (*? / *?)	Intermediate Metabolizer (IM)	Clopidogrel, Antidepressants, PPIs, and others - See Page 5.
CYP3A4 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Muscle relaxers, Benzodiazepines, Statins, and others - See Page 6.
CYP3A5 (*? / *?)	Intermediate Metabolizer (IM)	Muscle relaxers, Benzodiazepines, Statins, and others - See Page 6. (YELLOW)
CYP2C9 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Warfarin, NSAIDS, Sulfonylureas, Statins, and others - See Page 7.
CYP1A2 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Antipsychotics, Antidepressants, and others - See Page 8.
CYP2B6 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Some opioids, and others - See Page 9. (GREEN)
Genes affecting response or function		
SLC6A4 (? >?)	Intermediate Responder	Selective Serotonin Reuptake Inhibitors (SSRIs) - See page 10. (YELLOW)
OPRM1 (? >?)	Poor Opioid Responder	Opioids - See Page 11.
SLCO1B1 (? >?)	Decreased Function, High Myopathy Risk	Statins - See Page 12.
VKORC1 (? >?)	High Warfarin Sensitivity	Lower VKORC1 enzyme expression expected. See Page 13.

Page 1

(57) Abstract: The present invention is a method for assigning a qualitative importance of relevant genetic phenotypes to the use of specific drugs for individual patients based on genetic test results. The invention provides a drug-centric integration of pharmacogenetic test information across multiple genes relevant to an individual drug. The invention then assigns a color designation for each drug reported and groups the drugs together on a report according to drug class/therapeutic area, thus allowing the physician to easily and quickly identify a drug from a specific drug class that would be best for that patient according to their entire pharmacogenetic test results. The outputs of the method can be added to existing pharmacogenetic test reports as a quick guide for the physician. Such integration of pharmacogenetic information from multiple genes and drug-centric organization of the outputs should allow physicians to more easily utilize and incorporate pharmacogenetic testing into their practice.

METHOD FOR ASSIGNING A QUALITATIVE IMPORTANCE OF RELEVANT GENETIC PHENOTYPES TO THE USE OF SPECIFIC DRUGS FOR INDIVIDUAL PATIENTS BASED ON GENETIC TEST RESULTS

BACKGROUND OF THE INVENTION

[0001] This application claims priority from U.S. Provisional Application No. 62/023,439 (the '439 application), filed July 11, 2014. The '439 application is incorporated herein by reference

[0002] Pharmacogenetics involves the use of genetic information from an individual patient to inform drug selection. This rapidly emerging field has shown great promise in improving outcomes from pharmacotherapy by identifying genetic variants of genes known to affect drug metabolism and drug response. FDA has also noted the importance of pharmacogenetics by including pharmacogenetic information relevant to the safe and effective use of individual drugs into the drug's labeling. The number of drugs for which pharmacogenetic information is included in the product labeling currently stands at over 100, but that number is rapidly expanding.

[0003] Physicians are beginning to learn about pharmacogenetic testing and are struggling to keep abreast of this new field. Currently offered pharmacogenetic testing is conducted by obtaining a patient sample (e.g. blood, saliva, etc.), testing that sample for known variants in genes that are associated with drug response, and then issuing a test report that outlines the results according to the patient's genoptypes for the tested genes/gene variants, along with the associated phenotypes (i.e. the biological consequence of the genotypes). Usually, the pharmacogenetic test report lists each gene/genotype/phenotype separately and usually include a list of drugs affected by each gene, so that the physician can look at the information and make an optimal drug selection for this patient. However, many physicians find the test reports confusing and are having difficulty in incorporating this information into their usual practice of medicine. Some of the reasons for this difficulty are general lack of knowledge of genetics and pharmacogenetics in particular, time constraints related to their daily patient volumes, and the necessity to look at and integrate multiple sections of the report related to the different genes tested and their significance for a particular drug.

SUMMARY OF THE INVENTION

[0004] The present invention described herein eliminates these issues noted above by providing a drug-centric integration of the pharmacogenetic test information across multiple genes relevant to an individual drug. The method then assigns a color designation for each drug reported and groups the drugs together on the report according to drug class/therapeutic area, thus allowing the physician to easily and quickly identify a drug from a specific drug class that would be best for that patient according to their entire pharmacogenetic test results. It is anticipated that the outputs of the method can be added to existing pharmacogenetic test reports as a quick guide for the physician. Such integration of pharmacogenetic information from multiple genes and drug-centric organization of the outputs should allow physicians to more easily utilize and incorporate pharmacogenetic testing into their practice. The method is easily updated to include new genetic findings, new genes, additional drugs, and any new science that is relevant to the reported drugs.

[0005] The inventive method utilizes phenotypic results of individual patients obtained from genetic testing of genes that influence drug metabolism and innate drug response (both therapeutic and adverse responses). The inventive method determines the clinical relevance of response and metabolic gene phenotypes and integrates these into a qualitative importance assignment to specific drugs. The qualitative importance assignment is represented by color-coding of each specific drug into: Green (no genetic indicators of clinical importance found); Yellow (genetic indicators found that warrant extra caution); and Red (genetic indicators found that warrant extreme caution or avoidance). The color-coding of a specific drug, termed its Phenotypic Color Designation (PCD), is assigned based on the resultant PCD value as determined by the invention and described in the DETAILED DESCRIPTION OF THE INVENTION below.

[0006] It is an object of this invention to prepare a drug-centric combinatorial pharmacogenetic guidance report for a patient, that color-codes the drugs based on the risk designations resultant from the output of the method, and arranges the drugs by drug class for ease of comparison and drug selection by a physician.

[0007] Qualitative importance assignment is determined by individual assessment of metabolic gene phenotypes, which are calculated into a Drug Score Metabolic Component Value (hereafter referred to as "MCV"), and a separate calculation of the response/adverse effect phenotypes as a Drug Score Response Component Value (hereafter referred to as "RCV"). The specific

qualitative importance assignment for each specific drug is made based on the greater score between the MCV and RCV. In other words, if the RCV is greater than the MCV, then the drug is coded to reflect the RCV value, and vice versa.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The patent or application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawings will be provided by the Office upon request and payment of the necessary fee.

[0009] Figure 1 including Figures 1a through 1j is an example pharmacogenetic report reflecting the results of the inventive method as applied to an individual patient.

[0010] Figure 2 including Figures 2a through 2m is a spreadsheet that shows the invention and its use in producing the example report in Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

[0011] As noted above, the specific qualitative importance assignment for each specific drug is made based on the greater score between the MCV and RCV.

[0012] The metabolic component is the most complex assessment and the method of assessment is described as follows:

1) The relative clinical importance of each tested gene's phenotype was assigned by subjective determination of clinical relevance and assigned a % relevance value that sums to 100% across all tested relevant genes. The following pharmacological and toxicological attributes of each drug's metabolism were considered when assigning a % relevance value:

a) the overall contribution of each tested gene to the total metabolism of the drug and resultant drug metabolites. This measure forms the basis for the % relevance of each gene involved, but is modified to reflect the impact of the following influences in b), c), and d);

b) the clinical relevance of the metabolic product from each tested gene (e.g. active metabolite, toxic metabolite, primary to drug response (e.g. pro-drugs); and

c) known pharmacogenetic-related metabolic effects from the FDA-approved labeling.

d) relevant information from the scientific literature (e.g. in vitro studies using human hepatocytes, clinical studies, etc.

[0013] The above information was obtained by examination of the FDA-approved labeling and by a literature search and review based on googling the search terms "drug name cyp metabolism". A detailed review of the known effects of the metabolic genes tested was then used to assess their relative importance in respect to their biochemical, physiological, and pharmacological effects as these pertain to clinical safety and efficacy as per the drug/metabolite attributes listed above. In all cases the guiding maxim was "first, do no harm".

[0014] A bifurcated calculation based upon racial identification (African descent versus non-African descent) was employed for assigning clinical relevance to CYP3A4 and CYP3A5 metabolic status, as African ancestry indicates predominantly CYP3A5 activity and non-African ancestry indicates predominantly CYP3A4 activity according to a 10%/90% bifurcated assignment.

[0015] In addition, a general metabolic relevance adjustment factor (%) was applied to the MCV when appropriate, such as for a drug that is only minimally metabolized and excreted unchanged.

[0016] The MCV was calculated by the following equation:

Drug Score Metabolism Component = (PCD value Gene 1 x % gene importance Gene1) + (PCD value Gene 2 x % gene importance Gene 2) +.....and so on.

Phenotype color designation value (PCD): Red=10, Yellow=5, and Green =1

The equation can result in a maximum MCV of 10 and minimum MCV of 1. The qualitative importance assignment is made by comparing the MCV to the following scale ranges:

Red for $\geq$ 5.1; Yellow for < 5.1 >1.5; Green for $\leq$ 1.5

EXAMPLES

[0017] Example: Sustiva (metabolized by tested genes CYP3A4/5, CYP2B6, CYP2C9, and CYP2C19) in a Caucasian patient that had the following results: 3A4 PM, 3A5 IM, 2B6 EM, 2C9 IM, 2C19 PM

MCV = ((10*0.60)*0.9) + ((5*0.60)*0.1) + (1*0.30) + (5*0.05) + (10*0.05) = 6.75

Thus, for the above example for Sustiva, the MCV = 6.75, or a red phenotypic color designation for Sustiva in this patient. Since no response/adverse event markers relevant to Sustiva were tested, there is no RCV and thus the MCV is the sole determinant of the phenotypic color designation for Sustiva.

[0018] Example: Simvastatin (metabolized by tested genes CYP3A4/5 in a patient of African descent and the adverse effect gene SLCO1B1 for myopathy risk) that had the following results: 3A4 IM, 3A5 EM, SLCO1B1 Intermediate function.

MCV = ((5*1.0)*0.1) + ((1*1.0)*0.9) = 1.4 = Green

RCV = 5 = Yellow (SLCO1B1 is specific for statins and no other relevant response marker is tested)

Thus, for the above example of simvastatin, the MCV = 1.4 and the RCV = 5, therefore the phenotypic color designation for simvastatin in this patient is determined by the greater value RCV = 5, or Yellow.

[0019] The next example, desvenlafaxine, is one that employs a general metabolic relevance factor since desvenlafaxine is only metabolized 5-10% by CYP enzymes.

[0020] Example: Desvenlafaxine (metabolized by tested genes CYP3A4/5 and CYP2D6 in a patient of non-African descent) that had the following results: 3A4 EM, 3A5 PM, and 2D6 EM. Note that SLC6A4 is not included as a relevant response marker for desvenlafaxine since desvenlafaxine is a SNRI, not an SSRI.

MCV = ((1*0.9)*0.9) + ((10*0.9)*0.1) + (1*0.1) = 1.81 * 0.10 (the general metabolic relevance factor) = 0.18 = Green

Thus for the above example of desvenlafaxine, the MCV = 0.18 (after adjusting for general metabolic relevance) = Green (since there are no relevant response/adverse effect markers, the MCV is the sole determinant of the phenotypic color designation).

[0021] Referring now to Figure 1, which represents an example test report that includes the outputs of the invention (i.e. the phenotypic color designation) for a list of commonly prescribed drugs, shows how the invention can be incorporated into a pharmacogenetic test report. On page 1 of the example pharmacogenetic test report, are listed the genotypes and associated phenotypes for a number of genes that code for drug metabolizing enzymes and drug response/adverse effect proteins for a fictitious patient. The phenotypes for each of the tested genes, along with whether the patient is of African or Non-African descent are the inputs required by the invention to determine phenotypic color designations for the drugs shown on pages 2-3 of this example report. In this example report, the color-coded drugs are grouped according to drug class and therapeutic area to facilitate ease of use for the pharmacogenetic information by the physician in making a drug selection. The remainder of the report consists of descriptive information

regarding the clinical relevance of the patient's phenotypes for the tested genes and is not a product of the invention.

[0022] Figure 2 is a spreadsheet that shows the invention and its use in producing the example report in Figure 1. The phenotypes for each gene tested and patient's race are entered into the spreadsheet's upper left-hand corner (cells B3 through B13 for the phenotypes and cell B1 for race) and these inputs are subjected to the calculations that yield the MCV and RCV for each of the drugs evaluated. The drugs evaluated, the genes relevant to each specific drug, each relevant gene's metabolic % relative importance value, and the equations and logical operators that calculate the PCD values are shown on rows 16 through 141. Each row is specific for a particular drug and the end result of the calculations and logical operators, the PCD, is shown in column V. These PCDs are then converted into colored font text on the example report (Figure 1) on pages 2 and 3.

CLAIMS

We claim:

1. A method for assigning a qualitative importance of relevant genetic phenotypes to the use of specific drugs for individual patients based on genetic test results, comprising the following steps:

a. genetically testing a patient for CYP genes that influence drug metabolism and effector genes that affect drug response, each gene having a phenotype assigned with a phenotype color designation value of Red equal to 10 indicating that found genetic indicators warrant extreme caution or avoidance, Yellow equal to 5 indicating that found genetic indicators warrant extra caution, or Green equal to 1 indicating that no genetic indicators of clinical importance found;

b. for a specific drug, assign a percentage of clinical relevance to each CYP gene tested, the percentage being based upon the portion of a dose of the drug that is metabolized via each gene-controlled pathway and the percentage adjusted based upon the relevance of the metabolic process to the safety and/or efficacy of the drug per FDA guidance and the peer-reviewed scientific literature, which percentage sums to 100 percent for all CYP genes tested;

c. calculate a metabolic component value for that drug as follows:

metabolic component value = (phenotype color designation for first CYP gene x percentage of clinical relevance for first CYP gene) + (phenotype color designation for second CYP gene x percentage of clinical relevance for second CYP gene) + (phenotype color designation for third CYP gene x percentage of clinical relevance for third CYP gene) + similar sum for each remaining gene;

d. where applicable, calculate a response component value for that drug as done for the metabolic component value;

e. using the greater of the metabolic component value or the response component value for the drug, designate a phenotypic color to the drug as follows:

Red for greater than or equal to 5.1,

Yellow for less than 5.1 and greater than 1.5,

Green for less than or equal to 1.5;

f. prepare a drug-centric combinatorial pharmacogenetic guidance report for the patient, that color-codes the drugs based on the risk designations resultant from the output of the method, and arranges the drugs by drug class for ease of comparison and drug selection by a physician.

2. The method of claim 1 where the tested CYP genes that influence drug metabolism comprise CYP2D6, CYP2C19, CYP3A4, CYP3A5, CYP2C9, CYP1A2, CYP2B6, and the tested genes that affect drug response comprise SLC6A4, OPRM1, SLCO1B1, and VKORC1.

3. The method of claim 2 where the tested CYP genes that influence drug metabolism and the tested genes that affect drug response further comprise other CYP genes and non-CYP metabolic genes as supported in emerging scientific evidence.

4. The method of claim 1 for assigning a qualitative importance of relevant genetic phenotypes to the use of specific drugs for individual patients based on genetic test results, further comprises a bifurcated calculation based upon racial identification of African descent versus non-African descent by using a 10%/90% bifurcated assignment of clinical relevance to CYP3A4 and CYP3A5 metabolic status, as African ancestry indicates predominantly CYP3A5 activity and non-African ancestry indicates predominantly CYP3A4 activity.

Sheet 1/23

MyGenesRx Fig. 1a

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

EXAMPLE REPORT

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

The following is a summary of your **drug sensitivity** report. More detail on each gene can be found on the pages referenced.

PERSONALIZED PHARMACOGENETIC PROFILE

Report Guide		
NORMAL (GREEN)	IMPAIRED (YELLOW)	ELEVATED RISK (RED)

Gene (genotype)	Phenotype (gene expression)	Common drug categories that may be affected
Genes affecting drug metabolism		
CYP2D6 (*? / *?)	Intermediate Metabolizer (IM)	Opioids, Antidepressants, Antipsychotics, Beta Blockers and others - See Page 4. (YELLOW)
CYP2C19 (*? / *?)	Intermediate Metabolizer (IM)	Clopidogrel, Antidepressants, PPIs, and others - See Page 5.
CYP3A4 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Muscle relaxers, Benzodiazepines, Statins, and others - See Page 6. (GREEN)
CYP3A5 (*? / *?)	Intermediate Metabolizer (IM)	Muscle relaxers, Benzodiazepines, Statins, and others - See Page 6. (YELLOW)
CYP2C9 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Warfarin, NSAIDS, Sulfonylureas, Statins, and others - See Page 7.
CYP1A2 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Antipsychotics, Antidepressants, and others - See Page 8.
CYP2B6 (*? / *?)	Extensive (Normal) Metabolizer (EM)	Methadone, and others - See Page 9. (GREEN)
Genes affecting response or function		
SLC6A4 (? >?)	Intermediate Responder	Selective Serotonin Reuptake Inhibitors (SSRIs) - See page 10. (YELLOW)
OPRM1 (? >?)	Poor Opioid Responder	Opioids - See Page 10. (RED)
SLCO1B1 (? >?)	Decreased Function, High Myopathy Risk	Statins - See Page 10. (RED)
VKORC1 (? >?)	High Warfarin Sensitivity	Lower VKORC1 enzyme expression expected. See Page 10.

FIG. 1B

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Pain Management

- alfentanil (Alfenta)
- carisoprodol++ (Soma)
- celecoxib (Celebrex)
- codeine++
- cyclobenzaprine (Flexeril)
- fentanyl (Actiq, Duragesic, Sublimaze)
- hydrocodone++
- ibuprofen (Advil, Motrin)
- lidocaine (xylocaine, various brands)
- meperidine (Demerol)
- naproxen (Aleve)
- oxycodone++ (Oxycontin)
- ropivacaine (Naropin)
- tapentadol (Nucynta)
- tizanidine (Zanaflex)
- tramadol++ (Ultram)
- zolmitriptan (Zomig)

Pain Management - Neuropsychiatric

- methadone

Neuropsychiatric - Anticonvulsant

- carbamazepine (Various brands)
- phenytoin (Dilantin)
- zonisamide (Zonegran)

Neuropsychiatric - Anxiolytic

- alprazolam (Xanax)
- buspirone (BuSpar)
- diazepam (Valium)
- midazolam (Versed)
- phenobarbital
- triazolam (Halcion)
- zolpidem (Ambien)

Neuropsychiatric Precognitive Drug

- tacrine (Cognex)

Antipsychotic

- aripiprazole (Abilify)
- asenapine (Saphris)
- chlorpromazine (Thorazine)
- clozapine (Clozaril)
- haloperidol (Haldol)
- loperidone (Fanapt)
- lurasidone (Latuda)
- olanzapine (Zyprexa)
- perphenazine (Trilafon)
- promazine (Sparine)
- quetiapine (Seroquel)
- risperidone (Risperdal)
- thioridazine (Mellaril)
- ziprasidone (Geodon)

Neuropsychiatric ADHD Drug / Stimulant

- amphetamine (Adderall)
- atomoxetine (Strattera)

Neuropsychiatric Antidepressant

- amitriptyline (Elavil)
- bupropion
- citalopram (Celexa)
- clomipramine (Anafranil)
- desipramine (Norpramin)
- desvenlafaxine (Pristiq)
- doxepin (Sinequan, Silenor, Prudoxin, Zonalon)
- escitalopram (Lexapro)
- fluoxetine (Prozac)
- imipramine (Tofranil)
- mirtazapine (Remeron)
- nefazodone (Serzone)
- nortriptyline (Aventyl,Pamelor)
- paroxetine (Paxil)
- sertraline (Zoloft)
- trazodone (Oleptro)
- venlafaxine (Effexor)
- vilazodone (Viibryd)

Neuropsychiatric - Pain Management

- gabapentin (Gabitril)
- duloxetine (Cymbalta)

FIG. 1c

SHEET 3/23

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Antidiabetic
- glimepiride (Amaryl)
- glipizide (Glucotrol)
- glyburide (Diabeta)
- tolbutamide (Orinase)

Steroids
- estradiol
- progesterone
- testosterone

Gastrointestinal
- esomeprazole (Nexium)
- lansoprazole (Prevacid)
- omeprazole (Prilosec)
- pantoprazole (Protonix)
- rabeprazole (Aciphex)

Anti-Infectives
- clarithromycin (Biaxin)
- efavirenz (Sustiva)
- erythromycin (E-Mycin)
- indinavir (Crixivan)
- nelfinavir (Viracept)
- ritonavir (Norvir)
- saquinavir (Invirase)
- telithromycin (Ketek)

Cardiovascular - Antiarrhythmic
- amiodarone (Cordarone)
- dofetilide (Tikosyn)
- flecainide (Tambocor)
- propafenone (Rythmol)
- quinidine (Various brands)

Cardiovascular - Antihypertensive
- amlodipine (Norvasc)
- carvedilol (Coreg)
- diltiazem (Cardizem)
- felodipine (Plendil)
- lomerdipine (Zanidip)
- losartan ++(Cozaar)
- metoprolol (Lopressor, Toprol)
- nebivolol (Bystolic)
- nifedipine (Adalat, Procardia)
- nisoldipine (Sular)
- nitrendipine
- propanolol (Inderal)
- timolol (Blocadren)

Oncology
- docetaxel (Taxotere)
- ifosfamide
- tamoxifen ++ (Nolvadex)
- vincristine (Vincasar, Oncovin)
- cyclophosphamide (Cytoxan)++

Cardiovascular Cholesterol Lowering
- atorvastatin (Lipitor, Caduet)
- fluvastatin (Lescol)
- lovastatin (Mevacor)
- pravastatin (Pravachol)
- rosuvastatin (Crestor)
- simvastatin (Zocor)

Cardiovascular - Anticoagulant
- clopidogrel ++ (Plavix)
- rivaroxaban (Xarelto)
- ticargelor (Brilinta)
- warfarin (Coumadin)

Cardiovascular - Antianginal
- ranolazine (Ranexa)

Immunological
- cyclosporine (Gengraf)
- hydrocortisone
- tacrolimus (Prograf)
- zafirlukast (Accolate)

Other
- caffeine
- sildenafil (Viagra)
- theophylline

These lists of drugs are color-coded to reflect whether a genetic predisposition indicates that there may be issues with regard to drug response or adverse effects. A drug in green font indicates that there were found no genetic issues of clinical relevance to this drug among the genes tested. A drug in yellow font indicates that genetic issues of clinical relevance were found for this drug and extra caution should be observed when considering this drug for this patient. A drug in red font indicates that serious genetic issues of clinical relevance were found for this drug and extreme caution or avoidance of this drug should be observed when considering this drug for this patient.

FIG. 1d

SHEET 4/23

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype *(gene expression)*	What it means.
CYP 2D6	**Intermediate Metabolizer (IM)**	This genotype predicts less than normal metabolic enzyme activity. Potential for adverse drug reaction exists. ‡‡ **Caution should be observed with pro-drugs, e.g., codeine.** Desirable analgesic effects may not be achieved.

Common Medicines Metabolized by 2D6

Antidepressants & Antipsychotics

duloxetine (Cymbalta)
amitriptyline (Elavil)
clomipramine (Anafranil)
venlafaxine (Effexor)
imipramine (Tofranil)
paroxetine (Paxil)
fluoxetine (Prozac)
nortriptyline (Aventyl,Pamelor)
desipramine (Norpramin)
aripiprazole (Abilify)
perphenazine (Trilafon)
thioridazine (Mellaril)
lloperidine (Fanapt)
chlorpromazine (Thorazine)
amphetamine (Adderall)
atomoxetine (Strattera)
risperidone (Risperdal)
haloperidol (Haldol)
doxepin (Sinequan, Silenor, Prudoxin, Zonalon)
mirtazapine (Remeron)

Pain

hydrocodone‡‡
oxycodone‡‡ (Oxycontin)
codeine‡‡
tramadol‡‡ (Ultram)

Other

tamoxifen ‡‡ (Nolvadex)

Anti-arrythmic

flecainide (Tambocor)
propafenone (Rythmol)

Beta Blockers

metoprolol (Lopressor, Toprol)
carvedilol (Coreg)
timolol (Blocadren)
nebivolol (Bystolic)
propanolol (Inderal)

‡‡ Pro-drug; may not be effective in PM due to inability to metabolize and produce active metabolite

FIG. 1e

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype *(gene expression)*	What it means.
CYP 2C19	**Intermediate Metabolizer (IM)**	This genotype predicts a less than normal rate of metabolic enzyme activity. Potential for adverse drug reaction exists. †-† **Caution should be observed with pro-drugs, e.g., clopidogrel.** Less than normal drug metabolism is expected. A full effect of drug is not expected.

Common Medicines Metabolized by CYP 2C19		
clopidogrel †-† (Plavix)	citalopram (Celexa)	escitalopram (Lexapro)
imipramine (Tofranil)	sertraline (Zoloft)	diazepam (Valium)
omeprazole (Prilosec)	esomeprazole (Nexium)	pantoprazole (Protonix)
rabeprazole (Aciphex)	lansoprazole (Prevacid)	nelfinavir (Viracept)
methadone	carisoprodol†-† (Soma)	tapentadol (Nucynta)

†-† Pro-drug; may not be effective in PM due to inability to metabolize and produce active metabolite

FIG. 1f Sheet 6/23

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype *(gene expression)*	What it means.
CYP 3A4	**Extensive (Normal) Metabolizer (EM)**	This genotype predicts a normal rate of metabolic enzyme activity.

CYP 3A5	**Intermediate Metabolizer (IM)**	This genotype predicts a less than normal rate of metabolic enzyme activity. Potential for adverse drug reaction exists.

Common Medicines Metabolized by CYP 3A4 / 3A5

Benzodiazepines
alprazolam (Xanax)
midazolam (Versed)
triazolam (Halcion)

Antipsychotics
quetiapine (Seroquel)
ziprasidone (Geodon)
buspirone (BuSpar)
lurasidone (Latuda)
carbamazepine (Various brands)
iloperidone (Fanapt)

Antidepressants
desvenlafaxine (Pristiq)
vilazodone (Viibryd)
mirtazapine (Remeron)
trazodone (Oleptro)
nefazodone (Serzone)

Pain Management
cyclobenzaprine (Flexaril)
fentanyl (Actiq, Duragesic, Sublimaze)
alfentanil (Alfenta)

Other
aripiprazole (Abilify)
sildinafil (Viagra)
zolpidem (Ambien)
diazepam (Valium)
lansoprazole (Prevacid)
esomeprazole (Nexium)
rabeprazole (Aciphex)
efavirenza (Sustiva)

Steroids
estradiol
hydrocortisone
progesterone
testosterone

Cardiovascular
ticareglor (Brilinta)
amlodipine (Norvasc)
quinidine (Various brands)
rivaroxaban (Xarelto)
amiodarone (Cordarone)
diltiazem (Cardizem)
atorvastatin (Lipitor, Caduet)
lovastatin (Mevacor)
nisoldipine (Sular)
ranolazine (Ranexa)
felodipine (Plendil)
lercanidipine (Zanidip)
dofetilide (Tikosyn)
nifedipine (Adalat, Procardia)
nitrendipine
simvastatin (Zocor)

Antimicrobials/antivirals
clarithromycin (Biaxin)
erythromycin (E-Mycin)
telithromycin (Ketek)
indinavir (Crixivan)
nelfinavir (Viracept)
ritonavir (Norvir)
saquinavir (Invirase)

Anti-epileptic
tiagabine (Gabitril)
carbamazepine (Tegretol)
zonisamide (Zonegran)

Immunosuppressants
cyclosporine (Gengraf)
tacrolimus (Prograf)

Chemotherapeutics
vincristine (Vincasar, Oncovin)
docetaxel (Taxotere)

FIG. 19 Sheet 7/23

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Healthcare Customer Name: Thomas Jefferson
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Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype (*gene expression*)	What it means.
CYP 2C9	**Extensive (Normal) Metabolizer (EM)**	This genotype predicts a normal rate of metabolic enzyme activity.

Common Medicines Metabolized by 2C9			
celecoxib (Celebrex)	phenytoin (Dilantin)	warfarin (Coumadin)	fluoxetine (Prozac)
tapentadol (Nucynta)	tolbutamide (Orinase)	glyburide (Diabeta)	glipizide (Glucotrol)
naproxen (Aleve)	ibuprofen (Advil, Motrin)	zafirlukast (Accolate)	phenobarbital
losartan (Cozaar)	glimepiride (Amaryl)	fluvastatin (Lescol)	rosuvastatin (Crestor)

FIG. 14

Laboratory Director: John Spalding, Ph.D.
CLIA No. 32D1086620

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype (*gene expression*)	What it means.
CYP 1A2	**Extensive (Normal) Metabolizer (EM)**	This genotype predicts a normal rate of metabolic enzyme activity.

Common Medicines Metabolized by CYP1A2		
clozapine (Clozaril)	olanzapine (Zyprexa)	tizanidine (Zanaflex)
tacrine (Cognex)	ropivacaine (Naropin)	cyclobenzaprine (Flexaril)
lidocaine (xylocaine, various brands)	asenapine (Saphris)	theophylline
duloxetine (Cymbalta)	zolmitriptan (Zomig)	mirtazapine (Remeron)
promazine (Sparine)	Caffeine	

FIG. 1i

SHEET 9/23

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype (*gene expression*)	What it means.
CYP 2B6	**Extensive (Normal) Metabolizer (EM)**	This genotype predicts a normal rate of metabolic enzyme activity.

Common Medicines Metabolized by 2B6
buproprion ifosfamide methadone meperidine (Demerol) cyclophospharnide (Cytoxan)✣✣
✣✣ Pro-drug; may not be effective in PM due to inability to metabolize and produce active metabolite

SHEET 10/23

FIG 4

Healthcare Customer Name: Thomas Jefferson
DoB: April 13, 1743
Test ID: ABC123 Test Date: 02-14-2014

Health Care Professional: Dr. L. McCoy, MD
Report Date: 03-14-2014

Gene	Phenotype *(gene expression)*	What it means.
SLC6A4	**Intermediate Responder**	Decreased serotonin transporter expression expected. Risk of decreased or slower response to selective serotonin reuptake inhibitors (SSRIs) may be expected. Please discuss your results with a health care professional or a pharmacist before considering treatment changes.

Gene	Phenotype (gene expression)	What it means.
OPRM1	**Poor Opioid Responder**	Impaired μ opiate receptor function. A full analgesic response may not be attainable. Please discuss your results with a health care professional or a pharmacist before considering treatment changes. Note: CYP2D6 activity may influence the activation of active opioid metabolites from their prodrug forms (e.g. hydrocodone, codeine).

Gene	Phenotype *(gene expression)*	What it means.
SLCO1B1	**Decreased Function, High Myopathy Risk**	Decreased OATP1B1 transporter function. Increased risk of simvastatin-induced myopathy (based on simvastatin). Please discuss your results with a health care professional or a pharmacist before considering treatment changes.

Gene	Phenotype *(gene expression)*	What it means.
VKORC1	**High Warfarin Sensitivity**	Lower VKORC1 enzyme expression expected. Lower warfarin doses may be required. Please discuss your results with a health care professional or a pharmacist before considering treatment changes.

FIG. 2a

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	**Patient's Race =**		*(Choices: Caucasian=1; Jewish=2; Asian=3; African-American=4; Native-American=5 Hispanic Indian Arab-American Other* 1			**CYP3A4 Race Adjmnt**	**CYP3A5 Race Adjmnt**								
2	**Tested Gene**	**Resultant Phenotype**	**Phenotype Color Designation Value**			0.9	0.1								
3	CYP2D6	IM	5												
4	CYP2C19	IM	5												
5	CYP3A4	EM	1												
6	CYP3A5	IM	5												
7	CYP2C9	EM	1												
8	CYP1A2	EM	1												
9	CYP2B6	EM	1												
10	OPRM1	Poor Opioid Responder	10												
11	SLC6A4	Intermediate Responder	5												
12	SLCO1B1	Decreased Function, High Myopathy Risk	10												
13	VKORC1	High Warfarin Sensitivity	5												
14															
15	Drug Therapeutic Area 1	Drug Therapeutic Area 2	Drug	Gene 1	% Gene 1	Gene 2	% Gene 2	Gene 3	% Gene 3	Gene 4	% Gene 4	Gene 5	% Gene 5	Gene 6	% Gene 6
16	anti-infectives		clarithromycin (Biaxin)	CYP3A4/5	100		0		0		0		0		0
17	anti-infectives		efavirenza (Sustiva)	CYP3A4/5	60		0	2C19	5	2C9	5		0	2B6	30
18	anti-infectives		erythromycin (E-Mycin)	CYP3A4/5	100		0		0		0		0		0
19	anti-infectives		indinavir (Crixivan)	CYP3A4/5	90	CYP2D6	10		0		0		0		0
20	anti-infectives		nelfinavir (Viracept)	CYP3A4/5	60		0	CYP2C19	40		0		0		0
21	anti-infectives		ritonavir (Norvir)	CYP3A4/5	90	CYP2D6	6		0	CYP2C9	2	CYP1A2	2		0
22	anti-infectives		saquinavir (Invirase)	CYP3A4/5	100		0		0		0		0		0
23	anti-infectives		telithromycin (Ketek)	CYP3A4/5	100		0		0		0		0		0
24	cardiovascular		amiodarone (Cordarone)	CYP3A4/5	100		0		0		0		0		0
25	cardiovascular		amlodipine (Norvasc)	CYP3A4/5	100		0		0		0		0		0
26	cardiovascular		atorvastatin (Lipitor, Caduet)	CYP3A4/5	100		0		0		0		0		0
27	cardiovascular		carvedilol (Coreg)	CYP3A4/5	5	CYP2D6	80	CYP2C19	3	CYP2C9	10	CYP1A2	2		0
28	cardiovascular		clopidogrel ÷ ÷ (Plavix)	CYP3A4/5	3		0	CYP2C19	90	CYP2C9	3	CYP1A2	2	CYP2B6	2
29	cardiovascular		diltiazem (Cardizem)	CYP3A4/5	100		0		0		0		0		0
30	cardiovascular		dofetilide (Tikosyn)	CYP3A4/5	100		0		0		0		0		0
31	cardiovascular		felodipine (Plendil)	CYP3A4/5	100		0		0		0		0		0
32	cardiovascular		flecainide (Tambocor)		0	CYP2D6	100		0		0		0		0
33	cardiovascular		fluvastatin (Lescol)	CYP3A4/5	20		0		0	CYP2C9	80		0		0
34	cardiovascular		glimepiride (Amaryl)		0		0		0	CYP2C9	100		0		0
35	cardiovascular		glipizide (Glucotrol)	CYP3A4/5	10		0		0	CYP2C9	90		0		0
36	cardiovascular		glyburide (Diabeta)	CYP3A4/5	80		0		0	CYP2C9	20		0		0
37	cardiovascular		lercanidipine (Zanidip)	CYP3A4/5	70	CYP2D6	30		0		0		0		0
38	cardiovascular		losartan + +(Cozaar)	CYP3A4/5	50		0		0	CYP2C9	50		0		0
39	cardiovascular		lovastatin (Mevacor)	CYP3A4/5	100		0		0		0		0		0
40	cardiovascular		metoprolol (Lopressor, Toprol)		0	CYP2D6	100		0		0		0		0
41	cardiovascular		nebivolol (Bystolic)		0	CYP2D6	100		0		0		0		0
42	cardiovascular		nifedipine (Adalat, Procardia)	CYP3A4/5	100		0		0		0		0		0
43	cardiovascular		nisoldipine (Sular)	CYP3A4/5	100		0		0		0		0		0
44	cardiovascular		nitrendipine	CYP3A4/5	100		0		0		0		0		0
45	cardiovascular		pravastatin (Pravachol)		0		0		0		0		0		0
46	cardiovascular		propafenone (Rythmol)	CYP3A4/5	50	CYP2D6	50		0		0		0		0
47	cardiovascular		propanolol (Inderal)		0	CYP2D6	34	CYP2C19	33		0	CYP1A2	33		0
48	cardiovascular		quinidine (Various brands)	CYP3A4/5	50	CYP2D6	50		0		0		0		0

FIG. 2b

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
49	cardiovascular		ranolazine (Ranexa)	CYP3A4/5	100		0		0		0		0		0
50	cardiovascular		rivaroxaban (Xarelto)	CYP3A4/5	100		0		0		0		0		0
51	cardiovascular		rosuvastatin (Crestor)		0		0		0	CYP2C9	100		0		0
52	cardiovascular		simvastatin (Zocor)	CYP3A4/5	100		0		0		0		0		0
53	cardiovascular		ticargelor (Brilinta)	CYP3A4/5	100		0		0		0		0		0
54	cardiovascular		timolol (Blocadren)		0	CYP2D6	95	CYP2C19	5	CYP2C9	0		0		0
55	cardiovascular		tolbutamide (Orinase)		0		0	CYP2C19	10	CYP2C9	90		0		0
56	cardiovascular		warfarin (Coumadin)		0		0		0	CYP2C9	100		0		0
57	gastrointestinal		esomeprazole (Nexium)	CYP3A4/5	10		0	CYP2C19	90		0		0		0
58	gastrointestinal		lansoprazole (Prevacid)	CYP3A4/5	10		0	CYP2C19	90		0		0		0
59	gastrointestinal		omeprazole (Prilosec)	CYP3A4/5	10		0	CYP2C19	90		0		0		0
60	gastrointestinal		pantoprazole (Protonix)	CYP3A4/5	10		0	CYP2C19	90		0		0		0
61	gastrointestinal		rabeprazole (Aciphex)	CYP3A4/5	40		0	CYP2C19	60		0		0		0
62	immunological		cyclosporine (Gengraf)	CYP3A4/5	100		0		0		0		0		0
63	immunological		hydrocortisone	CYP3A4/5	100		0		0		0		0		0
64	immunological		tacrolimus (Prograf)	CYP3A4/5	100		0		0		0		0		0
65	immunological		zafirlukast (Accolate)	CYP3A4/5	30		0		0	CYP2C9	70		0		0
66	neuro-psychiatric		alprazolam (Xanax)	CYP3A4/5	100		0		0		0		0		0
67	neuro-psychiatric		amitriptyline (Elavil)		0	CYP2D6	100		0		0		0		0
68	neuro-psychiatric		amphetamine (Adderall)	CYP3A4/5	10	CYP2D6	80		0		0	CYP1A2	10		0
69	neuro-psychiatric		aripiprazole (Abilify)	CYP3A4/5	50	CYP2D6	50		0		0		0		0
70	neuro-psychiatric		asenapine (Saphris)		0	CYP2D6	30		0		0	CYP1A2	70		0
71	neuro-psychiatric		atomoxetine (Strattera)	CYP3A4/5	10	CYP2D6	90		0		0		0		0
72	neuro-psychiatric		buproprion		0	CYP2D6	30		0		0		0	CYP2B6	70
73	neuro-psychiatric		buspirone (BuSpar)	CYP3A4/5	100		0		0		0		0		0
74	neuro-psychiatric		carbamazepine (Various brands)	CYP3A4/5	100		0		0		0		0		0
75	neuro-psychiatric		chlorpromazine (Thorazine)	CYP3A4/5	30	CYP2D6	70		0		0		0		0
76	neuro-psychiatric		citalopram (Celexa)	CYP3A4/5	10	CYP2D6	20	CYP2C19	70		0		0		0
77	neuro-psychiatric		clomipramine (Anafranil)	CYP3A4/5	5	CYP2D6	80	CYP2C19	10		0	CYP1A2	5		0
78	neuro-psychiatric		clozapine (Clozaril)	CYP3A4/5	15	CYP2D6	15		0		0	CYP1A2	70		0
79	neuro-psychiatric		desipramine (Norpramin)		0	CYP2D6	100		0		0		0		0
80	neuro-psychiatric		desvenlafaxine (Pristiq)	CYP3A4/5	90	CYP2D6	10		0		0		0		0
81	neuro-psychiatric		diazepam (Valium)	CYP3A4/5	60		0	CYP2C19	40		0		0		0
82	neuro-psychiatric		doxepin (Sinequan, Silenor, Prudoxin, Zonalon)		0	CYP2D6	60	CYP2C19	40		0		0		0
83	neuro-psychiatric	pain management	duloxetine (Cymbalta)		0	CYP2D6	50		0		0	CYP1A2	50		0
84	neuro-psychiatric		escitalopram (Lexapro)	CYP3A4/5	10	CYP2D6	30	CYP2C19	60		0		0		0
85	neuro-psychiatric		fluoxetine (Prozac)	CYP3A4/5	10	CYP2D6	70		0	CYP2C9	20		0		0
86	neuro-psychiatric		haloperidol (Haldol)	CYP3A4/5	50	CYP2D6	50		0		0		0		0
87	neuro-psychiatric		iloperidine (Fanapt)	CYP3A4/5	50	CYP2D6	50		0		0		0		0
88	neuro-psychiatric		imipramine (Tofranil)		0	CYP2D6	40	CYP2C19	60		0		0		0
89	neuro-psychiatric		lurasidone (Latuda)	CYP3A4/5	100		0		0		0		0		0
90	neuro-psychiatric		midazolam (Versed)	CYP3A4/5	100		0		0		0		0		0
91	neuro-psychiatric		mirtazapine (Remeron)	CYP3A4/5	50	CYP2D6	25		0		0	CYP1A2	25		0
92	neuro-psychiatric		nefazodone (Serzone)	CYP3A4/5	100		0		0		0		0		0
93	neuro-psychiatric		nortriptyline (Aventyl,Pamelor)		0	CYP2D6	100		0		0		0		0
94	neuro-psychiatric		olanzapine (Zyprexa)		0	CYP2D6	25		0		0	CYP1A2	75		0

FIG 2c

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
95	neuro-psychiatric		paroxetine (Paxil)	CYP3A4/5	15	CYP2D6	75	CYP2C19	3		0	CYP1A2	7		0
96	neuro-psychiatric		perphenazine (Trilafon)	CYP3A4/5	35	CYP2D6	50	CYP2C19	7		0	CYP1A2	8		0
97	neuro-psychiatric		phenobarbital		0		0	CYP2C19	40	CYP2C9	60		0		0
98	neuro-psychiatric		phenytoin (Dilantin)	CYP3A4/5	10		0	CYP2C19	35	CYP2C9	55		0		0
99	neuro-psychiatric		promazine (Sparine)	CYP3A4/5	50		0		0		0	CYP1A2	50		0
100	neuro-psychiatric		quetiapine (Seroquel)	CYP3A4/5	80	CYP2D6	20		0		0		0		0
101	neuro-psychiatric		risperidone (Risperdal)	CYP3A4/5	5	CYP2D6	95		0		0		0		0
102	neuro-psychiatric		sertraline (Zoloft)	CYP3A4/5	20	CYP2D6	5	CYP2C19	40	CYP2C9	5		0	CYP2B6	30
103	neuro-psychiatric		tacrine (Cognex)		0	CYP2D6	30		0		0	CYP1A2	70		0
104	neuro-psychiatric		thioridazine (Mellaril)	CYP3A4/5	33	CYP2D6	34		0		0	CYP1A2	33		0
105	neuro-psychiatric	pain management	tiagabine (Gabitril)	CYP3A4/5	90	CYP2D6	3	CYP2C19	2		0	CYP1A2	5		0
106	neuro-psychiatric		trazodone (Oleptro)	CYP3A4/5	90	CYP2D6	10		0		0		0		0
107	neuro-psychiatric		triazolam (Halcion)	CYP3A4/5	100		0		0		0		0		0
108	neuro-psychiatric		venlafaxine (Effexor)	CYP3A4/5	10	CYP2D6	80	CYP2C19	10		0		0		0
109	neuro-psychiatric		vilazodone (Viibryd)	CYP3A4/5	90	CYP2D6	5	CYP2C19	5		0		0		0
110	neuro-psychiatric		ziprasidone (Geodon)	CYP3A4/5	95		0		0		0	CYP1A2	5		0
111	neuro-psychiatric		zolpidem (Ambien)	CYP3A4/5	80		0		0	CYP2C9	20		0		0
112	neuro-psychiatric		zonisamide (Zonegran)	CYP3A4/5	100		0		0		0		0		0
113	oncology	immunological	cyclophosphamide (Cytoxan)+ +	CYP3A4/5	5		0		0		0		0	CYP2B6	95
114	oncology		docetaxel (Taxotere)	CYP3A4/5	100		0		0		0		0		0
115	oncology		ifosfamide	CYP3A4/5	60		0		0		0		0	CYP2B6	40
116	oncology		tamoxifen + + (Nolvadex)	CYP3A4/5	20	CYP2D6	75		0	CYP2C9	5		0		0
117	oncology		vincristine (Vincasar, Oncovin)	CYP3A4/5	100		0		0		0		0		0
118	other		caffeine		0		0		0		0	CYP1A2	100		0
119	other		sildinafil (Viagra)	CYP3A4/5	80		0		0	CYP2C9	20		0		0
120	other		theophylline		0		0		0		0	CYP1A2	100		0
121	pain management		alfentanil (Alfenta)	CYP3A4/5	100		0		0		0		0		0
122	pain management		carisoprodol + + (Soma)		0		0	CYP2C19	100		0		0		0
123	pain management		celecoxib (Celebrex)		0	CYP2D6	10		0	CYP2C9	90		0		0
124	pain management		codeine + +	CYP3A4/5	10	CYP2D6	90		0		0		0		0
125	pain management		cyclobenzaprine (Flexaril)	CYP3A4/5	45	CYP2D6	5		0		0	CYP1A2	50		0
126	pain management		fentanyl (Actiq, Duragesic, Sublimaze)	CYP3A4/5	100		0		0		0		0		0
127	pain management		hydrocodone + +	CYP3A4/5	10	CYP2D6	90		0		0		0		0
128	pain management		ibuprofen (Advil, Motrin)	CYP3A4/5	5	CYP2D6		5	CYP2C19	5	CYP2C9	80		0	CYP2B6	5
129	pain management		lidocaine (xylocaine, various brands)	CYP3A4/5	20		0		0		0	CYP1A2	80			0
130	pain management		meperidine (Demerol)	CYP3A4/5	30		0	CYP2C19	10		0			0	CYP2B6	60
131	pain management	neuro-psychiatric	methadone	CYP3A4/5	40	CYP2D6		5	CYP2C19	10	CYP2C9	5		0	CYP2B6	40
132	pain management		naproxen (Aleve)		0		0		0	CYP2C9	60	CYP1A2	40			0
133	pain management		oxycodone + + (Oxycontin)	CYP3A4/5	60	CYP2D6	40		0		0		0			0
134	pain management		ropivacaine (Naropin)	CYP3A4/5	10		0		0		0	CYP1A2	90			0
135	pain management		tapentadol (Nucynta)		0		0	CYP2C19	50	CYP2C9	50		0			0
136	pain management		tizanidine (Zanaflex)	CYP3A4/5	10		0		0		0	CYP1A2	90			0
137	pain management		tramadol + + (Ultram)	CYP3A4/5	15	CYP2D6	70		0		0			0	CYP2B6	15
138	pain management		zolmitriptan (Zomig)		0		0		0		0	CYP1A2	100			0
139	steroids		estradiol	CYP3A4/5	50		0		0		0	CYP1A2	50			0
140	steroids		progesterone	CYP3A4/5	40		0	CYP2C19	10	CYP2C9	50			0		0
141	steroids		testosterone	CYP3A4/5	100		0		0		0			0		0

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15	Metabolism Notes	General Metabolic Relevance Adjustment Factor	Drug Score Metabolism Component (MCV)	Response / Adverse Drug Reaction Gene	Drug Score Response / Adverse Effect Component (RCV)	Overall Composite Drug Score	Qualitative Importance Assignment	*% is a relative measure of gene importance*				
16		1	1.4		0	1.4	GREEN					
17		1	1.44		0	1.44	GREEN					
18		1	1.4		0	1.4	GREEN	Phenotype color designation: red=10 , yellow=5, and green =1				
19		1	1.76		0	1.76	YELLOW	Drug Score Metabolism Component = (PCD value Gene 1 x % gene importance Gene1) + (PCD value				
20		1	2.84		0	2.84	YELLOW					
21		1	1.6		0	1.6	YELLOW	Maximum of 10 and minimum of 1				
22		1	1.4		0	1.4	GREEN	Red for ≥ 5.1; Yellow for < 5.1 >1.5; Green for ≤ 1.5				
23		1	1.4		0	1.4	GREEN					
24		1	1.4		0	1.4	GREEN	Drug color is the worse of the Drug color from the metabolism score or the color of the response/AE				
25		1	1.4		0	1.4	GREEN					
26		1	1.4	SLCO1B1	10	10	RED					
27		1	4.34		0	4.34	YELLOW					
28		1	4.612		0	4.612	YELLOW					
29		1	1.4		0	1.4	GREEN					
30		1	1.4		0	1.4	GREEN					
31		1	1.4		0	1.4	GREEN					
32		1	5		0	5	YELLOW					
33		1	1.08	SLCO1B1	10	10	RED					
34		1	1		0	1	GREEN					
35		1	1.04		0	1.04	GREEN					
36		1	1.32		0	1.32	GREEN					
37		1	2.48		0	2.48	YELLOW					
38		1	1.2		0	1.2	GREEN					
39		1	1.4	SLCO1B1	10	10	RED					
40		1	5		0	5	YELLOW					
41		1	5		0	5	YELLOW					
42		1	1.4		0	1.4	GREEN					
43		1	1.4		0	1.4	GREEN					
44		1	1.4		0	1.4	GREEN					
45	excreted unchanged	0	0	SLCO1B1	10	10	RED					
46		1	3.2		0	3.2	YELLOW					
47		1	3.68		0	3.68	YELLOW					
48		1	3.2		0	3.2	YELLOW					

Fig 29

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
49		1	1.4		0	1.4	GREEN					
50		1	1.4		0	1.4	GREEN					
51	but is only 10% metabolized	0.2	1	SLCO1B1	10	10	RED					
52		1	1.4	SLCO1B1	10	10	RED					
53		1	1.4		0	1.4	GREEN					
54	little systemic absorption makes PGx of little clinical importance in opthalmic use	1	5		0	5	YELLOW					
55		1	1.4		0	1.4	GREEN					
56		1	1	VKORC1	5	5	YELLOW					
57		1	4.64		0	4.64	YELLOW					
58		1	4.64		0	4.64	YELLOW					
59		1	4.64		0	4.64	YELLOW					
60		1	4.64		0	4.64	YELLOW					
61		1	3.56		0	3.56	YELLOW					
62		1	1.4		0	1.4	GREEN					
63	not metabolized by 3A4 but is a dose-dependent inducer of 3A4	0.5	1.4		0	1.4	GREEN					
64		1	1.4		0	1.4	GREEN					
65		1	1.12		0	1.12	GREEN					
66	50% metabolized and 50% excreted unchanged	0.8	1.4		0	1.4	GREEN					
67		1	5		0	5	YELLOW					
68		1	4.24		0	4.24	YELLOW					
69		1	3.2		0	3.2	YELLOW					
70		1	2.2		0	2.2	YELLOW					
71		1	4.64		0	4.64	YELLOW					
72	Not metabolized by 2D6 but is an inhibitor of 2D6	1	2.2		0	2.2	YELLOW					
73		1	1.4		0	1.4	GREEN					
74		1	1.4		0	1.4	GREEN					
75		1	3.92		0	3.92	YELLOW					
76	6 of 7 non-responders are UM for 2C19 or 2D6	1	4.64	SLC6A4	5	5	YELLOW					
77		1	4.62		0	4.62	YELLOW					
78		1	1.66		0	1.66	YELLOW					
79		1	5		0	5	YELLOW					
80	CYP metabolism accounts for only 5-10% of metabolism and is of little clinical relevance	0.2	1.76		0	1.76	YELLOW					
81		1	2.84		0	2.84	YELLOW					
82		1	5		0	5	YELLOW					
83		1	3		0	3	YELLOW					
84		1	4.64	SLC6A4	5	5	YELLOW					
85		1	3.84	SLC6A4	5	5	YELLOW					
86		1	3.2		0	3.2	YELLOW					
87		1	3.2		0	3.2	YELLOW					
88		1	5		0	5	YELLOW					
89		1	1.4		0	1.4	GREEN					
90		1	1.4		0	1.4	GREEN					
91		1	2.2		0	2.2	YELLOW					
92		1	1.4		0	1.4	GREEN					
93	Only TCA that has a defined therapeutic window via plasma concentration.	1	5		0	5	YELLOW					
94		1	2		0	2	YELLOW					

FIG 2e

SHEET 15/23

FIG 2F

	P	Q	R	S	T	U	V	W	X	Y	Z	AA
95		1	4.18	SLC6A4	5	5	YELLOW					
96		1	3.42		0	3.42	YELLOW					
97	50% is excreted unchanged.	0.8	2.6		0	2.6	YELLOW					
98		1	2.44		0	2.44	YELLOW					
99		1	1.2		0	1.2	GREEN					
100		1	2.12		0	2.12	YELLOW					
101		1	4.82		0	4.82	YELLOW					
102		1	2.38	SLC6A4	5	5	YELLOW					
103		1	2.2		0	2.2	YELLOW					
104		1	2.492		0	2.492	YELLOW					
105		3	1.56		0	1.56	YELLOW					
106		1	1.76		0	1.76	YELLOW					
107		1	1.4		0	1.4	GREEN					
108		1	4.64		0	4.64	YELLOW					
109		1	1.76	SLC6A4	5	5	YELLOW					
110		1	1.38		0	1.38	GREEN					
111		1	1.32		0	1.32	GREEN					
112		1	1.4		0	1.4	GREEN					
113		1	1.02		0	1.02	GREEN					
114		1	1.4		0	1.4	GREEN					
115		1	1.24		0	1.24	GREEN					
116		1	4.08		0	4.08	YELLOW					
117		1	1.4		0	1.4	GREEN					
118		1	1		0	1	GREEN					
119		1	1.32		0	1.32	GREEN					
120		1	1		0	1	GREEN					
121		1	1.4	OPRM1	10	10	RED					
122		1	5		0	5	YELLOW					
123		1	1.4		0	1.4	GREEN					
124		1	4.64	OPRM1	10	10	RED					
125		1	1.38		0	1.38	GREEN					
126		1	1.4	OPRM1	10	10	RED					
127		1	4.64	OPRM1	10	10	RED					
128		1	1.42		0	1.42	GREEN					
129		1	1.08		0	1.08	GREEN					
130		1	1.52	OPRM1	10	10	RED					
131		1	1.76	OPRM1	10	10	RED					
132		1	1		0	1	GREEN					
133		1	2.84	OPRM1	10	10	RED					
134		1	1.04		0	1.04	GREEN					
135	primarily metabolized by non-cyp enzymes. Adjust metabolic score by 40%.	0.7	3	OPRM1	10	10	RED					
136		1	1.04		0	1.04	GREEN					
137		1	3.86	OPRM1	10	10	RED					
138		1	1		0	1	GREEN					
139		1	1.2		0	1.2	GREEN					
140		1	1.56		0	1.56	YELLOW					
141		1	1.4		0	1.4	GREEN					

FIG 29

	AB	AC	AD	AE
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15				
16				
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19	gene 2 x % gene importance Gene 2) +.....			
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23				
24	gene if applicable			
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FIG. 2h

	A	B	C	D	E
1	Major Classification	Additional Major Classification	Sub-Classification	Drug	Color in Example Report
2	anti-infectives			clarithromycin (Biaxin)	GREEN
3	anti-infectives			efavirenza (Sustiva)	GREEN
4	anti-infectives			erythromycin (E-Mycin)	GREEN
5	anti-infectives			indinavir (Crixivan)	YELLOW
6	anti-infectives			nelfinavir (Viracept)	YELLOW
7	anti-infectives			ritonavir (Norvir)	YELLOW
8	anti-infectives			saquinavir (Invirase)	GREEN
9	anti-infectives			telithromycin (Ketek)	GREEN
10	cardiovascular		Antianginal	ranolazine (Ranexa)	GREEN
11	cardiovascular		Antiarrhythmic	amiodarone (Cordarone)	GREEN
12	cardiovascular		Antiarrhythmic	dofetilide (Tikosyn)	GREEN
13	cardiovascular		Antiarrhythmic	flecainide (Tambocor)	YELLOW
14	cardiovascular		Antiarrhythmic	propafenone (Rythmol)	YELLOW
15	cardiovascular		Antiarrhythmic	quinidine (Various brands)	YELLOW
16	cardiovascular		Anticoagulant	clopidogrel ÷÷ (Plavix)	YELLOW
17	cardiovascular		Anticoagulant	rivaroxaban (Xarelto)	GREEN
18	cardiovascular		Anticoagulant	ticargelor (Brilinta)	GREEN
19	cardiovascular		Anticoagulant	warfarin (Coumadin)	YELLOW
20	cardiovascular		Anti-Diabetic Drug	glimepiride (Amaryl)	GREEN
21	cardiovascular		Anti-Diabetic Drug	glipizide (Glucotrol)	GREEN
22	cardiovascular		Anti-Diabetic Drug	glyburide (Diabeta)	GREEN
23	cardiovascular		Anti-Diabetic Drug	tolbutamide (Orinase)	GREEN
24	cardiovascular		Anti-Hypertensive	amlodipine (Norvasc)	GREEN
25	cardiovascular		Anti-Hypertensive	carvedilol (Coreg)	YELLOW
26	cardiovascular		Anti-Hypertensive	diltiazem (Cardizem)	GREEN
27	cardiovascular		Anti-Hypertensive	felodipine (Plendil)	GREEN
28	cardiovascular		Anti-Hypertensive	lercanidipine (Zanidip)	YELLOW
29	cardiovascular		Anti-Hypertensive	losartan +÷ (Cozaar)	GREEN
30	cardiovascular		Anti-Hypertensive	metoprolol (Lopressor, Toprol)	YELLOW
31	cardiovascular		Anti-Hypertensive	nebivolol (Bystolic)	YELLOW
32	cardiovascular		Anti-Hypertensive	nifedipine (Adalat, Procardia)	GREEN
33	cardiovascular		Anti-Hypertensive	nisoldipine (Sular)	GREEN
34	cardiovascular		Anti-Hypertensive	nitrendipine	GREEN
35	cardiovascular		Anti-Hypertensive	propanolol (Inderal)	YELLOW
36	cardiovascular		Anti-Hypertensive	timolol (Blocadren)	YELLOW
37	cardiovascular		Cholesterol-Lowering Drug	atorvastatin (Lipitor, Caduet)	RED
38	cardiovascular		Cholesterol-Lowering Drug	fluvastatin (Lescol)	RED
39	cardiovascular		Cholesterol-Lowering Drug	lovastatin (Mevacor)	RED
40	cardiovascular		Cholesterol-Lowering Drug	pravastatin (Pravachol)	RED
41	cardiovascular		Cholesterol-Lowering Drug	rosuvastatin (Crestor)	RED
42	cardiovascular		Cholesterol-Lowering Drug	simvastatin (Zocor)	RED
43	gastrointestinal			esomeprazole (Nexium)	YELLOW
44	gastrointestinal			lansoprazole (Prevacid)	YELLOW
45	gastrointestinal			omeprazole (Prilosec)	YELLOW
46	gastrointestinal			pantoprazole (Protonix)	YELLOW
47	gastrointestinal			rabeprazole (Aciphex)	YELLOW
48	immunological			cyclosporine (Gengraf)	GREEN

FIG. 2c'

	A	B	C	D	E
49	immunological			hydrocortisone	GREEN
50	immunological			tacrolimus (Prograf)	GREEN
51	immunological			zafirlukast (Accolate)	GREEN
52	neuro-psychiatric		ADHD Drug / Stimulant	amphetamine (Adderall)	YELLOW
53	neuro-psychiatric		ADHD Drug / Stimulant	atomoxetine (Strattera)	YELLOW
54	neuro-psychiatric		Anticonvulsant	carbamazepine (Various brands)	GREEN
55	neuro-psychiatric		Anticonvulsant	phenytoin (Dilantin)	YELLOW
56	neuro-psychiatric	pain management	Anticonvulsant	tiagabine (Gabitril)	YELLOW
57	neuro-psychiatric		Anticonvulsant	zonisamide (Zonegran)	GREEN
58	neuro-psychiatric		Antidepressant	amitriptyline (Elavil)	YELLOW
59	neuro-psychiatric		Antidepressant	buproprion	YELLOW
60	neuro-psychiatric		Antidepressant	citalopram (Celexa)	YELLOW
61	neuro-psychiatric		Antidepressant	clomipramine (Anafranil)	YELLOW
62	neuro-psychiatric		Antidepressant	desipramine (Norpramin)	YELLOW
63	neuro-psychiatric		Antidepressant	desvenlafaxine (Pristiq)	YELLOW
64	neuro-psychiatric		Antidepressant	doxepin (Sinequan, Silenor, Prudoxin, Zonalon)	YELLOW
65	neuro-psychiatric	pain management	Antidepressant	duloxetine (Cymbalta)	YELLOW
66	neuro-psychiatric		Antidepressant	escitalopram (Lexapro)	YELLOW
67	neuro-psychiatric		Antidepressant	fluoxetine (Prozac)	YELLOW
68	neuro-psychiatric		Antidepressant	imipramine (Tofranil)	YELLOW
69	neuro-psychiatric		Antidepressant	mirtazapine (Remeron)	YELLOW
70	neuro-psychiatric		Antidepressant	nefazodone (Serzone)	GREEN
71	neuro-psychiatric		Antidepressant	nortriptyline (Aventyl,Pamelor)	YELLOW
72	neuro-psychiatric		Antidepressant	paroxetine (Paxil)	YELLOW
73	neuro-psychiatric		Antidepressant	sertraline (Zoloft)	YELLOW
74	neuro-psychiatric		Antidepressant	trazodone (Oleptro)	YELLOW
75	neuro-psychiatric		Antidepressant	venlafaxine (Effexor)	YELLOW
76	neuro-psychiatric		Antidepressant	vilazodone (Viibryd)	YELLOW
77	neuro-psychiatric		Antipsychotic	aripiprazole (Abilify)	YELLOW
78	neuro-psychiatric		Antipsychotic	asenapine (Saphris)	YELLOW
79	neuro-psychiatric		Antipsychotic	chlorpromazine (Thorazine)	YELLOW
80	neuro-psychiatric		Antipsychotic	clozapine (Clozaril)	YELLOW
81	neuro-psychiatric		Antipsychotic	haloperidol (Haldol)	YELLOW
82	neuro-psychiatric		Antipsychotic	lloperidine (Fanapt)	YELLOW
83	neuro-psychiatric		Antipsychotic	lurasidone (Latuda)	GREEN
84	neuro-psychiatric		Antipsychotic	olanzapine (Zyprexa)	YELLOW
85	neuro-psychiatric		Antipsychotic	perphenazine (Trilafon)	YELLOW
86	neuro-psychiatric		Antipsychotic	promazine (Sparine)	GREEN
87	neuro-psychiatric		Antipsychotic	quetiapine (Seroquel)	YELLOW
88	neuro-psychiatric		Antipsychotic	risperidone (Risperdal)	YELLOW
89	neuro-psychiatric		Antipsychotic	thioridazine (Mellaril)	YELLOW
90	neuro-psychiatric		Antipsychotic	ziprasidone (Geodon)	GREEN
91	neuro-psychiatric		Anxiolytic	alprazolam (Xanax)	GREEN
92	neuro-psychiatric		Anxiolytic	buspirone (BuSpar)	GREEN
93	neuro-psychiatric		Anxiolytic	diazepam (Valium)	YELLOW
94	neuro-psychiatric		Anxiolytic	midazolam (Versed)	GREEN
95	neuro-psychiatric		Anxiolytic	phenobarbital	YELLOW
96	neuro-psychiatric		Anxiolytic	triazolam (Halcion)	GREEN

Fig. 2J

	A	B	C	D	E
97	neuro-psychiatric		Anxiolytic	zolpidem (Ambien)	GREEN
98	neuro-psychiatric		Procognitive Drug	tacrine (Cognex)	YELLOW
99	oncology	immunological		cyclophosphamide (Cytoxan)+ +	GREEN
100	oncology			docetaxel (Taxotere)	GREEN
101	oncology			ifosfamide	GREEN
102	oncology			tamoxifen + + (Nolvadex)	YELLOW
103	oncology			vincristine (Vincasar, Oncovin)	GREEN
104	other			caffeine	GREEN
105	other			sildnafil (Viagra)	GREEN
106	other			theophylline	GREEN
107	pain management			alfentanil (Alfenta)	RED
108	pain management			carisoprodol + + (Soma)	YELLOW
109	pain management			celecoxib (Celebrex)	GREEN
110	pain management			codeine + +	RED
111	pain management			cyclobenzaprine (Flexaril)	GREEN
112	pain management			fentanyl (Actiq, Duragesic, Sublimaze)	RED
113	pain management			hydrocodone + +	RED
114	pain management			ibuprofen (Advil, Motrin)	GREEN
115	pain management			lidocaine (xylocaine, various brands)	GREEN
116	pain management			meperidine (Demerol)	RED
117	pain management	neuro-psychiatric		methadone	RED
118	pain management			naproxen (Aleve)	GREEN
119	pain management			oxycodone + + (Oxycontin)	RED
120	pain management			ropivacaine (Naropin)	GREEN
121	pain management			tapentadol (Nucynta)	RED
122	pain management			tizanidine (Zanaflex)	GREEN
123	pain management			tramadol + + (Ultram)	RED
124	pain management			zolmitriptan (Zomig)	GREEN
125	steroids			estradiol	GREEN
126	steroids			progesterone	YELLOW
127	steroids			testosterone	GREEN

FIG. 2K

	A	B	C	D	E
1	1 (1)	budesonide	12,849	60.65%	Stats
2	2 (1)	acetaminophen/hydrocodone	9,155	1.25%	Stats
3	3	ProAir HFA	7,730	9.66%	Stats
4	4 ()	ONE TOUCH ULTRA	6,196	Not Available	Stats
5	5 ()	levothyroxine	5,997	Not Available	Stats
6	6 ()	Ventolin HFA	5,505	Not Available	Stats
7	7 (1)	Nexium	5,298	-2.75%	Stats
8	8 (1)	Advair Diskus	5,263	0.21%	Stats
9	9 (1)	Lantus Solostar	5,059	1.95%	Stats
10	10 (5)	Cymbalta	4,595	-25.41%	Stats
11	11 (2)	Lantus	4,534	-4.37%	Stats
12	12 (1)	enoxaparin	4,422	15.55%	Stats
13	13 (1)	Crestor	3,656	1.58%	Stats
14	14	Levemir	3,382	0.86%	Stats
15	15 (1)	metoprolol	3,097	4.77%	Stats
16	16 (3)	Spiriva	3,056	-9.61%	Stats
17	17 (2)	NovoLog FlexPen	3,030	1.13%	Stats
18	18	Humalog	2,664	1.25%	Stats
19	19	Novolog	2,508	-2.90%	Stats
20	20 (1)	Abilify	2,370	0.47%	Stats
21	21 (1)	Synthroid	2,286	-4.79%	Stats
22	22	Januvia	2,168	-2.78%	Stats
23		Merck & Co., Inc.			
24	23	Nasonex	2,105	-1.41%	Stats
25		Merck & Co., Inc.			
26	24	Lyrica	2,031	1.10%	Stats
27		Pfizer Inc			
28	25 (1)	Symbicort	2,027	7.48%	Stats
29		AstraZeneca Pharmaceuticals			
30	26 ()	Tamiflu	1,909	Not Available	Stats
31		Roche Pharmaceuticals			
32	27 (2)	Zetia	1,888	-3.33%	Stats
33		Merck & Co., Inc.			
34	28 (1)	Namenda	1,704	-9.12%	Stats
35		Forest Pharmaceuticals, Inc			
36	29 (4)	Flovent HFA	1,678	7.77%	Stats
37		GlaxoSmithKline			
38	30 (2)	Diovan	1,661	-3.65%	Stats
39		Novartis Corporation			
40	31 (2)	Suboxone	1,657	-3.16%	Stats
41		Reckitt Benckiser Pharmaceuticals Inc.			
42	32 (1)	fenofibrate	1,656	3.18%	Stats
43		Generic			
44	33 (3)	Remicade	1,568	-4.85%	Stats
45		Centocor Ortho Biotech, Inc			
46	34 (2)	AndroGel	1,563	-1.76%	Stats
47		AbbVie, Inc.			
48	35	Restasis	1,496	3.60%	Stats
49		Allergan, Inc			
50	36 ()	lidocaine	1,438	Not Available	Stats
51		Generic			
52	37 (3)	Dexilant	1,420	-2.27%	Stats
53		Takeda Pharmaceuticals North America, Inc			
54	38 (2)	Benicar	1,355	-4.10%	Stats
55		Daiichi Sankyo			
56	39 (2)	Lovaza	1,336	-5.05%	Stats
57		GlaxoSmithKline			
58	40 (2)	Xarelto	1,172	15.58%	Stats
59		Ortho-McNeil-Janssen Pharmaceuticals, Inc.			

	A	B	C	D	E
60	41 (2)	Humalog KwikPen	1,170	3.91%	Stats
61	42 (2)	OxyContin	1,048	-1.87%	Stats
62	43 (2)	VESIcare	1,018	0.39%	Stats
63		Astellas Pharma US			
64	44 (1)	Enbrel	954	-1.14%	Stats
65		Amgen Inc.			
66	45	Celebrex	950	1.71%	Stats
67		Pfizer Inc			
68	46 (3)	Combivent Respimat	947	11.15%	Stats
69	47 (3)	Vytorin	888	-7.40%	Stats
70		Merck & Co., Inc.			
71	48	Cialis	872	1.99%	Stats
72		Eli Lilly and Company			
73	49 (2)	Janumet	865	-3.46%	Stats
74		Merck & Co., Inc.			
75	50	Pradaxa	819	-3.53%	Stats
76		Boehringer Ingelheim Pharmaceuticals, Inc			
77	51 (1)	doxycycline	798	2.57%	Stats
78		Generic			
79	52 (1)	methylphenidate	793	10.45%	Stats
80		Generic			
81	53 (2)	Evista	776	-4.55%	Stats
82		Eli Lilly and Company			
83	54	Vyvanse	775	8.70%	Stats
84		Shire US Inc			
85	55	amphetamine/dextroamphetamine	739	5.27%	Stats
86		Generic			
87	56 (1)	Humira	669	1.52%	Stats
88		AbbVie, Inc.			
89	57 (2)	Victoza	639	3.73%	Stats
90		Novo Nordisk Inc.			
91	58	Epogen	631	1.12%	Stats
92		Amgen Inc.			
93	59 ()	divalproex sodium	615	Not Available	Stats
94		Generic			
95	60 (1)	Rituxan	545	1.30%	Stats
96		Genentech, Inc			
97	61 (1)	Truvada	532	-0.56%	Stats
98		Gilead Sciences, Inc.			
99	62 (1)	Avastin	455	0.22%	Stats
100		Genentech, Inc			
101	63 (3)	Atripla	428	-0.23%	Stats
102		Gilead Sciences, Inc.			
103	64 (3)	Viagra	398	-1.00%	Stats
104		Pfizer Inc			
105	65 (1)	Rebif	395	-12.61%	Stats
106	66 (2)	Seroquel XR	378	0.80%	Stats
107		AstraZeneca Pharmaceuticals			
108	67 (2)	Renvela	376	11.90%	Stats
109		Genzyme Corporation			
110	68 (4)	Sensipar	339	10.78%	Stats
111		Amgen Inc.			
112	69 (2)	Orencia	328	0.31%	Stats
113		Bristol-Myers Squibb Company			
114	70	Neulasta	308	-6.10%	Stats
115		Amgen Inc.			
116	71 (3)	Xolair	293	-1.68%	Stats
117	72 (1)	Lunesta	284	-6.58%	Stats
118		Sunovion Pharmaceuticals Inc.			
119	73 (4)	Adderall XR	282	1.81%	Stats

	A	B	C	D	E
120	73 (4)	Shire US Inc	282	1.81%	Stats
121	74 (4)	Lucentis	275	0.36%	Stats
122		Genentech, Inc			
123	75 (5)	Prezista	266	3.10%	Stats
124		Janssen Pharmaceuticals, Inc			
125	76 (3)	Isentress	263	-0.38%	Stats
126		Merck & Co., Inc.			
127	77 (2)	Procrit	261	-10.00%	Stats
128		Janssen Pharmaceuticals, Inc			
129	78 (4)	Reyataz	231	-2.53%	Stats
130		Bristol-Myers Squibb Company			
131	79 (2)	Aranesp	217	-11.43%	Stats
132		Amgen Inc.			
133	80 (4)	Alimta	204	7.94%	Stats
134		Eli Lilly and Company			
135	81 (2)	Copaxone	202	-5.16%	Stats
136		Teva Pharmaceuticals			
137	82 (7)	Zostavax	182	20.53%	Stats
138		Merck & Co., Inc.			
139	83 (2)	Prevnar 13	180	6.51%	Stats
140		Wyeth			
141	84 (4)	Invega Sustenna	170	9.68%	Stats
142		Janssen Pharmaceuticals, Inc			
143	85 (1)	Herceptin	167	3.09%	Stats
144		Genentech, Inc			
145	86 ()	Synagis	157	Not Available	Stats
146		MedImmune, Inc			
147	87	Neupogen	147	-5.77%	Stats
148		Amgen Inc.			
149	88 (2)	Xgeva	134	3.08%	Stats
150		Amgen Inc.			
151	89 (2)	Betaseron	116	-3.33%	Stats
152		Bayer Healthcare Pharmaceuticals			
153	90 (2)	Tecfidera	113	16.49%	Stats
154		Biogen Idec			
155	91 ()	Complera	107	Not Available	Stats
156		Gilead Sciences, Inc.			
157	92 ()	Stribild	99	Not Available	Stats
158	93	Gleevec	81	3.85%	Stats
159		Novartis Corporation			
160	94	Avonex	70	-6.67%	Stats
161		Biogen Idec			
162	95	Gilenya	64	4.92%	Stats
163		Novartis Corporation			
164	96	Xeloda	60	1.69%	Stats
165		Roche Pharmaceuticals			
166	97	Avonex Pen	52	8.33%	Stats
167		Biogen Idec			
168	98	Zytiga	36	5.88%	Stats
169		Centocor Ortho Biotech, Inc			
170	99	Stelara	30	11.11%	Stats
171	100	Afinitor	24	Not Available	Stats
172		Novartis Corporation			