



PGX EHR DESIGN AND USAGE

Jen Miller, Sr Clinical Systems Analyst
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Children's Minnesota

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11

Genes



30

Drugs



262

Alert variations (gene/drug/phenotype)

10

Create Problem Rules

PGx Results

- Manual Data Entry
 - Default suggestions
 - Text Overrides
 - Rules auto-add problems

✓ Pharmacogenomics

✗ CACNA1S Results

✗ CEP72 Results

✗ CYP2B6 Results

✗ CYP2C9 Results

✗ CYP2C19 Results

✗ CYP2D6 Results

✗ CYP3A5 Results

✗ DPYD Results

✗ MTHFR Results

✗ NUDT15 Results

✗ RYR1 Results

✗ TPMT Results

✗ UGT1A1 Results

Pharmacogenomics UGT1A1 Results

Laboratory

PharmacoScan (RPRD)
 NT-Panel (RPRD)
 Genesight (Assurex)
 RightMed (OneDme)
 DMET (MCW)
 Prometheus
 Other:

UGT1A1 Genotype

<input checked="" type="radio"/> *1/*1	<input type="radio"/> *6/*28+60+93	<input type="radio"/> *27/*80	<input type="radio"/> *28/*60	<input type="radio"/> *28+60+80+93/*28+60+80+93	<input type="radio"/> *37/*60
<input type="radio"/> *1/*6	<input type="radio"/> *6/*28+60+80+93	<input type="radio"/> *27+28+60+93/*27+28+60+93	<input type="radio"/> *28/*60+80	<input type="radio"/> *28+60+80+93/*36	<input type="radio"/> *37/*60+80
<input type="radio"/> *1/*27	<input type="radio"/> *6/*36	<input type="radio"/> *27+28+60+93/*28	<input type="radio"/> *28/*80	<input type="radio"/> *28+60+80+93/*36+60	<input type="radio"/> *37/*80
<input type="radio"/> *1/*27+28+60+93	<input type="radio"/> *6/*36+60	<input type="radio"/> *27+28+60+93/*28+60	<input type="radio"/> *28+60/*28+60+93	<input type="radio"/> *28+60+80+93/*37	<input type="radio"/> *60/*60
<input type="radio"/> *1/*28	<input type="radio"/> *6/*37	<input type="radio"/> *27+28+60+93/*28+60+93	<input type="radio"/> *28+60/*28+60+80+93	<input type="radio"/> *28+60+80+93/*60	<input type="radio"/> *60/*60+80
<input type="radio"/> *1/*28+60	<input type="radio"/> *6/*60	<input type="radio"/> *27+28+60+93/*28+60+80+93	<input type="radio"/> *28+60/*36	<input type="radio"/> *28+60+80+93/*60+80	<input type="radio"/> *60/*80
<input type="radio"/> *1/*28+60+93	<input type="radio"/> *6/*60+80	<input type="radio"/> *27+28+60+93/*36	<input type="radio"/> *28+60/*36+60	<input type="radio"/> *28+60+80+93/*80	<input type="radio"/> *60+80/*60+80
<input type="radio"/> *1/*28+60+80+93	<input type="radio"/> *6/*80	<input type="radio"/> *27+28+60+93/*36+60	<input type="radio"/> *28+60/*37	<input type="radio"/> *36/*36	<input type="radio"/> *60+80/*80
<input type="radio"/> *1/*36	<input type="radio"/> *27/*27	<input type="radio"/> *27+28+60+93/*37	<input type="radio"/> *28+60/*60	<input type="radio"/> *36/*36+60	<input type="radio"/> *80/*80
<input type="radio"/> *1/*36+60	<input type="radio"/> *27/*27+28+60+93	<input type="radio"/> *27+28+60+93/*60	<input type="radio"/> *28+60/*60+80	<input type="radio"/> *36/*37	<input type="radio"/> Other:
<input type="radio"/> *1/*37	<input type="radio"/> *27/*28	<input type="radio"/> *27+28+60+93/*60+80	<input type="radio"/> *28+60/*80	<input type="radio"/> *36/*60	
<input type="radio"/> *1/*60	<input type="radio"/> *27/*28+60	<input type="radio"/> *27+28+60+93/*80	<input type="radio"/> *28+60+93/*28+60+93	<input type="radio"/> *36/*60+80	
<input type="radio"/> *1/*60+80	<input type="radio"/> *27/*28+60+93	<input type="radio"/> *28/*28	<input type="radio"/> *28+60+93/*28+60+80+93	<input type="radio"/> *36/*80	
<input type="radio"/> *1/*80	<input type="radio"/> *27/*28+60+80+93	<input type="radio"/> *28/*28+60	<input type="radio"/> *28+60+93/*36	<input type="radio"/> *36+60/*36+60	
<input type="radio"/> *6/*6	<input type="radio"/> *27/*36	<input type="radio"/> *28/*28+60+93	<input type="radio"/> *28+60+93/*36+60	<input type="radio"/> *36+60/*37	
<input type="radio"/> *6/*27	<input type="radio"/> *27/*36+60	<input type="radio"/> *28/*28+60+80+93	<input type="radio"/> *28+60+93/*37	<input type="radio"/> *36+60/*60	
<input type="radio"/> *6/*27+28+60+93	<input type="radio"/> *27/*37	<input type="radio"/> *28/*36	<input type="radio"/> *28+60+93/*60	<input type="radio"/> *36+60/*60+80	
<input type="radio"/> *6/*28	<input type="radio"/> *27/*60	<input type="radio"/> *28/*36+60	<input type="radio"/> *28+60+93/*60+80	<input type="radio"/> *36+60/*80	
<input type="radio"/> *6/*28+60	<input type="radio"/> *27/*60+80	<input type="radio"/> *28/*37	<input type="radio"/> *28+60+93/*80	<input type="radio"/> *37/*37	

UGT1A1 Results Interpretation

Automated Results

Abnormal Flag Normal Abnormal

Phenotype Normal Metabolizer
 Intermediate Metabolizer
 Poor Metabolizer
 Unknown Metabolizer

Diplotype Interpretation

This result signifies that the patient has two copies of a normal function allele.
 This result signifies that the patient has one copy of a normal function allele and one copy of an increased function allele.
 This result signifies that the patient has one copy of a normal function allele and one copy of a decreased function allele.
 This result signifies that the patient has one copy of a normal function allele and one copy of an uncertain function allele.
 This result signifies that the patient has two copies of an increased function allele.
 This result signifies that the patient has one copy of an increased function allele and one copy of a decreased function allele.
 This result signifies that the patient has one copy of an increased function allele and one copy of an uncertain function allele.
 This result signifies that the patient has two copies of a decreased function allele.
 This result signifies that the patient has one copy of a decreased function allele and one copy of an uncertain function allele.
 This result signifies that the patient has two copies of an uncertain function allele.

PGx Results

- Electronic Data Entry in development
- Any non-automated results will generate email to PGx team asking them to use manual result entry

Fwd: M0033 - New Genomics Results

Preview Properties Personal

Print Forward















From: "Greg Zarambo" <Greg.Zarambo@childrensmn.org>
 To: "Jen Miller" <Jen.Miller@childrensmn.org>
 Sent / Received: Thu Sep 24 2020 06:27:57 GMT-0500 (Central Daylight Time)
 Subject: Fwd: M0033 - New Genomics Results
 Attachments: TEXT.htm Greg_Zarambo.vcf

▶ **TPMT** Results Charted
PGX TPMT Genotype: *1/*1
 Phenotype : Normal Metabolizer
 Result Status : Normal
 Diplotype Interpretation : This result signifies that the patient has two copies of a normal function allele.

```
#Accession=[REDACTED]
#PatientName=[REDACTED]
#RPRD ID=[REDACTED]
#PatientID=[REDACTED]
#SampleType=Whole Blood
#TranslationFile=PharmacoScan_24F.r6.20180103+Aug18Update.translation
#AnnotationFile=PharmacoScan.na35.annot
#ReporterBuild=3.1
#GeneSymbol=TPMT
Called Interpretation Code UNIQ
Called Diplotypes Possible *1/*1
Called Novel Diplotypes Possible -
Number Non-reference Probe Sets 3
Probe Set ID Affy Verified Genome Position dbSNP RS ID Genotype Call Contributes To Alleles
Description
AX-15326874 - Ch6:18148247 rs12529220 T/A Ref/Var - TPMT [REDACTED] _c.141-101A>T
AX-12531207 - Ch6:18143769 rs2518463 A/G Ref/Var - TPMT [REDACTED] _c.366+58T>C
AX-165876861 - Ch6:18139214 rs2842934 A/A Var/Var - TPMT [REDACTED] _c.474C>T (I158=)
Number Reference only Probe Sets 39
Probe Set ID Affy Verified Genome Position dbSNP RS ID Genotype Call Contributes To Alleles
Description
AX-112069216 - Ch6:18149358 rs9333569 T/T Ref/Ref *14 TPMT [REDACTED] *14_c.1A>G (M1V)
AX-112248402 - Ch6:18149357 rs267607275 A/A Ref/Ref *29 TPMT [REDACTED] *29_c.2T>C (M1T)
```

PGx Problems

- Rules auto-populate Problem List based on result entry

Problems				
+ Add ✎ Modify ↔ Convert 🗑️ No Chronic Problems Display: All				
	Annotated Display ^	Condition Name	Onset Date	Code
 	CYP2B6 intermediate metabolizer	CYP2B6 intermediate metabolizer		3533509010
 	CYP2C19 rapid metabolizer	CYP2C19 rapid metabolizer		3533668010
 	CYP2C9 intermediate metabolizer	CYP2C9 intermediate metabolizer		3532696012
 	CYP2D6 poor metabolizer	CYP2D6 poor metabolizer		3532655014
 	CYP3A5 normal metabolizer	CYP3A5 normal metabolizer		3534801014
 	Malignant hyperthermia precautions	Malignant hyperthermia precautions		1480506012
 	NUDT15 intermediate metabolizer	NUDT15 intermediate metabolizer		3712839014

Rule Name:	CYP2B6 Phenotype Add to Problem List
PPM:	174510
Script:	DOC_CLI_PHENOTYPE
Purpose:	The purpose is to add a specific problem to the problem list when a CYP2B6 Phenotype is charted as <u>Ultrarapid Metabolizer</u> , <u>Rapid Metabolizer</u> , <u>Intermediate Metabolizer</u> , <u>Poor Metabolizer</u> . This will aid in identifying patients with the CYP2B6 Phenotype.
Bibliographic citation of the Intervention	CPIC Clinical Pharmacogenetics Implementation Consortium http://www.cpicpgx.org (Accessed on 2/27/2017)
Developer	Children's Hospital and Clinics of Minnesota
Funding	Private - Children's Hospital and Clinics of Minnesota
Release and Revisions	See PPM
Website(s)	

When will the rule evoke?

The rule will evoke when PGx CYP2B6 Phenotype event set is charted as "Ultrarapid Metabolizer", "Rapid Metabolizer", "Intermediate Metabolizer", or "Poor Metabolizer".

What conditions exist to trigger the rule?

Event set charted and The patient does not have exact same active problem on their worklist nor the existing limitations around liver or bone marrow transplant.

What actions will the rule take?

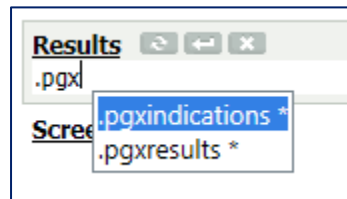
If PGx CYP2B6 Phenotype charted as either "Ultrarapid Metabolizer"

Problem	
Problem	CYP2B6 ultra-rapid metabolizer 3712533019
Confirmation	Confirmed
Classification	Medical
Life Cycle	Active
Comment	Automatically added when CYP2B6 Phenotype was charted as < <u>PGx</u> CYP2B6 Phenotype>.

If PGx CYP2B6 Phenotype charted as "Rapid Metabolizer"

PGx Documentation Assistance

- Dot-phrases to document interpretative consult



Results

Pharmacogenomics Abnormal Results

Calcium Voltage-Gated Channel Subunit Alpha 1 S (CACNA1S) WT/c.520C>T Phenotype: Malignant Hyperthermia Susceptible

Interpretive Result

Diplotype Interpretation: This result signifies that the patient has one copy of a normal function allele and one copy of an allele that confers increased risk of malignant hyperthermia.

Phenotype Assignment: Based on the genotype result this patient is Malignant Hyperthermia Susceptible. This patient has an increased risk of developing malignant hyperthermia if administered halogenated volatile anesthetics or the depolarizing muscle relaxant (succinylcholine).

Dosing Recommendation: Halogenated volatile anesthetics and depolarizing muscle relaxants (succinylcholine) are contraindicated for this patient. Alternative anesthetics should be used. Please consult a clinical pharmacist for more information about how Malignant Hyperthermia Susceptibility influences drug selection and dosing.

Cytochrome P450 2B6 (CYP2B6) *1/*18 Phenotype: Intermediate Metabolizer

Interpretive Result

Diplotype Interpretation: This result signifies that the patient has one copy of a normal function allele and one copy of a no function allele.

Phenotype Assignment: Based on the genotype result this patient is predicted to be a Intermediate Metabolizer of CYP2B6 substrates.

Dosing Recommendation: This patient may be at risk for an adverse or poor response to medications that are metabolized by CYP2B6. To avoid an untoward drug response, dose adjustments or alternative therapeutic agents may be necessary for medications metabolized by CYP2B6. Please consult a clinical pharmacist for more information about how CYP2B6 metabolic status influences drug selection and dosing.

PGx Mpage

- Clinical Highlights (main Children’s clinical snapshot) shares PGx status and navigates to Pharmacogenomics Mpage

Clinical Highlights	
<div style="background-color: #f2f2f2; padding: 5px;"> △ Patient Information </div>	
Precautions:	
COVID Results:	No Results Found in the Last 3 Years
COVID Order Status:	No Pending Orders
Safety Measures:	Safe Room, 1:1 CSA, • Bathroom Privileges Monitoring • Security Monitoring • Hospital Issued Scrubs • Personal belongings secured • Safe Room Care (Provided to Family) • Plastic utensils and dishes
Code Status:	Full Resuscitation Click to view plan
Outside Record Information Available:	Check CommonWell Enrollment
Health Information Exchange Status:	Given
Pharmacogenomics:	Abnormal
<div style="background-color: #f2f2f2; padding: 5px;"> △ Patient Plans (Displays plans looking back 3 years) </div>	
Critical Care Procedural Consent:	Procedural Consent not obtained
Patient Care Preferences:	None Reported
<div style="background-color: #f2f2f2; padding: 5px;"> △ Care Team </div>	
Current Service:	CVICU 1
Primary Attending Contact:	MD Zzztest MD
Lifetime Clinical Team	
Current Housestaff Team:	
Current Consultants:	

PGx Mpage

- PGx individual patient results
- Proactive med list notifications
- Bold/Red existing meds based on concerns
- Relevant results – NOT used for drug dose adjustment

Pharmacogenomics

These pharmacogenomic results and interpretations are based on CPIC (Clinical Pharmacogenetics Implementation Consortium) guidelines (<https://cpicpgx.org/>) and Children's pharmacogenomic experts. The results may differ from laboratory report interpretations.

See Scanned DNA results under Clinical Documents, Lab Documents

▶ **Choose Alternative Medication or Use with Caution**

▶ **Medications May Require Dose Adjustments**

Abnormal Results

- ▶ Calcium Voltage-Gated Channel Subunit Alpha 1 S (CACNA1S) WT/c.520C>T Phenotype: **Malignant Hyperthermia Susceptible**
- ▶ Cytochrome P450 2B6 (CYP2B6) *1/*18 Phenotype: **Intermediate Metabolizer**
- ▶ Cytochrome P450 2C19 (CYP2C19) *1/*17 Phenotype: **Rapid Metabolizer**
- ▶ Cytochrome P450 2C9 (CYP2C9) *1/*12 Phenotype: **Intermediate Metabolizer**
- ▶ Cytochrome P450 2D6 (CYP2D6) *4/*4 Phenotype: **Poor Metabolizer**
- ▶ Cytochrome P450 3A5 (CYP3A5) *1/*1 Phenotype: **Normal Metabolizer**
- ▶ Nudix Hydrolase 15 (NUDT15) *1/*2 Phenotype: **Intermediate Metabolizer**

Normal Results

- ▶ Dihydropyrimidine Dehydrogenase (DPYD) *1/*1 Phenotype: **Normal Metabolizer**
- Methylenetetrahydrofolate reductase (MTHFR) Phenotype:
- ▶ Ryanodine Receptor 1 (RYR1) WT/WT Phenotype: **Uncertain Malignant Hyperthermia Susceptibility**
- ▶ Thiopurine S-Methyltransferase (TPMT) *1/*1 Phenotype: **Normal Metabolizer**
- ▶ Uridine Diphosphate Glucuronosyltransferase 1A1 (UGT1A1) *1/*1 Phenotype: **Normal Metabolizer**

Relevant Results

- ▶ Centrosomal protein 72 (CEP72) rs924607 T/T Phenotype: **Increased Risk**

Additional Pharmacogenomics Resources

<http://intranet.childrensmn.org/references/genetics/>
Cerner message pool: Pharmacogenomics
Contacts: David Gregornik, PharmD, pager 651-629-0198

Measurements
Height: 32 cm
BSA: 0.267 m²

Current Medication List
amiTRIPTYline 5 mg, PO, QHS

Home Medication List
ibuprofen 400 mg, 2 CAP, PO, 0 Refill(s)

PGx Mpage

- Phenotype Assignment/Dosing Recommendation can be immediately changed for any gene on all patients.

Abnormal Results

▶ Calcium Voltage-Gated Channel Subunit Alpha 1 S (CACNA1S) WT/c.520C>T Phenotype: Malignant Hyperthermia Susceptible

◀ Cytochrome P450 2B6 (CYP2B6) *1/*18 Phenotype: Intermediate Metabolizer

Interpretive Result

Diplotype Interpretation: This result signifies that the patient has one copy of a normal function allele and one copy of a no function allele.

Phenotype Assignment: Based on the genotype result this patient is predicted to be a Intermediate Metabolizer of CYP2B6 substrates.

Dosing Recommendation: This patient may be at risk for an adverse or poor response to medications that are metabolized by CYP2B6. To avoid an untoward drug response, dose adjustments or alternative therapeutic agents may be necessary for medications metabolized by CYP2B6. Please consult a clinical pharmacist for more information about how CYP2B6 metabolic status influences drug selection and dosing.

PGx Mpage

- Proactive medication notifications can be immediately updated on all patients

⁴ Choose Alternative Medication or Use with Caution

Medications	Gene	Usage	Outcome
desflurane	CACNA1S-RYR1	Anesthesia	TOXICITY
isoflurane	CACNA1S-RYR1	Anesthesia	TOXICITY
sevoflurane	CACNA1S-RYR1	Anesthesia	TOXICITY
succinylcholine	CACNA1S-RYR1	Anesthesia, Rapid Intubation	TOXICITY
amITRIPTYline	CYP2C19-CYP2D6	Antidepressant	TOXICITY
clomiPRAMINE	CYP2C19-CYP2D6	Antidepressant	TOXICITY
desipramine	CYP2D6	Antidepressant	TOXICITY
doxepin	CYP2C19-CYP2D6	Antidepressant	TOXICITY
imipramine	CYP2C19-CYP2D6	Antidepressant	TOXICITY
nortriptyline	CYP2D6	Antidepressant	TOXICITY
trimipramine	CYP2C19-CYP2D6	Antidepressant	TOXICITY
PARoxetine (If warranted, recommend a 50% reduction in starting dose)	CYP2D6	Antidepressant, Antianxiety	TOXICITY
ARIPIprazole (Consider 50% reduction in starting dose)	CYP2D6	Antipsychotic	TOXICITY
thioguanine (Refer to protocol/clinical trial or Start 50%-80% of normal dose, monitor)	TPMT-NUDT15	Chemotherapy, Oncology	TOXICITY
azaTHIOprine (If starting dose \geq 2.5mg/kg, decrease 20%, monitor If starting dose < 2.5mg/kg, dose reduction may not be recommended, monitor)	TPMT-NUDT15	Chemotherapy, Oncology	TOXICITY
mercaptapurine (Oncology: Refer to protocol/clinical trial or If starting dose \geq 75 mg/m ² , decrease 20%, monitor If starting dose < 75 mg/m ² , dose reduction may not be recommended, monitor)	TPMT-NUDT15	Chemotherapy, Oncology, Gastrointestinal, Immunosuppressant	TOXICITY

⁴ Medications May Require Dose Adjustments

Medications	Gene	Usage	Outcome
atomoxetine (Check peak plasma concentration after 2 weeks of use if no clinical response.)	CYP2D6	ADHD	TOXICITY
proton pump inhibitors (For treatment of H. pylori and erosive esophagitis consider increasing starting daily dose by 50-100%. Initiate standard starting daily dose for all other treatment. Daily dose may be given in divided doses. Monitor for efficacy.)	CYP2C19	Acid Suppression	Therapeutic Failure
citalopram (Initiate with recommended starting dose, monitor)	CYP2C19	Antidepressant, Antianxiety	Therapeutic Failure
escitalopram (Initiate with recommended starting dose, monitor)	CYP2C19	Antidepressant, Antianxiety	Therapeutic Failure
fluvoxamine (If warranted, recommend a 25-50% reduction in starting dose)	CYP2D6	Antidepressant, Antianxiety	TOXICITY
sertraline (Initiate with recommended starting dose, monitor)	CYP2C19	Antidepressant, Antianxiety	Therapeutic Failure
tacrolimus (Increase standard starting dose 1.5-2 times, followed by therapeutic drug monitoring)	CYP3A5	Immunosuppressant	Therapeutic Failure
efavirenz (Consider initiating efavirenz with 30% dose reduction.)	CYP2B6	Infectious Disease, Antiviral	TOXICITY

PGx Alerts

- Interruptive alerts and passive notification

Discern: (1 of 1)

CYP2D6 POOR METABOLIZER/CYP2C19 RAPID METABOLIZER

Based upon the Cytochrome P450 2D6 (CYP2D6) and Cytochrome P450 2C19 (CYP2C19) Genotype
Phenotype: CYP2D6 **POOR METABOLIZER**/CYP2C19 **RAPID METABOLIZER**
Outcome: **TOXICITY** - Increased risk of toxicity due to higher plasma concentrations following **AMITRIPTYLINE** administration.

Recommend: Avoid tricyclic antidepressant use. If AMITRIPTYLINE is indicated for this patient, recommend 50% reduction in starting dose. Strongly suggest therapeutic drug monitoring and checking an EKG.

Additional Information: Clinical Pharmacist, Pharmacogenomics message pool

<http://khan.childrensmn.org/references/genetics/index.php?view=folder&folder=pgxCYP2C19>
<http://khan.childrensmn.org/references/genetics/index.php?view=folder&folder=CYP2D6>

ClinicalDecisionSupport@childrensmn.org

Alert Action:

- Cancel amitRIPTYline
- Continue
- Modify amitRIPTYline

Add orders for:

- Amitriptyline and Nortriptyline Level
- Outpatient EKG

OK

Orders Medication List Document In Plan

Orders for Signature

View	Order Name
Diagnoses & Problems	
Related Results (3)	
<input type="checkbox"/> WEIGHT more...	
20 kg	3/2/2021 15:19 CST
6 kg	3/2/2021 15:12 CST
8 kg	1/29/2021 11:25 CST
<input type="checkbox"/> PGx CYP2C19 Phenotype	
Rapid Metabolizer	3/15/2021 8:25 CDT
<input type="checkbox"/> PGx CYP2D6 Phenotype	
Poor Metabolizer	3/15/2021 8:25 CDT

\$?	?	Order Name
△			NICU-M; 3415; 02 Account No:70917520 Admit
△			Medications
			amiTRIPTYline

PGx Alerts Report

- Tracking of interruptive alerts

RULEDT	MRN	FIN	ALERT	TRIGGER	ALERT_RECIPIENT	ACTION	OVERRIDE_REASON	OVERRIDE_FREETEXT
FEB/14/21 13:04:08			CYP2D6 ULTRARAPID METABOLIZER	ondansetron		Modify		
FEB/14/21 14:40:40			CYP2D6 ULTRARAPID METABOLIZER	ondansetron		Cancel		
FEB/15/21 10:41:57			CYP2C19-CYP2D6 CYP2D6 INTERMEDIATE METABOLIZER/CYP2D6 ULTRARAPID METABOLIZER	amiTRIPItyline		Proceed	Other	will start at decreased dose
FEB/15/21 10:45:43			CYP2C19-CYP2D6 CYP2D6 INTERMEDIATE METABOLIZER/CYP2D6 ULTRARAPID METABOLIZER	amiTRIPItyline		Proceed		
FEB/15/21 12:23:16			CYP2D6 ULTRARAPID METABOLIZER	traMADol		Modify		
FEB/15/21 12:39:52			CYP2D6 ULTRARAPID METABOLIZER	traMADol		Proceed	Other	Started at lower dose (~0.5 mg/kg)
FEB/16/21 04:12:37			NO TPMT AND NUDT15 GENOTYPE RESULTS	mercaptopurine		Cancel		
FEB/16/21 07:20:15			NO TPMT AND NUDT15 GENOTYPE RESULTS	mercaptopurine		Cancel		

PGx Custom Admin Tools

- Allows nonprogrammer to setup consults, alerts, and proactive med list displays

Alerts

Genotypes:

Name:

CYP2C19 Phenotype:

Catalog Name:

New Alert Group

CYP2D6 Phenotype:

Alert based on Phenotype
 Substitution Values: PHENOTYPE, MEDICATION, HighlightOnly, REPLACE EKG
 For Combinations, use "No Alert" for no alerts, this will prevent alerts from firing for single PhyenoType

```

<p align='left'>Based upon the Cytochrome P450 2D6 (CYP2D6) and Cytochrome P450 2C19 (CYP2C19)
Genotype<br><strong> Phenotype:</strong>PHENOTYPE<br><strong>Outcome:</strong> <span
style='color:red;font-weight: bold'>TOXICITY </span> - Increased risk of toxicity due to higher
concentrations following <span style='color:red;font-weight: bold'>MEDICATION</span>
administration. <br><br><br><strong>Recommend:</strong> Consider selecting an alternative drug not
extensively metabolized by CYP2C19. (nortriptyline, desipramine) <br><br>REPLACE
EKG<br><strong>Additional Information:</strong>Clinical Pharmacist, Pharmacogenomics message
    
```

PGx Custom Admin Tools

- Most logic based on phenotype but can override by activity score or diplotype

4 Dosing Recommendations

Genotypes:

Name:

CYP2C19 Phenotype:

CYP2C19 Diplotypes:

Drug Class:

Catalog:

Type Choose Alternative Medications Use with Caution

Usage:

Outcome:

Description:

New Dosing Group

CYP2D6 Phenotype:

CYP2D6 Diplotypes:

Interoperability

Pharmacogenomics document naming convention requested from LOINC in 2018.

New Pharmacogenomics Progress Note request submitted 3/2021

LOINC	COMPONENT	SYSTEM	METHOD_TYP	CLASS	Version	STATUS	LONG_COMMON_NAME
90005-0	Note	Outpatient	Pharmacogenomics	DOC. ONTOLOGY	2.65	ACTIVE	Pharmacogenomics Outpatient Note
90006-8	Consultation note	{Setting}	Pharmacogenomics	DOC. ONTOLOGY	2.65	ACTIVE	Pharmacogenomics Consult note
90007-6	Progress note	{Setting}	Pharmacogenomics	DOC. ONTOLOGY	2.65	ACTIVE	Pharmacogenomics Progress note
90008-4	Note	Telehealth	Pharmacogenomics	DOC. ONTOLOGY	2.65	ACTIVE	Pharmacogenomics Telehealth Note
93964-5	Diagnostic study note	{Setting}	Pharmacogenomics	DOC. ONTOLOGY	2.67	ACTIVE	Pharmacogenomics Diagnostic study note

Interoperability

Problems and Results shared via CCDA

Summary of Care: 1/13/21 - 3/15/21

Jfm, Infant Admin Sex: Female DOB: 11/1/2020

Summary of Care: 1/13/21 - 3/15/21 Created: 03/15/2021
 Summarization of Episode Note | 01/13/2021 to 03/15/2021
 Source: Children's Minneapolis More Details

Primary Encounter
 Encounter
 Vital Signs
Problem List
 Allergies, Adverse Reactions, Alerts
 Medications
 Results
 Immunizations
 Procedures
 Social History
 Assessment and Plan
 Reason for Visit

Condition	Effective Dates	Status	Health Status	Informant
CYP2B6 intermediate metabolizer(Confirmed) ¹		Active		
CYP2C19 rapid metabolizer(Confirmed) ²		Active		
CYP2C9 intermediate metabolizer(Confirmed) ³		Active		
CYP2D6 poor metabolizer (Confirmed) ⁴		Active		
CYP3A5 normal metabolizer(Confirmed) ⁵		Active		
Malignant hyperthermia precautions(Confirmed) ⁶		Active		
NUDT15 intermediate metabolizer(Confirmed) ⁷		Active		
Special Needs Children Program (CP)(Confirmed)		Active		
Spinal muscular atrophy, type II(Confirmed)		Active		

¹ Automatically added when CYP2B6 Phenotype was charted as Intermediate Metabolizer.
² Automatically added when CYP2C19 Phenotype was charted as Rapid Metabolizer.
³ Automatically added when CYP2C9 Phenotype was charted as Intermediate Metabolizer.
⁴ Automatically added when CYP2D6 Phenotype was charted as Poor Metabolizer.

Summary of Care: 1/13/21 - 3/15/21

Jfm, Infant Admin Sex: Female DOB: 11/1/2020

Summary of Care: 1/13/21 - 3/15/21 Created: 03/15/2021
 Summarization of Episode Note | 01/13/2021 to 03/15/2021
 Source: Children's Minneapolis More Details

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Most recent to oldest [Reference Range]:	1
PGx CYP3A5 Genotype	*1/*1 (3/15/21 8:25 AM)
PGx CYP3A5 Result Status	Abnormal (3/15/21 8:25 AM)
PGx CYP3A5 Phenotype	Normal Metabolizer (3/15/21 8:25 AM)
PGx DPYD Genotype	*1/*1 (3/15/21 8:25 AM)
PGx DPYD Result Status	Normal (3/15/21 8:25 AM)
PGx DPYD Phenotype	Normal Metabolizer (3/15/21 8:25 AM)
PGx CACNA1S Genotype	WT/c.520C>T (3/15/21 8:25 AM)
PGx CACNA1S Result Status	Abnormal (3/15/21 8:25 AM)
PGx CACNA1S Phenotype	Malignant Hyperthermia Susceptible (3/15/21 8:25 AM)
PGx RYR1 Genotype	WT/WT (3/15/21 8:25 AM)
PGx RYR1 Result Status	Normal (3/15/21 8:25 AM)

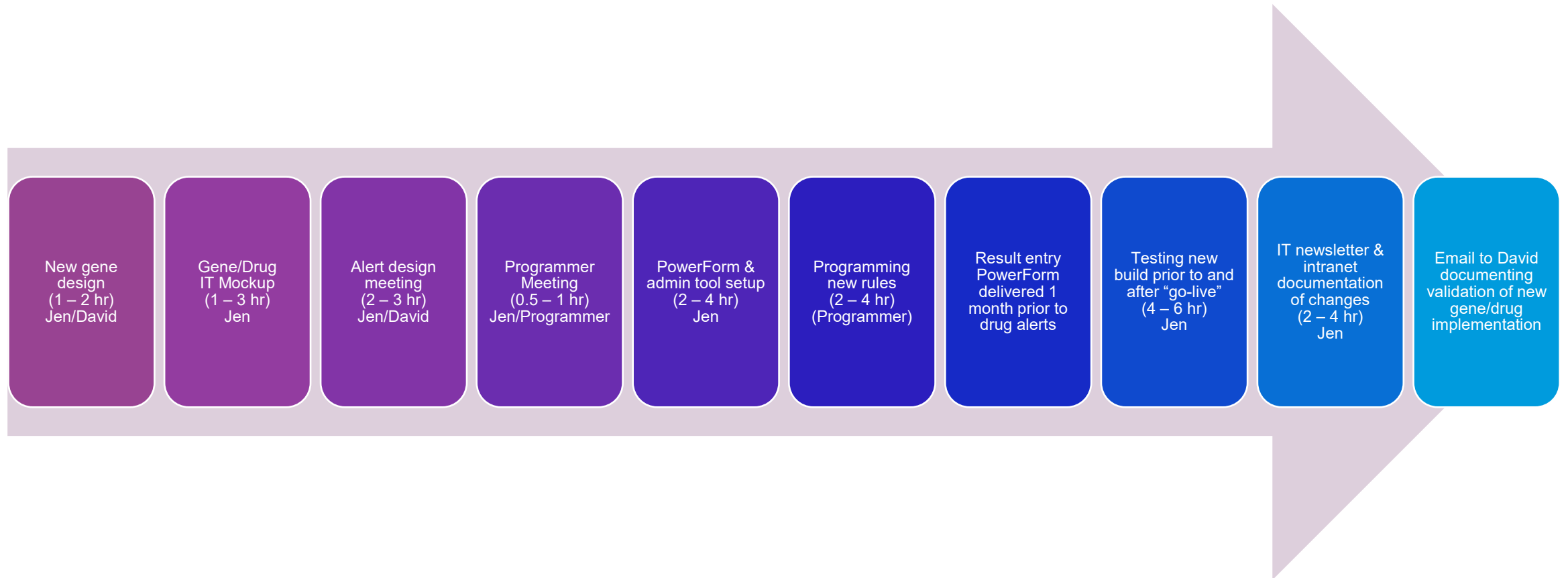
Additional PGx Report

Data warehouse report utilized for overall patient result tracking

Pharmacogenomics button click counter report

Weekly notification of resulted pgx orders, pending pgx orders, and inactivated pgx problems

New Gene/Drug Alerts: 3 Month Process for Deliverables



PGx IT Wish List

Automated patient results summary report

Electronic result entry

Continual new gene/drug alert work

Data warehouse dashboard



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