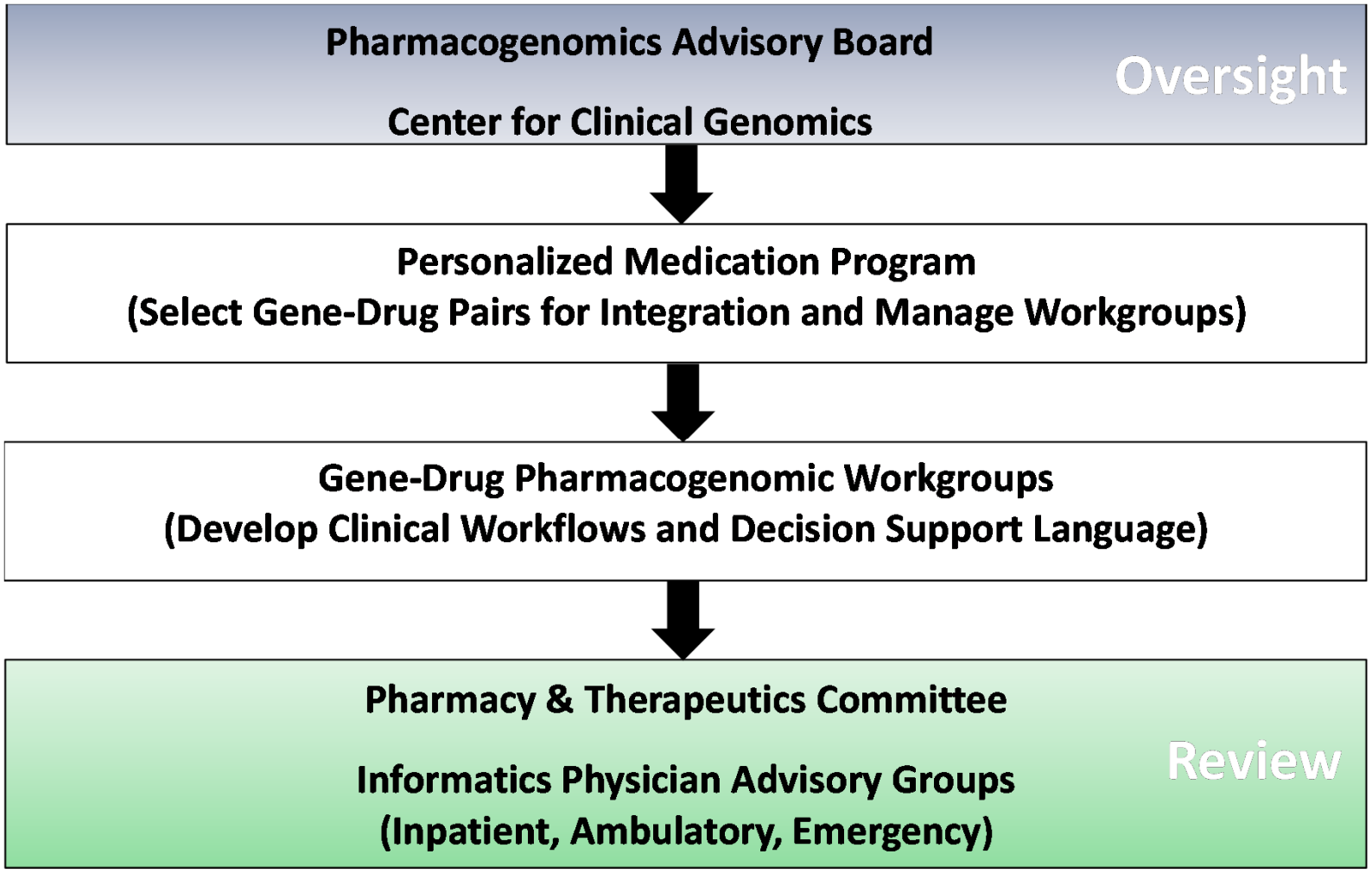
Cleveland Clinic

Implementation of CPIC Guidelines into Clinical Practice

Cleveland Clinic Experience

- 10 adult hospitals & a children’s hospital in Ohio
- Hospital in Florida
- Over 90 ambulatory locations in Ohio and Florida
- 5.5 million patient visits per year

Schematic of Pharmacogenomic Implementation Oversight and Review



Implementation Science
Gene-Drug Pairs Integrated into EHR

***TPMT* – thiopurines**

Predictive of severe life-threating myelosuppression

***HLA-B*57:01* – abacavir**

FDA boxed warning. Predictive of serious and sometimes fatal hypersensitivity reaction

***HLA-B*15:02* – anticonvulsants**

FDA boxed warning. Predictive of Stevens-Johnson syndrome/epidermal necrolysis

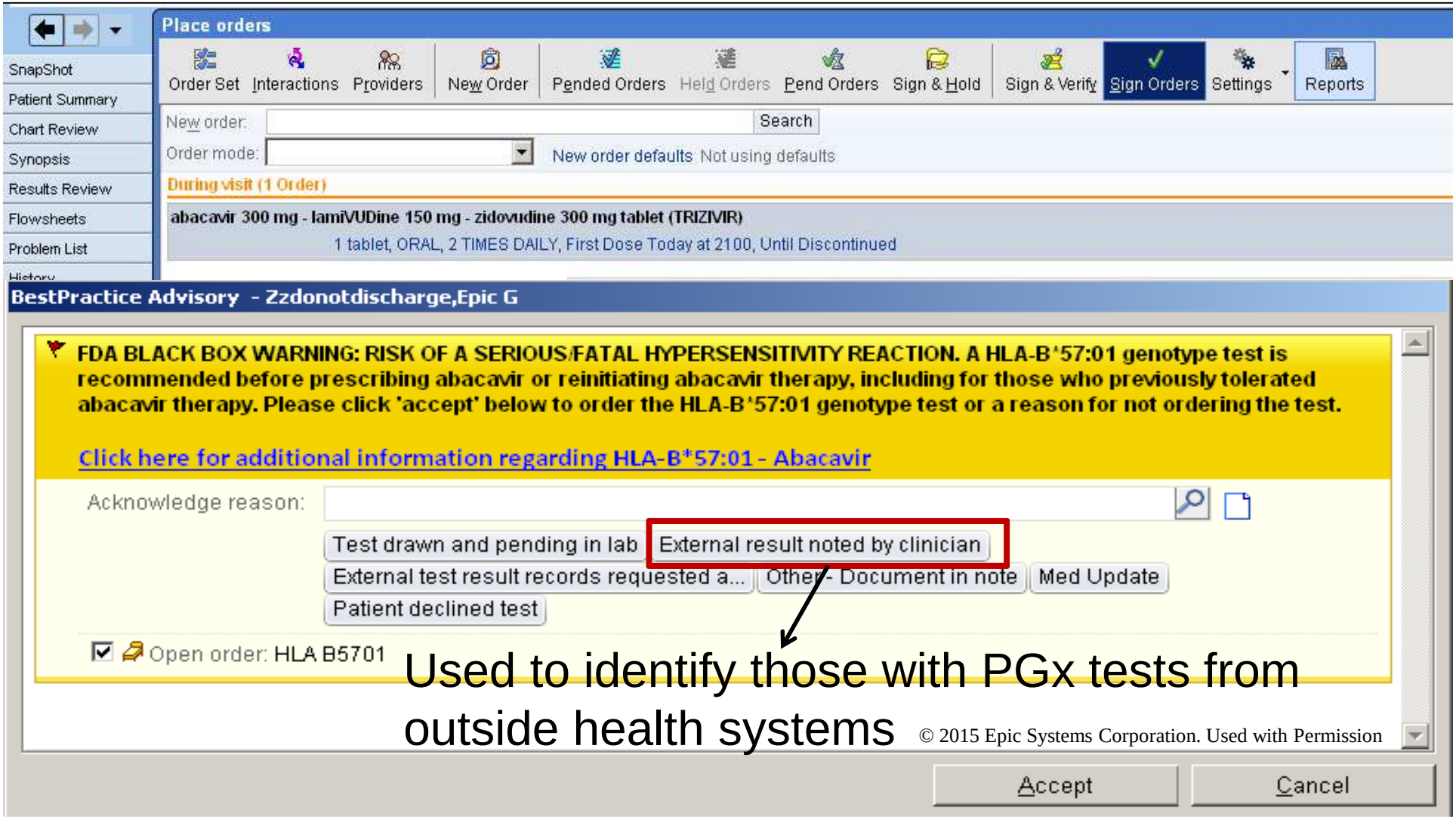
***G6PD* – oral dapsone**

Predictive of acute hemolytic anemia

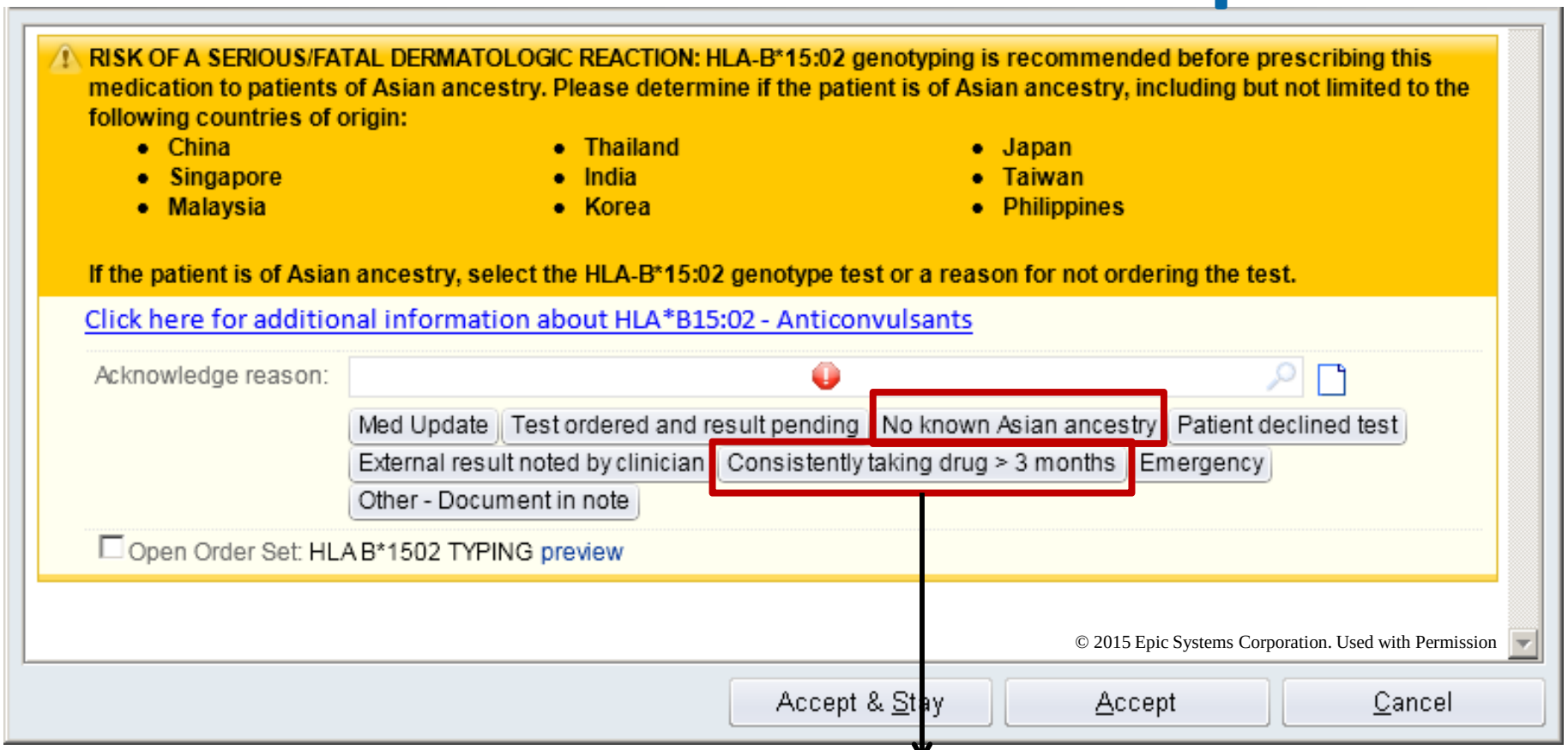
Clinical Decision Support for Guiding PGX Testing

- Cleveland Clinic does not have a preemptive genotyping protocol
- For gene-drug pairs selected for implementation, point-of-care reminders needed
- Interruptive pre-test alerts were deployed to the EHR that reminded (educate) clinicians to consider genetic testing

Example of Pharmacogenomic CDS
*HLA-B*57:01* – Abacavir

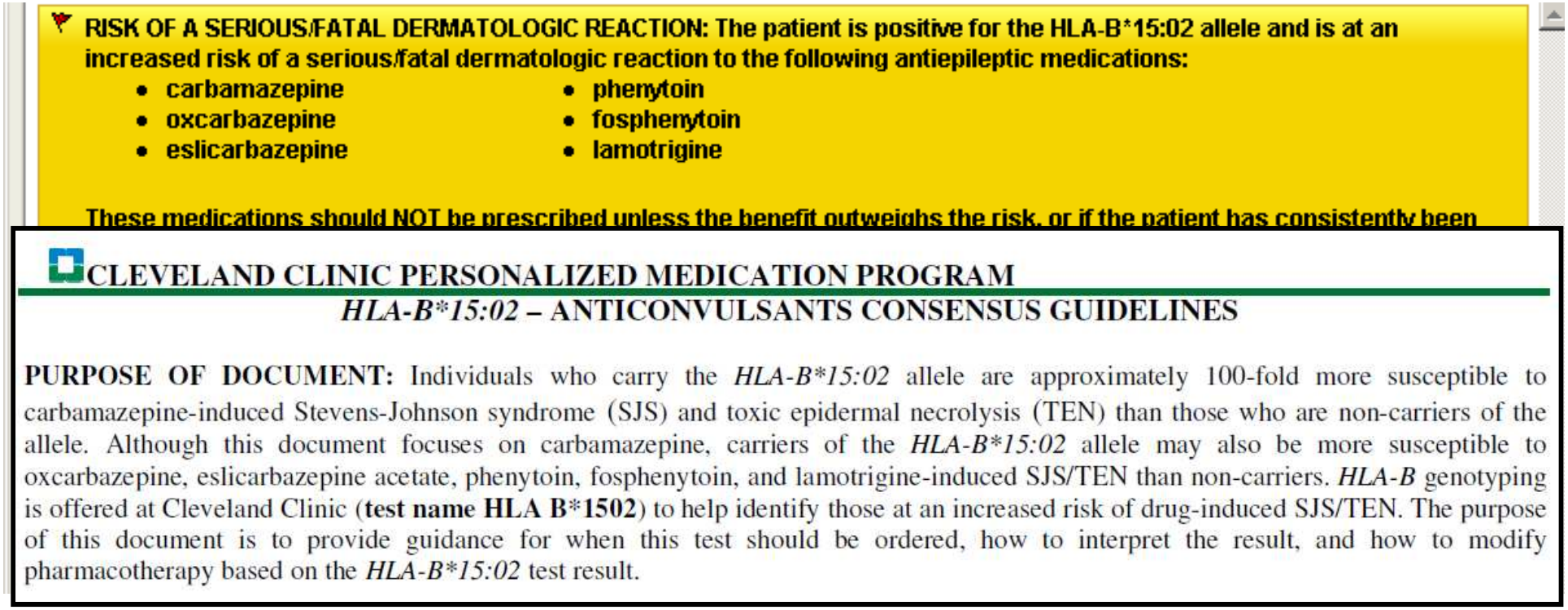


Example of Pharmacogenomic CDS
*HLA-B*15:02* – Carbamazepine



Selection of these acknowledgements suppresses future pre-test alerts to prevent alert fatigue

Education Documents & EHR Stage 2 Meaningful Use



RISK OF A SERIOUS/FATAL DERMATOLOGIC REACTION: The patient is positive for the HLA-B*15:02 allele and is at an increased risk of a serious/fatal dermatologic reaction to the following antiepileptic medications:

- carbamazepine
- oxcarbazepine
- eslicarbazepine
- phenytoin
- fosphenytoin
- lamotrigine

These medications should NOT be prescribed unless the benefit outweighs the risk, or if the patient has consistently been

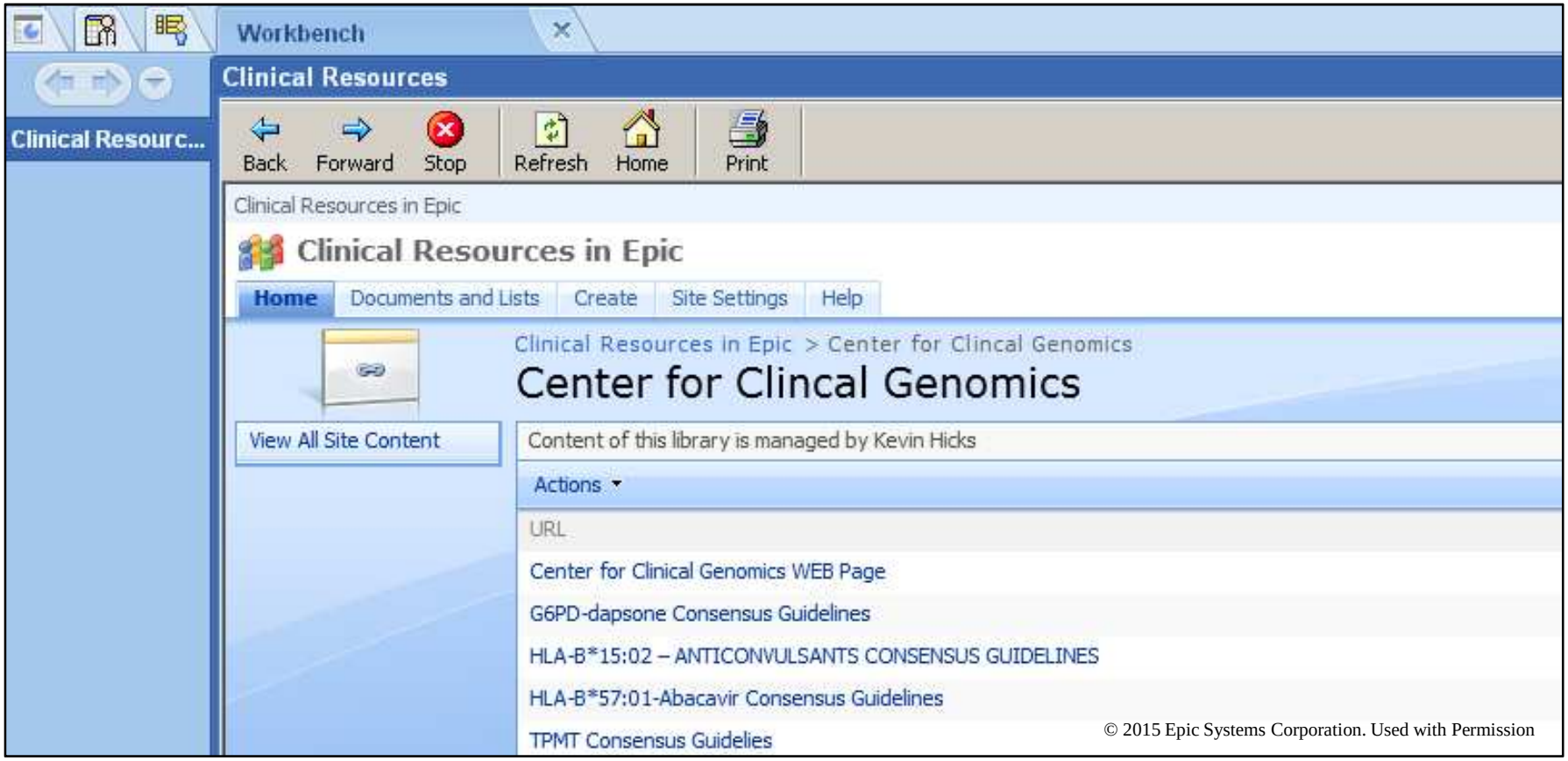
CLEVELAND CLINIC PERSONALIZED MEDICATION PROGRAM

***HLA-B*15:02* – ANTICONVULSANTS CONSENSUS GUIDELINES**

PURPOSE OF DOCUMENT: Individuals who carry the *HLA-B*15:02* allele are approximately 100-fold more susceptible to carbamazepine-induced Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) than those who are non-carriers of the allele. Although this document focuses on carbamazepine, carriers of the *HLA-B*15:02* allele may also be more susceptible to oxcarbazepine, eslicarbazepine acetate, phenytoin, fosphenytoin, and lamotrigine-induced SJS/TEN than non-carriers. *HLA-B* genotyping is offered at Cleveland Clinic (**test name HLA B*1502**) to help identify those at an increased risk of drug-induced SJS/TEN. The purpose of this document is to provide guidance for when this test should be ordered, how to interpret the result, and how to modify pharmacotherapy based on the *HLA-B*15:02* test result.

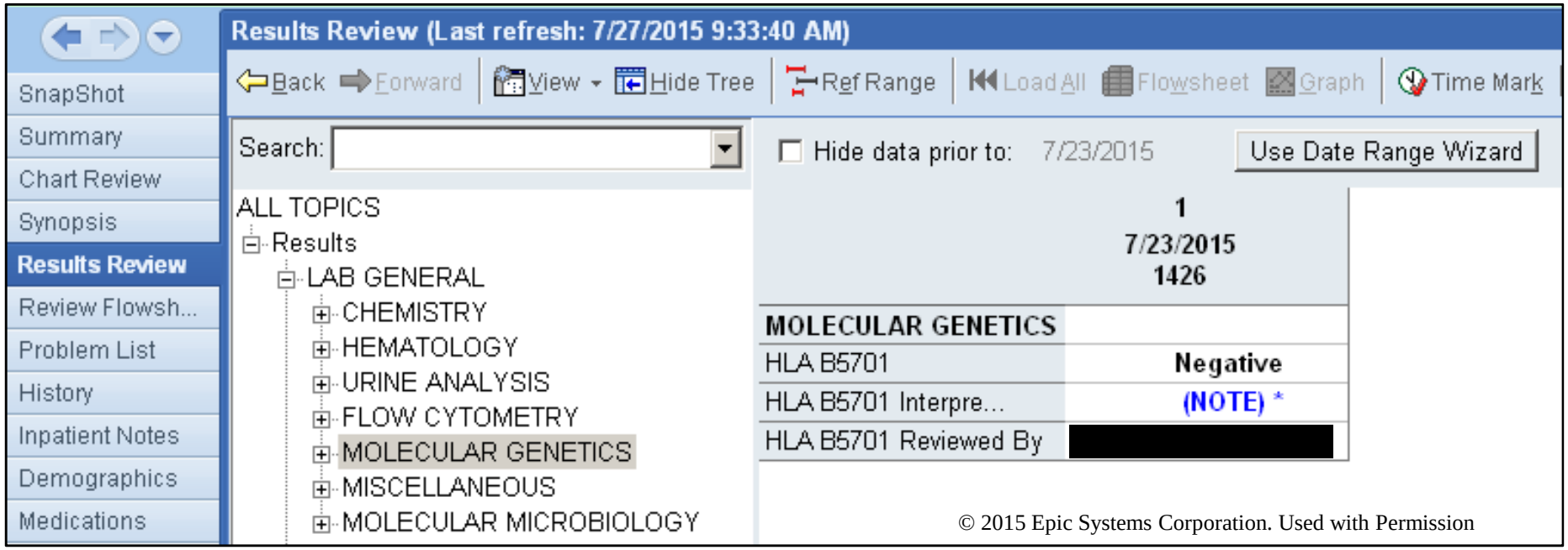
Evidence-based referenced education documents linked to decision support for CMS Stage 2 meaningful use criteria

Pharmacogenomic Decision Support
Clinical Resources



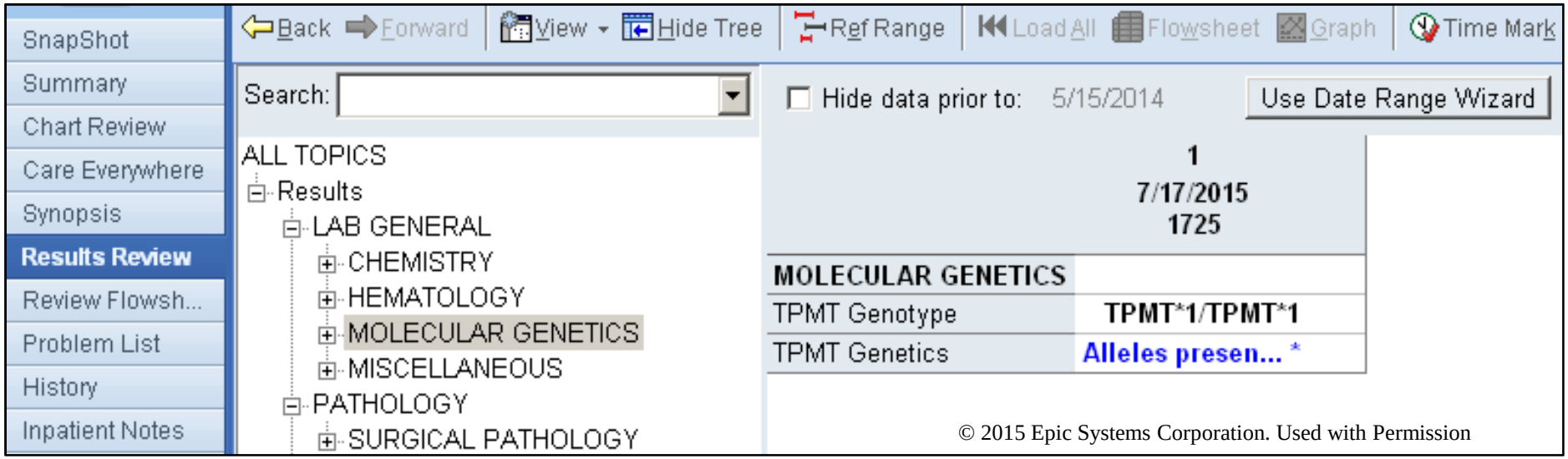
Stored in a Microsoft SharePoint© site that interfaces with the EHR

Integrating Pharmacogenomic Results into the EHR



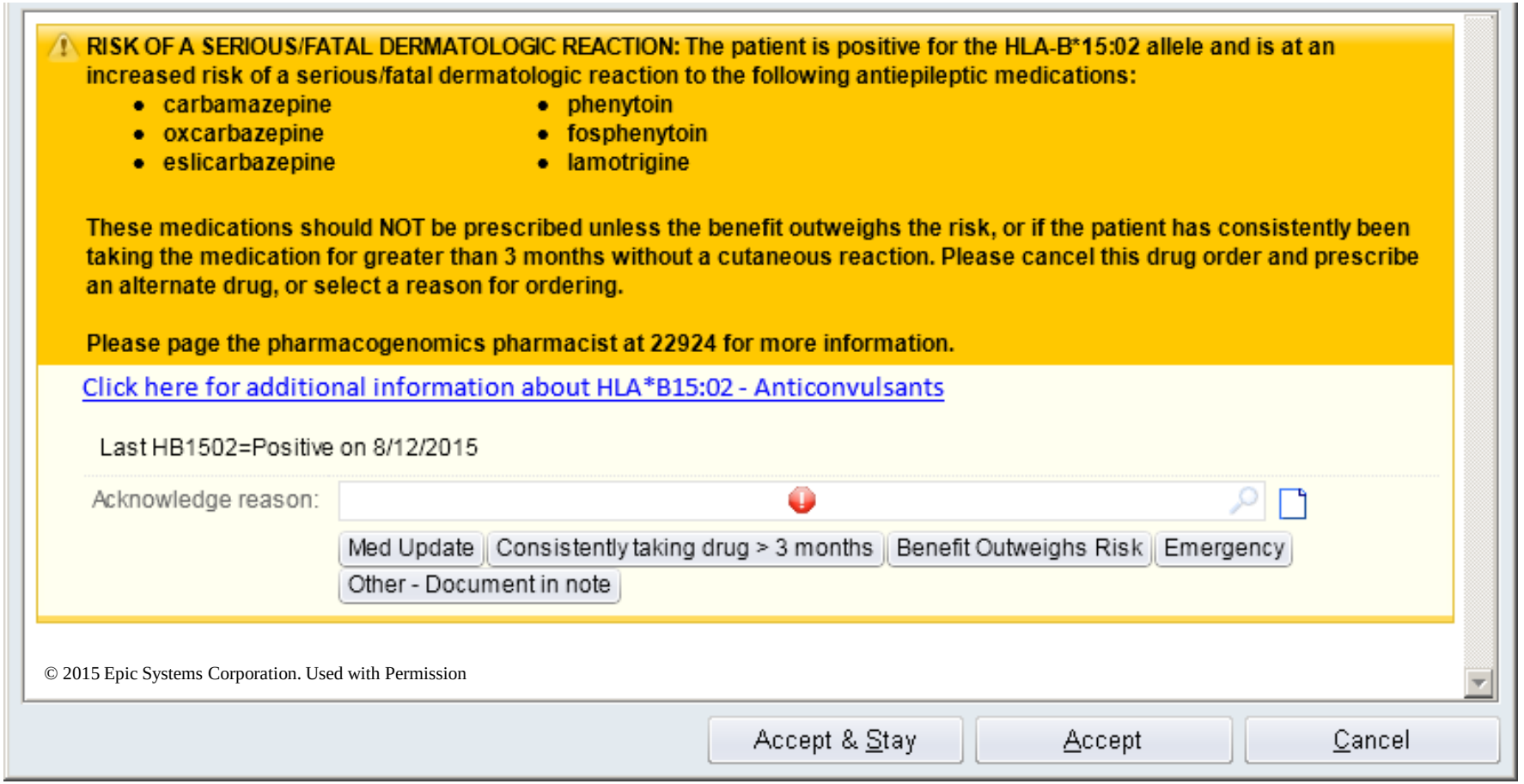
Entry of *HLA* results (negative/positive) is an automated process

Integrating Pharmacogenomic Results into the EHR

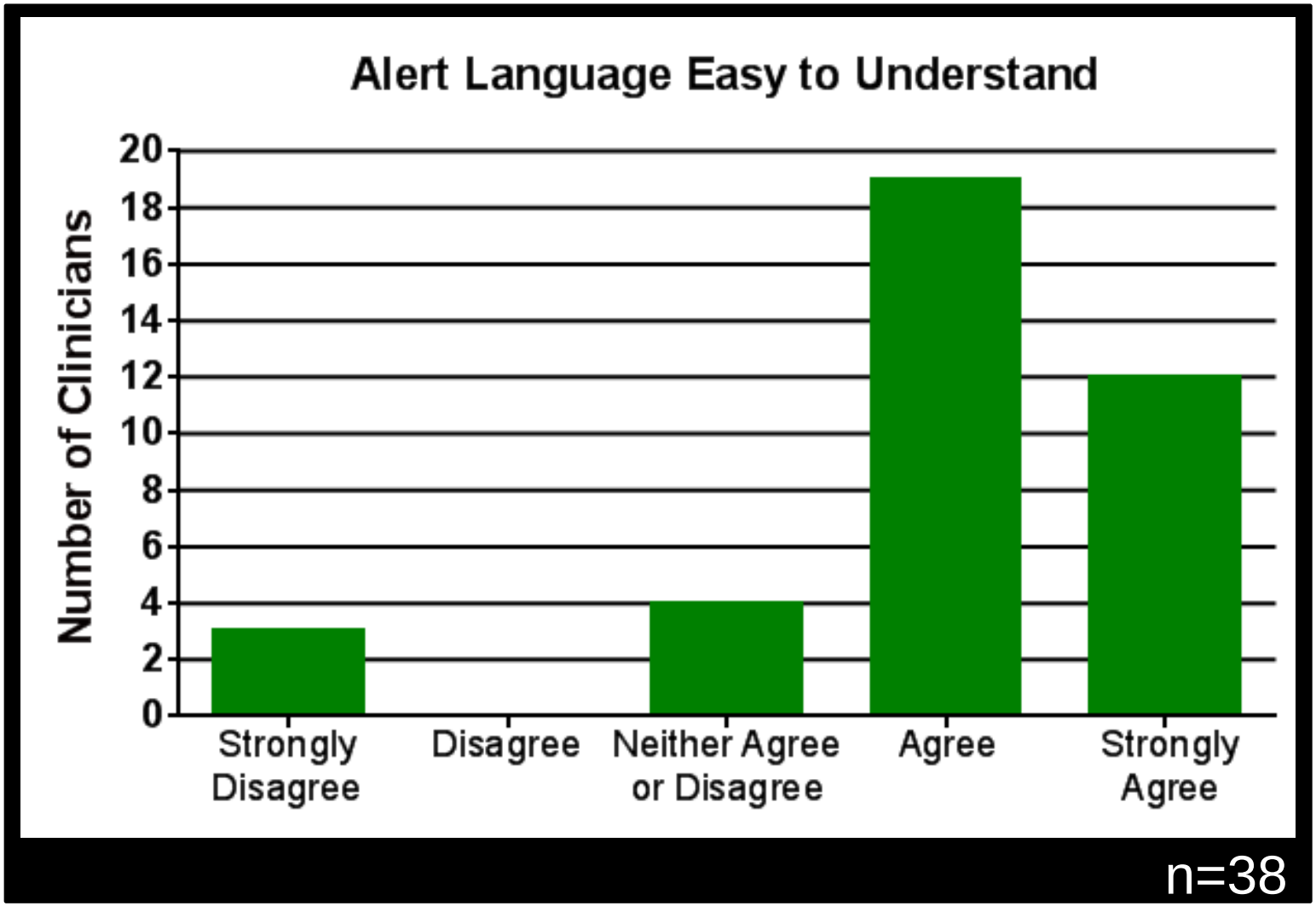


Entry of *TPMT* results into discrete data field requires manual annotation

*HLA-B*15:02* – Carbamazepine Patient Safety Alerts

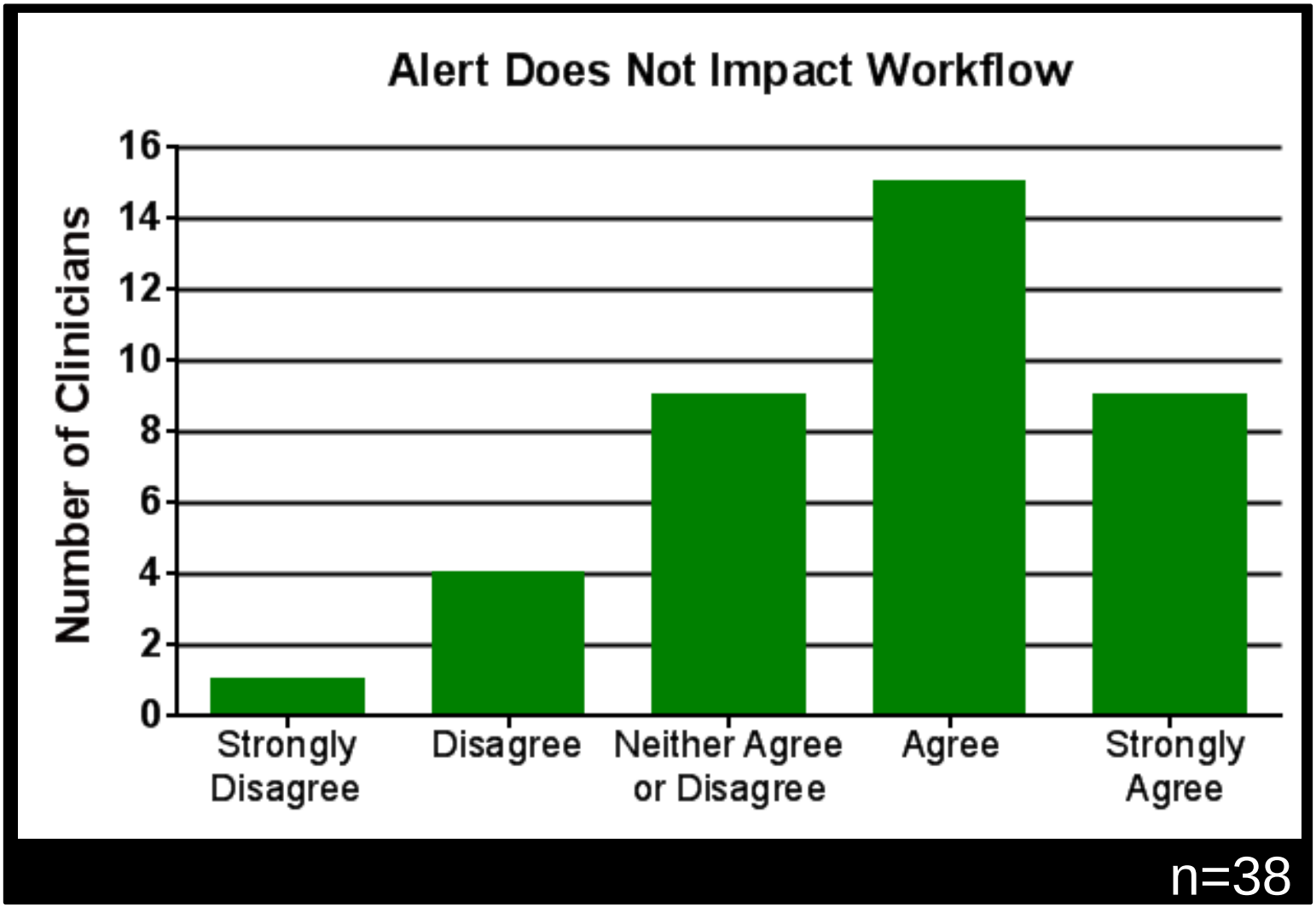


CDS Formative Evaluation



Practice Recommendations: Involve clinicians early

CDS Formative Evaluation

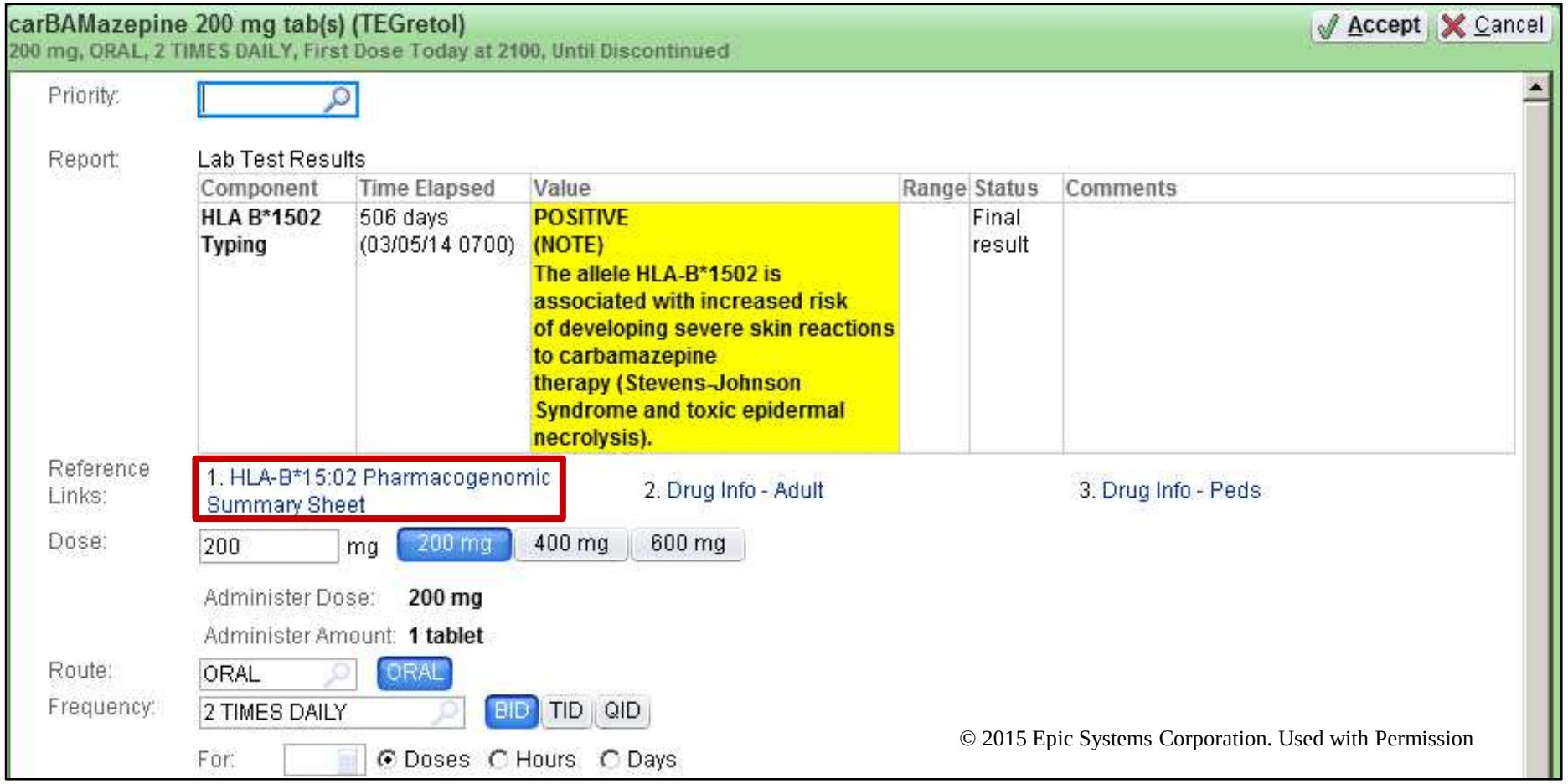


Practice Recommendations: Involve clinicians early

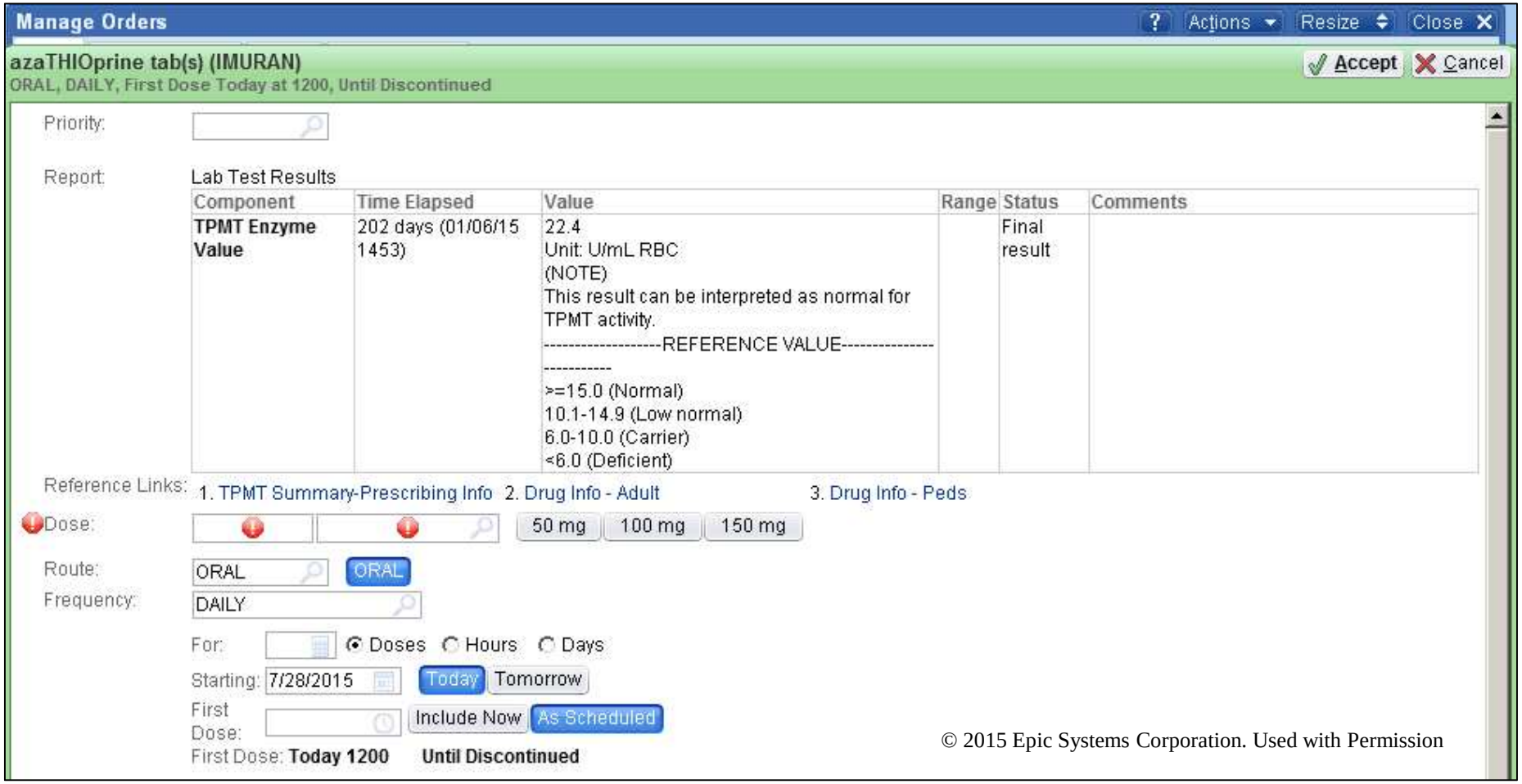
Passive Clinical Decision Support for Guiding PGX

- **Reserve interruptive PGx alerts for very high-risk gene-drug**
- **Passive decision support for other gene-drug interactions**
  - **Reduce alert fatigue**
  - **Faster integration of PGx data into EHR**
- **PGx data initially resulted in the EHR is textual**
  - **Not sustainable to manually annotate results**

Pharmacogenomic Test Reporting in Drug Entry Screen



Pharmacogenomic Test Reporting in Drug Entry Screen

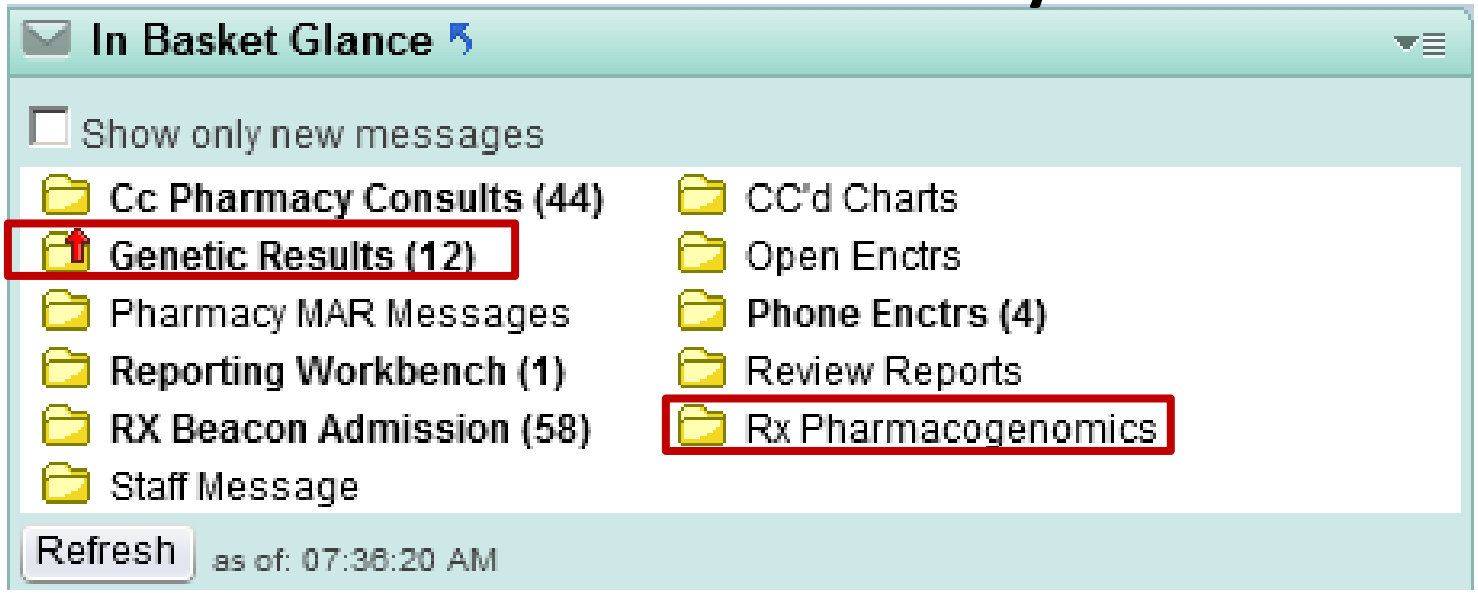


Pharmacogenomic Decision Support Impact on Patient Care

- **Compliance with clinical recommendations**
  - **Contraindications – 100% compliant**
  - **Dose reductions – 90 to 95% compliant**

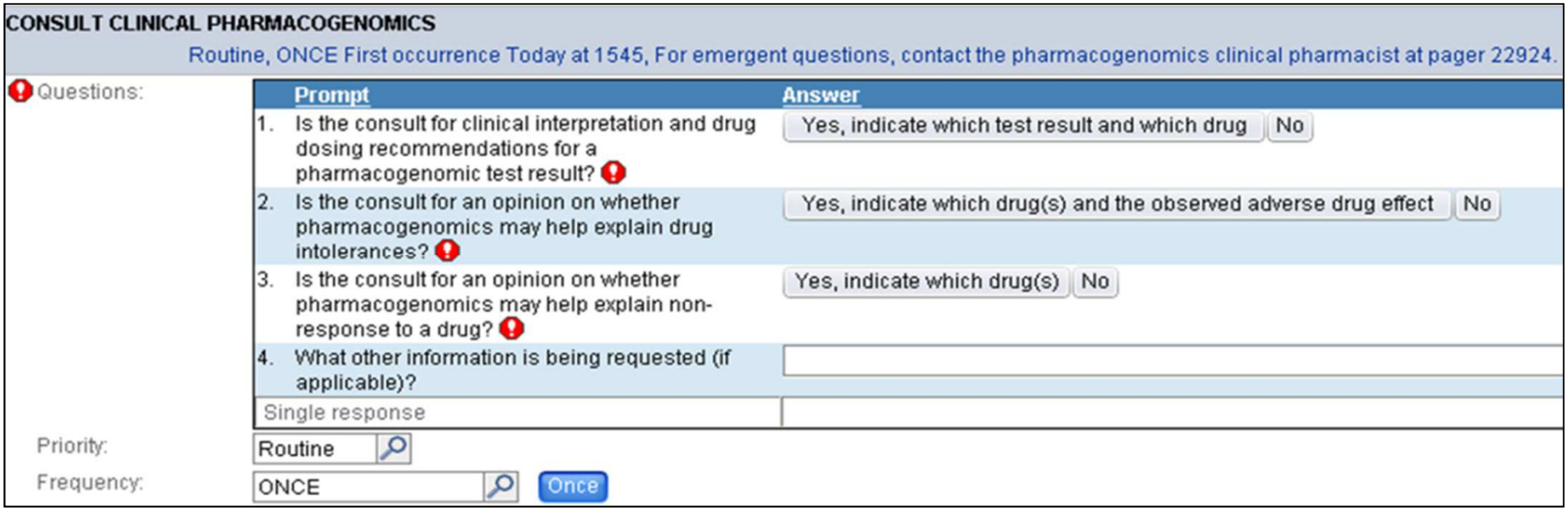
Pharmacy Managed Behind-The-Scenes Review of Pharmacogenomic Test Ordering & Results

EHR In Basket – Pharmacy View



- **Provides a summary of PGx Enterprise wide**
- **Review for correct test selection – Cost Savings**
- **Follow up with clinicians when necessary**

Personalized Medication Program
EHR Pharmacogenomic Consult Request



CONSULT CLINICAL PHARMACOGENOMICS

Routine, ONCE First occurrence Today at 1545, For emergent questions, contact the pharmacogenomics clinical pharmacist at pager 22924.

Questions:

	Prompt	Answer
1.	Is the consult for clinical interpretation and drug dosing recommendations for a pharmacogenomic test result?	Yes, indicate which test result and which drug / No
2.	Is the consult for an opinion on whether pharmacogenomics may help explain drug intolerances?	Yes, indicate which drug(s) and the observed adverse drug effect / No
3.	Is the consult for an opinion on whether pharmacogenomics may help explain non-response to a drug?	Yes, indicate which drug(s) / No
4.	What other information is being requested (if applicable)?	
	Single response	

Priority: Routine

Frequency: ONCE Once

MyConsult Pharmacogenomic Service

Cleveland Clinic

MyConsult®

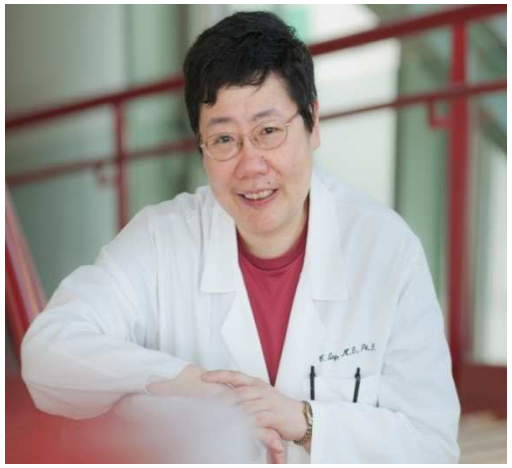
Your First Choice For a Second Opinion®

Pharmacogenomics Consultations

Cleveland Clinic's MyConsult® Online Medical Second Opinion now offers a consultation service for individuals who are seeking an expert second opinion regarding pharmacogenomics

Implementation of Pharmacogenomic Services

- **Outpatient Pharmacogenomics Clinic**



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Chair, Genomic Medicine Institute

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Every life deserves world class care.