**CASE STUDIES** 

Stahl's Essential Psychopharmacology

# **CASE STUDIES** Stahl's Essential Psychopharmacology

# Stephen M. Stahl

University of California at San Diego University of Cambridge, UK

Debbi A. Morrissette

with illustrations by Nancy Muntner





Shaftesbury Road, Cambridge CB2 8EA, United Kingdom One Liberty Plaza, 20th Floor, New York, NY 10006, USA 477 Williamstown Road, Port Melbourne, VIC 3207, Australia 314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India 103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467 Cambridge University Press is part of Cambridge University Press & Assessment, a department of the University of Cambridge. We share the University's mission to contribute to society through the pursuit of education, learning and research at the highest international levels of excellence. www.cambridge.org Information on this title: www.cambridge.org/9780521182089 © Stephen M. Stahl 2011

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press & Assessment.

First published 2011 Reprinted 2014

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-18208-9 Paperback

Cambridge University Press & Assessment has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

.....

Every effort has been made in preparing this book to provide accurate and up-to-date information which is in accord with accepted standards and practice at the time of publication. Although case histories are drawn from actual cases, every effort has been made to disguise the identities of the individuals involved. Nevertheless, the authors, editors and publishers can make no warranties that the information contained herein is totally free from error, not least because clinical standards are constantly changing through research and regulation. The authors, editors and publishers therefore disclaim all liability for direct or consequential damages resulting from the use of material contained in this book. Readers are strongly advised to pay careful attention to information provided by the manufacturer of any drugs or equipment that they plan to use.

## Contents

| Introduction<br>List of icons<br>Abbreviations used in this book                                                                                                                                                                                                                                                                                                                                                                                             | xi<br>xv<br>xvii |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <ol> <li>The Case: The man whose antidepressants stopped working<br/>The Question: Do depressive episodes become more difficult to treat and<br/>more recurrent over time?<br/>The Dilemma: When can you stop antidepressant treatment and what do<br/>you do if medications that worked in the past no longer work?</li> </ol>                                                                                                                              | 1                |
| <ul> <li>2 The Case: The son who would not take a shower<br/>The Question: Will a 32-year-old man with an 18-year history of psychotic<br/>disorder ever be able to live on his own?<br/>The Dilemma: How can aging parents no longer with the health or the<br/>means to support an adult patient with a serious mental illness move their<br/>son towards independence without decompensating his psychotic illness or<br/>making him homeless?</li> </ul> | 15               |
| <ul> <li>3 The Case: The man who kept hitting his wife over the head with a frying pan The Question: How do you treat aggressive behavior in a patient with early Alzheimer's Disease?</li> <li>The Dilemma: Can Alzheimer patients ever be treated with black box antipsychotics?</li> </ul>                                                                                                                                                                | 25               |
| <ul> <li>4 The Case: The son who would not go to bed<br/>The Question: What do you do when SSRIs and behavioral therapy fail to<br/>reverse disability in OCD for more than 19 years?<br/>The Dilemma: How to improve quality of life for a patient with treatment<br/>resistant OCD still living at home?</li> </ul>                                                                                                                                        | 33               |
| <b>5 The Case</b> : The sleepy woman with anxiety<br><b>The Question</b> : How can you be anxious and narcoleptic at the same time?<br><b>The Dilemma</b> : Finding an effective regimen for recurrent, treatment resistant<br>anxious depression while juggling complex treatments for sleep disorder.                                                                                                                                                      | 47               |

e designates a "Lighting Round," a short case without a tutorial

Contents

| 6  | The Case: The woman who felt numb<br>The Question: Are the complaints of a 63-year-old woman with a complex<br>set of psychiatric conditions due to incomplete recovery, or to SSRI induced<br>apathy?<br>The Dilemma: How to have your cake and eat it, too: namely, remission<br>from psychiatric disorders yet no drug-induced cognitive side effects                                          | 65  |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 7  | <b>The Case</b> : The case of physician do not heal thyself<br><b>The Question</b> : Does the patient have a complex mood disorder, a personality<br>disorder or both?<br><b>The Dilemma</b> : How do you treat a complex and long-term unstable disorder<br>of mood in a difficult patient?                                                                                                      | 69  |
| 8  | <b>The Case</b> : The son whose parents were desperate to have him avoid Kraepelin<br><b>The Question</b> : Can you forecast whether an adolescent will become bipolar,<br>schizophrenic or recover?<br><b>The Dilemma</b> : Should you treat symptoms empirically when the diagnosis<br>changes every time the patient come for a visit?                                                         | 81  |
| 9  | <b>The Case</b> : The soldier who thinks he is a "slacker" broken beyond all repair<br>after 3 deployments to Iraq<br><b>The Question</b> : Are his back injury and PTSD going to end his military career?<br><b>The Dilemma</b> : Is polypharmacy with 14 medications including multiple<br>opiates, tranquilizers and psychotropics the right way to head him towards<br>symptomatic remission? | 93  |
| 10 | <b>The Case</b> : The young man everybody was afraid to treat<br><b>The Question</b> : How can you be confident about the safety of combining<br>antihypertensive medications for serious hypertension with psychotropic<br>drugs for serious depression in a patient with a positive urine screen for<br>amphetamine?<br><b>The Dilemma</b> : Which antidepressants can you use?                 | 105 |
| 11 | <b>The Case</b> : The young woman whose doctors could not decide whether she has schizophrenia, bipolar disorder or both <b>The Question</b> : Is there a such thing as schizoaffective disorder? <b>The Dilemma</b> : Does treatment depend upon whether the diagnosis is schizophrenia, bipolar disorder or schizoaffective disorder?                                                           | 117 |
| 12 | The Case: The scary man with only partial symptom control on clozapine<br>The Question: How to manage breakthrough positive symptoms as well as<br>chronic negative symptoms in a 48-year-old psychotic patient with a history<br>of homicide and suicide attempts?<br>The Dilemma: What do you do when even clozapine does not work adequately?                                                  | 129 |

|    |                                                                                                                                                                                                                                                                                                                                                                                                      | Contents |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 13 | The Case: The 8-year-old girl who was naughty<br>The Question: Do girls get ADHD?<br>The Dilemma: How do you treat ADHD with oppositional symptoms?                                                                                                                                                                                                                                                  | 133      |
| 14 | The Case: The scatter-brained mother whose daughter has ADHD, like<br>mother, like daughter<br>The Question: How often does ADHD run in families?<br>The Dilemma: When you see a child with ADHD, should you also evaluate<br>the parents and siblings?                                                                                                                                              | 151      |
| 15 | <b>The Case</b> : The doctor who couldn't keep up with his patients<br><b>The Question</b> :Is cognitive dysfunction following a head injury due to<br>tramatic brain injury or to depression?<br><b>The Dilemma</b> : How can treatment improve his functioning at work?                                                                                                                            | 167      |
| 16 | <ul> <li>The Case: The computer analyst who thought the government would choke him to death</li> <li>The Question: Can you tell the difference between schizophrenia, delusional disorder and obsessive compulsive disorder?</li> <li>The Dilemma: What do you do when antipsychotics do not help delusions?</li> </ul>                                                                              | 175      |
| 17 | <ul> <li>The Case: The severely depressed man with a life insurance policy soon to lose its suicide exemption</li> <li>The Question: Is unstable depression without mania or hypomania a form of unipolar depression or bipolar depression?</li> <li>The Dilemma: Do mood stabilizers work for patients with very unstable mood even if the patient has no history of mania or hypomania?</li> </ul> | 185      |
| 18 | The Case: The anxious woman who was more afraid of her anxiety<br>medications than of anything else<br>The Question: Is medication phobia part of this patient's anxiety disorder?<br>The Dilemma: How do you treat a patient who has intolerable side effects<br>with every medication?                                                                                                             | 201      |
| 19 | <b>The Case</b> : The psychotic woman with delusions that no medication could fix<br><b>The Question</b> : How can you weigh severe side effects with therapeutic<br>benefits of clozapine plus augmentation in a severely ill patient?<br><b>The Dilemma</b> : Is it possible for a patient to have better functioning even<br>though treatment does not help her delusions?                        | 209      |
| 20 | The Case: The breast cancer survivor who couldn't remember how to cook<br>The Question: What is chemobrain?<br>The Dilemma: Can you treat cognitive dysfunction following chemotherapy<br>for breast cancer?                                                                                                                                                                                         | 223      |

Contents

| 21 | The Case: The woman who has always been out of control<br>The Question: How do you treat chaos?<br>The Dilemma: What can you expect from an antipsychotic in a woman with<br>many problems and diagnoses?                                                                                                                                                                                                    | 237 |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 22 | <ul> <li>The Case: The young man with alcohol abuse and depression like father, like son; like grandfather, like father; like great grandfather, like grandfather</li> <li>The Question: How can you help a young man who denies his alcoholism and depression?</li> <li>The Dilemma: Why do so few psychopharmacologists treat addictive disorders with approved medications?</li> </ul>                    | 241 |
| 23 | <ul> <li>The Case: The woman with psychotic depression responsive to her own TMS machine</li> <li>The Question: What do you do for TMS responders who need long-term maintenance?</li> <li>The Dilemma: Finding simultaneous medication treatments to supplement TMS for her psychosis, confusion and mood disorder when ECT and clozapine have failed</li> </ul>                                            | 257 |
| 24 | The Case: The boy getting kicked out of his classroom<br>The Question: What is pediatric mania?<br>The Dilemma: What do you do for a little boy with a family history of mania<br>and who is irritable, inattentive, defiant and aggressive?                                                                                                                                                                 | 271 |
| 25 | <b>The Case</b> : The young man whose dyskinesia was prompt and not tardive<br><b>The Question</b> : What is the cause of a profound and early onset movement<br>disorder in a young man who just started a second generation atypical<br>antipsychotic?<br><b>The Dilemma</b> : How do you treat the psychotic illness without making the<br>movement disorder worse?                                       | 277 |
| 26 | <b>The Case</b> : The patient whose daughter wouldn't give up<br><b>The Question</b> : Is medication treatment of recurrent depression in an elderly<br>woman worth the risks?<br><b>The Dilemma</b> : Should remission still be the goal of antidepressant treatment<br>if it means high doses and combinations of antidepressants in a frail patient<br>with two forms of cancer and two hip replacements? | 291 |
| 27 | The Case: The psychotic arsonist who burned his house and tried to burn<br>himself<br>The Question: How to keep an uncooperative 48-year-old psychotic man<br>with menacing behavior under behavioral control<br>The Dilemma: What can you do after you think you have blocked every<br>dopamine receptor and cannot give clozapine?                                                                         | 309 |

viii

|    |                                                                                                                                                                                                                                                                                                                                                                      | Contents |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 28 | The Case: The woman with depression whose Parkinson's disease vanished<br>The Question: Can state dependent parkinsonism be part of major<br>depressive disorder?<br>The Dilemma: How to diagnose and treat with simultaneous antidepressants<br>and anti-parkinsonian drugs?                                                                                        |          |
| 29 | <b>The Case</b> : The depressed man who thought he was out of options<br><b>The Question</b> : Are some episodes of depression untreatable?<br><b>The Dilemma</b> : What do you do when even ECT and MAOIs do not work?                                                                                                                                              | 323      |
| 30 | <ul> <li>The Case: The woman who was either manic or fat</li> <li>The Question: Will patients be compliant with effective mood stabilizers that cause major weight gain?</li> <li>The Dilemma: Can you find a mood stabilizer that does not cause weight gain or a medication that blocks the weight gain of the mood stabilizer?</li> </ul>                         | 341      |
| 31 | The Case: The girl who couldn't find a doctor<br>The Question: How aggressive should medication treatment be in a child<br>with an anxiety disorder?<br>The Dilemma: Can you justify giving high dose benzodiazepines plus SSRIs<br>to a 12-year-old?                                                                                                                | 351      |
| 32 | <b>The Case</b> : The man who wondered if once a bipolar always a bipolar?<br><b>The Question</b> :Is antidepressant induced mania real bipolar disorder?<br><b>The Dilemma</b> : Can you stop mood stabilizers after 7 years of stability<br>following one episode of antidepressant induced mania without boarding a<br>2 year roller coaster of mood instability? | 363      |
| 33 | <ul> <li>The Case: Suck it up, soldier, and quit whining</li> <li>The Question: What is wrong with a soldier returning from his deployment in Afghanistan?</li> <li>The Dilemma: Is it traumatic brain injury, PTSD or post-concussive syndrome, and how do you treat him?</li> </ul>                                                                                | 377      |
| 34 | <ul><li>The Case: The young man who is failing to launch</li><li>The Question:What is the underlying illness and when can you make a long term diagnosis?</li><li>The Dilemma: What can you do for a young adult on a tragic downhill course of social and cognitive decline?</li></ul>                                                                              | 387      |
| 35 | The Case: The young cancer survivor with panic<br>The Question:Why is this patient resistant to medication treatments?<br>The Dilemma: How aggressive should psychopharmacological treatment be<br>in terms of dosing and duration of drug treatment for panic?                                                                                                      | 401      |

Contents

| 36  | <b>The Case</b> : The man whose antipsychotic almost killed him<br><b>The Question</b> : How closely should you monitor atypical antipsychotic<br>augmentation in a type 2 diabetic with treatment resistant depression?<br><b>The Dilemma</b> : Can you rechallenge a patient with an atypical antipsychotic<br>for his highly resistant depression when he developed hyperglycemic<br>hyperosmotic syndrome on the medication the last time he took it? | 409        |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 37  | <b>The Case</b> : The painful man who soaked up his opiates like a sponge<br><b>The Question</b> : What do you do for a complex chronic pain patient whose<br>symptoms progress despite treatment?<br><b>The Dilemma</b> : How far can medications go to treat chronic pain?                                                                                                                                                                              | 417        |
| 38  | The Case: The woman with an ever fluctuating mood<br>The Question: Where does her personality disorder end and where does her<br>mood disorder begin?<br>The Dilemma: Can medication work for mood instability of a personality disorder                                                                                                                                                                                                                  | 437<br>er? |
| 39  | The Case: The psychotic sex offender with grandiosity and mania<br>The Question: How to stabilize an assaultive patient with deviant sexual<br>fantasies not responsive to standard doses of antipsychotics and mood<br>stabilizers?<br>The Dilemma: Should heroic doses of quetiapine be tried when standard<br>doses give only a partial response?                                                                                                      | 451        |
| 40  | <b>The Case</b> : The elderly man with schizophrenia and Alzheimer's disease<br><b>The Question</b> : How do you treat a patient with schizophrenia who is poorly<br>responsive to antipsychotics and then develops Alzheimer's dementia?<br><b>The Dilemma</b> : Can you give an antipsychotic for one disorder when this is<br>relatively contraindicated for another disorder in the same patient at the<br>same time?                                 | 457        |
| Ind | ex of Drug Names                                                                                                                                                                                                                                                                                                                                                                                                                                          | 461        |

Index of Drug Names Index of Case Studies 461 467

#### Introduction

Joining the *Essential Psychopharmacology* series here is a new idea – namely, a case book. *Essential Psychopharmacology* started in 1996 as a textbook (currently in its third edition) on *how psychotropic drugs work*. It then expanded to a companion *Prescriber's Guide* in 2005 (currently in its fourth edition) on *how to prescribe psychotropic drugs*. In 2008, a website was added (*stahlonline.org*) with both of these books available online in combination with several more, including an *Illustrated* series of several books covering specialty topics in psychopharmacology. Now comes a *Case Book*, showing *how to apply the concepts* presented in these previous books *to real patients in a clinical practice setting*.

Why a case book? For practitioners, it is necessary to know the science of psychopharmacology – namely, both the mechanism of action of psychotropic drugs and the evidence-based data on how to prescribe them – but this is not sufficient to become a master clinician. Many patients are beyond the data and are excluded from randomized controlled trials. Thus, a true clinical expert also needs to develop the art of psychopharmacology: namely, how to listen, educate, destigmatize, mix psychotherapy with medications and use intuition to select and combine medications. The art of psychopharmacology is especially important when confronting the frequent situations where there is no evidence on which to base a clinical decision.

What do you do when there is no evidence? The short answer is to combine the science with the art of psychopharmacology. The best way to learn this is probably by seeing individual patients. Here I hope you will join me and peer over my shoulder to observe 40 complex cases from my own clinical practice. Each case is anonymized in identifying details, but incorporates real case outcomes that are not fictionalized. Sometimes more than one case is combined into a single case. Hopefully, you will recognize many of these patients as the same as those you have seen in your own practice (although they will not be the exact same patient, as the identifying historical details are changed here to comply with disclosure standards and many patients can look very much like many other patients you know, which is why you may find this teaching approach effective for your clinical practice).

I have presented cases from my clinical practice for many years online (e.g., in the master psychopharmacology program of the Neuroscience Education Institute (NEI) at neiglobal.com) and in live courses (especially at the annual NEI Psychopharmacology Congress). Over the years, I have been fortunate to have many young psychiatrists from my university and indeed from all over

#### Introduction

the world, sit in on my practice to observe these cases, and now I attempt to bring this information to you in the form of a case book.

The cases are presented in a novel written format in order to follow consultations over time, with different categories of information designated by different background colors and explanatory icons. For those of you familiar with Essential Psychopharmacology: The Prescribers Guide, this layout will look quite familiar. Included in the case book, however, are many unique sections as well; for example, presenting what was on the author's mind at various points during the management of the case, and also questions along the way for you to ask yourself in order to develop an action plan. Also, these cases incorporate ideas from the recent changes in maintenance of certification standards by the American Board of Psychiatry and Neurology for those of you interested in recertification in psychiatry. Thus, there is a section on Performance in Practice (called here "confessions of a psychopharmacologist"). This is a short section at the end of every case. looking back and seeing what could have been done better in retrospect. Another section of most cases is a short psychopharmacology lesson or tutorial, called the "Two Minute Tute," with background information, tables and figures from literature relevant to the case on hand. Shorter cases of only a few pages do not contain the Tutes, but get directly to the point, and are called "Lightning Rounds." Drugs are listed by their generic name, and often have a brand name mentioned the first time they appear in a case. A generic and brand name index is included at the back of the book for your convenience. Lists of icons and abbreviations are provided in the front of the book.

The case-based approach is how this book attempts to complement "evidence based prescribing" from other books in the *Essential Psychopharmacology* series, plus the literature, with "prescribing based evidence" derived from empiric experience. It is certainly important to know the data from randomized controlled trials, but after knowing all this information, case based clinical experience supplements that data. The old saying that applies here is that wisdom is what you learn AFTER you know it all. And so, too, for studying cases after seeing the data.

A note of caution. I am not so naive as to think that there are not potential pitfalls to the centuries-old tradition of case-based teaching. Thus, I think it is a good idea to point some of them out here in order to try to avoid these traps.

Do not ignore the "law of small numbers" by basing broad predictions on narrow samples or even a single case.

Do not ignore the fact that if something is easy to recall, particularly when associated with a significant emotional event, we tend to think it happens more often than it does.

Do not forget the recency effect, namely, the tendency to think that something that has just been observed happens more often than it does.

Introduction

According to editorialists (1), when moving away from evidence-based medicine to case-based medicine it is also important to avoid:

- Eloquence- or elegance-based medicine
- Vehemence-based medicine
- Providence-based medicine
- Diffidence-based medicine
- Nervousness-based medicine
- Confidence-based medicine

I have been counseled by colleagues and trainees that perhaps the most important pitfall for me to try to avoid in this book is "eminence-based medicine," and to remember specifically that:

- Radiance of gray hair is not proportional to an understanding of the facts
- Eloquence, smoothness of the tongue and sartorial elegance cannot change reality
- Qualifications and past accomplishments do not signify a privileged access to the truth
- Experts almost always have conflicts of interest
- Clinical acumen is not measured in frequent flier miles

So, it is with all humility as a practicing psychiatrist that I invite you to walk a mile in my shoes, experience the fascination, the disappointments, the thrills and the learnings that result from observing cases in the real world.

Stephen M. Stahl, M.D, Ph.D.

(1) Isaccs D and Fitzgerald D, Seven alternatives to evidence based medicine, British Medical Journal 1999, 319:7225

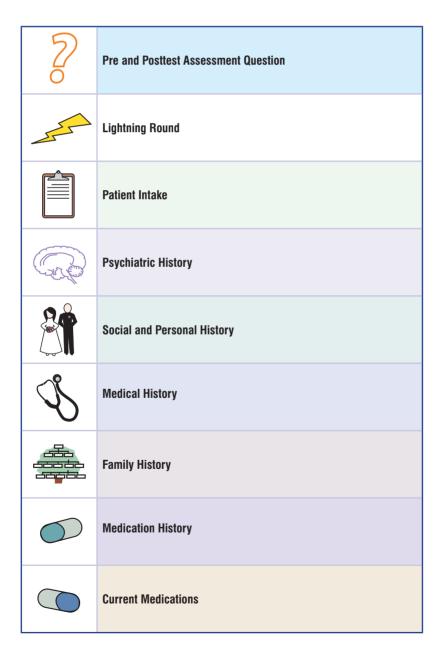
In memory of Daniel X. Freedman, mentor, colleague, and scientific father.

To all the courageous patients and their families that have been part of my practice of psychiatry over the years

To Cindy, my wife, best friend, and tireless supporter.

To Jennifer and Victoria, my daughters, for their patience and understanding of the demands of authorship.

### **List of Icons**



XV

List of Icons



Cambridge University Press & Assessment 978-0-521-18208-9 - Case Studies: Stahl's Essential Psychopharmacology Stephen M. Stahl, Edited by Debbi A. Morrissette, Illustrated by Nancy Muntner Frontmatter More Information

#### Abbreviations used in this book

| ACE<br>ADHD | angiotensin converting enzyme attention deficit hyperactivity | MSLT<br>MTHFR | multiple sleep latency test<br>methylene tetrahydrofolate |
|-------------|---------------------------------------------------------------|---------------|-----------------------------------------------------------|
| Αυπυ        | disorder                                                      |               | reductase                                                 |
| BMI         | body mass index                                               | NE            | norepinephrine                                            |
| BP<br>BUN   | blood pressure                                                | NIMH          | National Institute of Mental<br>Health                    |
| CBT         | blood urea nitrogen                                           | NMDA          | N-methyl-d-aspartate                                      |
| CD          | cognitive behavioral therapy<br>conduct disorder              | NOS           | not otherwise specified                                   |
| 02          |                                                               | NRI           | norepinephrine reuptake                                   |
| COMT<br>CSF | catechol O methyl transferase                                 | N. C.         | inhibition                                                |
| СТ          | cerebrospinal fluid                                           | OCD           | obsessive compulsive disorder                             |
| DA          | computerized tomography<br>dopamine                           | ODD           | oppositional defiant disorder                             |
| DBS         | deep brain stimulation                                        | PFC           | prefrontal cortex                                         |
| DKA         | diabetic ketoacidosis                                         | PET           | positron emission tomography                              |
| DLPFC       | dorsolateral prefrontal cortex                                | prn           | as needed (Latin)                                         |
| ECT         | electroconvulsive therapy                                     | PSG           | polysomnogram                                             |
| FFG         | electroencephalogram                                          | PTSD          | post traumatic stress disorder                            |
| EMDR        | eye movement desensitization                                  | qhs           | at bedtime (Latin)                                        |
| LINDIT      | and reprocessing                                              | REM           | rapid eye movements                                       |
| EPS         | extrapyramidal symptoms                                       | RLS           | restless legs syndrome                                    |
| ESS         | Epworth sleepiness scale                                      | SAMe          | S-adenosyl-methionine                                     |
| fMRI        | functional magnetic resonance                                 | SERT          | serotonin transporter                                     |
|             | imaging                                                       | SNRI          | serotonin norepinephrine                                  |
| GAD         | generalized anxiety disorder                                  |               | reuptake inhibitor                                        |
| HHS         | hyperglycemic hyperosmolar<br>syndrome                        | SOREMP        | sleep onset rapid eye movement periods                    |
| HMO         | health maintenance organization                               | SSRI          | serotonin selective reuptake                              |
| ICU         | intensive care unit                                           |               | inhibitor                                                 |
| IM          | intramuscular                                                 | TBI           | traumatic brain injury                                    |
| MAOI        | monoamine oxidase inhibitor                                   | TCA           | tricyclic antidepressant                                  |
| MDD         | major depression disorder                                     | TMS           | transcrancial magnetic stimulation                        |
| MDE         | major depressive episode                                      | VNS           |                                                           |
| MRI         | magnetic resonance imaging                                    | VIV0          | vagal nerve stimulation                                   |

xvii