

A prescription to improve drug regimens?

Quantitative EEG, genetic testing can help psychiatrists choose the right psychotropic.

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One day we may be able to consistently choose medications that offer optimal benefit and minimal adverse events—without subjecting our patients to unsuccessful trials. Thanks to quantitative EEG (QEEG) testing and pharmacogenetic testing, that day may be coming closer.

HOW QUANTITATIVE EEG WORKS

QEEG adds modern computer and statistical analyses to traditional EEG recordings. The computer creates a graphic display on a schematic map of the head. The procedure is often called brain electrical activity mapping (BEAM) or simply “mapping.”¹

QEEG is nearly identical to EEG, but approximately 50% more electrodes are applied to the scalp. The additional electrodes provide better definition and about twice the data compared with traditional EEG.

The UCLA Quantitative EEG Laboratory developed cordance,² a QEEG measure, to study regional brain activity. Cordance is calculated with reference to absolute and relative power measures from the various electrodes on the brain. It is more closely correlated than traditional EEG with regional cerebral perfusion, which may offer clues to brain activity under different conditions such as depression and medication treatment.

WHAT THE DATA SHOW

Several studies suggest that QEEG can trace response to medication.

Cook et al³ used QEEG in a double-blind study comparing response to fluoxetine, 20 mg/d, and placebo across 8 weeks in 24 adults with unipolar major depression. Subjects were classified as concordant or discordant depending on how many electrodes showed discordance.

Concordant patients showed a more-robust response to fluoxetine than did the discordant group, as evidenced by lower Beck Depression Inventory and Hamilton Rating Scale for Depression (HRSD) scores. The findings suggest that cordance may identify patients who will or will not respond to an antidepressant.

Cook et al⁴ also used cordance to measure response to placebo, fluoxetine, 20 mg/d, or venlafaxine, 150 mg/d, in 51 adults with unipolar depression. Responders to antidepressants (defined as HRSD score \leq 10) showed decreased prefrontal cordance after 48 hours and 1 week, suggesting that the prefrontal region may mediate antidepressant response.

A recent study in Korea⁵ investigated the effects of methylphenidate, 0.7 mg/kg/d (mean dosage 20.8 mg/d [+/-6.1 mg/d], range 15 to 35 mg/d), on QEEG patterns in 20 boys ages 6 to 12 while at work or rest. Numerous changes in band waves were seen during continuous performance tests, but none were reported while the subjects were at rest. This suggests that methylphenidate exerts greater electrophysiologic influence during attention-related tasks.

CLINICAL APPLICABILITY

QEEG has just begun to enter mainstream practice, with vendors offering analysis services. As patients increasingly demand improved diagnostic reliability and medication effectiveness, QEEG use could become a standard of practice within 5 years.

[Lexicor](#) offers a QEEG analysis to diagnose attention-deficit/hyperactivity disorder based on theta/beta band wave ratio. Lexicor says its analysis offers 86% to 90% sensitivity and 94% to 98% specificity, both far greater than traditional methods such as the Child Behavior Checklist, Behavior Assessment System for Children, and Devereaux Scales of Mental Disorder.

Major health plans offer limited coverage of quantitative EEG testing, however, so many patients would pay \$200 or more for tests out of pocket. Also, the American Academy of Neurology and American Clinical Neurophysiology Society endorse QEEG for use in screening for and assessing epilepsy, but not in mental disorders,⁶ making insurers less likely to cover these tests for psychiatric purposes.

PHARMACOGENETIC TESTING

With the sequencing of the human genome and improved speed of genetic analysis, pharmacogenetic testing could supplement quantitative EEG in identifying an appropriate medication.

Companies such as [Genelex](#) and [Signature Genetics](#) have begun offering tests to detect variants of the cytochrome-P(CYP) 2C9, 2C19, 2D6, and 1A2 genes. The findings will indicate if the patient will metabolize a medication too slowly or rapidly through these pathways. Psychiatrists can then adjust the dosage accordingly or try another medication. (See [New tool: Genotyping makes prescribing safer, more effective](#), CURRENT PSYCHIATRY, September 2004.) Physicians can order any combination of gene tests, which cost about \$150 to \$200 each, or all available tests for a discounted price of approximately \$600.

[Genelex](#) and [Signature Genetics](#) can create individualized CYP-450 function reports to facilitate prescribing and customized reports that take into account the patient's medication and diet regimen. Genelex also offers an Internet-based software tool, GeneMedRx, which allows doctors to customize medication regimens based on both potential drug-drug interactions and genomic information.

Signature Genetics offers a prospective assessment of drugs based on genetic test results. This assessment provides a comprehensive report of which medications are affected by the test results.

Genetic profiling can help psychiatrists improve the likelihood of treatment success and minimize potential drug-drug interactions and adverse reactions. Patients will be more satisfied, knowing that their medications fit their individual needs. Also, as more is learned about genetic analysis, genetic testing could one day reveal susceptibility to Alzheimer's disease, heart attack risk, or other medical problems.

As with quantitative EEG, however, few insurance companies cover genetic testing. Also, patients found to have a higher likelihood of developing certain diseases could potentially be charged higher health insurance premiums.

Related resources

Indiana University School of Medicine. Drug interactions table. <http://medicine.iupui.edu/flockhart/clinlist.htm>

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Disclosure

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