Brain Electrical Activity Mapping for Diagnosing Psychiatric Disorders: A Review

Context
Psychiatric disorders are thought to result from imbalances of certain neurotransmitters, or chemicals in the brain. For example, Alzheimer disease may be associated with a lack of acetylcholine, serotonin, and gamma-aminobutyric acid (GABA), while psychoses such as schizophrenia may result from abnormal levels and functioning of dopamine and serotonin. Psychiatric disorders are traditionally diagnosed through the observation of symptoms that match certain clinical diagnostic criteria. However, brain electrical activity mapping (BEAM), also known as quantitative electroencephalography (qEEG), is another technique that may help physicians diagnose neuropsychiatric diseases.

Technology
BEAM involves computer-assisted imaging and statistical analysis of electrical brain activity. The idea behind this technique is that significant abnormalities in the electrical activity of the brain relate to psychiatric disorders, therefore making detection of aberrant electrical activity potentially useful for diagnosis. BEAM is relatively inexpensive, non-invasive, and produces vivid images of electrical activity.

Issue
A review of the effectiveness of BEAM for assessing levels of acetylcholine, dopamine, GABA, and serotonin in the brain, and an evaluation of its diagnostic accuracy for schizophrenia, bipolar disorders, and dementia, will help inform decisions on its use for diagnosing psychiatric disorders.

Methods
A limited literature search was conducted of key resources, and titles and abstracts of the retrieved publications were reviewed. Full-text publications were evaluated for final article selection according to predetermined selection criteria (population, intervention, comparator, outcomes, and study designs).

Key Messages
- No information was found on the effectiveness of BEAM for assessing levels of acetylcholine, dopamine, GABA, and serotonin activity.
- No information was found on the accuracy of BEAM for diagnosing schizophrenia.
- No information was found on the accuracy of BEAM for diagnosing bipolar disorder.
- For the diagnosis of dementia, BEAM may improve accuracy when used along with traditional screening tests, but not enough evidence was found to assess whether it is effective as a stand-alone diagnostic tool.

Results
The literature search identified 293 citations, with no additional articles identified from other sources. After screening the abstracts, 16 potentially relevant reports were identified and 2 studies met the criteria for inclusion in this review — 1 non-randomized study and 1 retrospective study.