Pharmacogenomics—the study of how genetic variability influences drug response—is increasingly being used to personalize pharmacotherapy. Used in the context of other clinical variables, genetic-based drug selection and dosing could help clinicians choose the right therapy for a patient, thus minimizing the incidence of treatment failure and intolerable side effects. Pharmacogenomics could be particularly useful in psychiatric pharmacotherapy, where response rates are low and the risk of adverse effects and nonadherence is high.

Despite the potential benefits of pharmacogenetic testing, many barriers prevent its routine use in practice, including a lack of knowledge about how to (1) order gene tests, (2) interpret results for an individual patient, and (3) apply those results to care. To help bridge this knowledge gap, we list practical, freely available pharmacogenomics resources that a psychiatric practitioner can use.

**CPIC guidelines**

The Clinical Pharmacogenetics Implementation Consortium (CPIC) is an international collaboration of pharmacogenomics experts that publishes clinical practice guidelines on using pharmacogenetic test results to optimize drug therapy.1 Note: These guidelines do not address when tests should be ordered, but rather how results should be used to guide prescribing.

Each CPIC guideline includes a summary of the gene, the drug, and their pharmacogenetic relationship, as well as clear guidance on interpreting pharmacogenetic test results, including:

- how to convert genotype to phenotype
- how to modify drug selection or dosing based on these results
- the level of evidence for each recommendation.

In summary, CPIC guidelines and supplementary information are available on the CPIC Web site (https://www.cpicpgx.org) and are updated regularly. Table 1 provides current CPIC guidelines for neuropsychiatric drugs.

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1. As of August 2016

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**Table 1**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Gene(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amitriptyline</td>
<td>CYP2C19, CYP2D6</td>
</tr>
<tr>
<td>Nortriptyline</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Citalopram and escitalopram</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Fluvoxamine</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Paroxetine</td>
<td>CYP2D6</td>
</tr>
<tr>
<td>Sertraline</td>
<td>CYP2C19</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>HLA-B</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>HLA-B, CYP2C9</td>
</tr>
</tbody>
</table>

CPIC: Clinical Pharmacogenetics Implementation Consortium; CYP: cytochrome P450; HLA: human leukocyte antigen

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PharmGKB
Providing searchable annotations of pharmacogenetic variants, PharmGKB summarizes the clinical implications of important pharmacogenes, and includes FDA drug labels containing pharmacogenomics information (https://www.pharmgkb.org).2 The Web site also provides users with evidence-based figures illustrating the pharmacokinetic and pharmacodynamic pathways of drugs that have pharmacogenetic implications.

PharmGKB is an excellent resource to consult for a summary of available evidence when a CPIC guideline does not exist for a given gene or drug.

Other resources
Table 2 lists other online resources for practitioners to aid in advancing pharmacogenomics knowledge as it relates to practice.

Putting guidance to best use
Familiarity with resources such as CPIC guidelines and PharmGKB can help ensure that patients with pharmacogenetic test results receive genetically tailored therapy that is more likely to be effective and less likely to cause adverse effects.9,10

References