Improving Major Depressive Disorder (MDD) Treatment Outcomes: Tailoring Strategies for Remission

Patrick Gillette, MD
Internal Medicine
Medford, Oregon
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Learning Objectives

• Explain patterns of depression recurrence and therapeutic response for patients with major depressive disorder (MDD)
• Identify patients with inadequate response to therapy for MDD
• Apply treatment algorithms to optimize outcomes for patients with major depressive disorder
Depression – Global Burden of Disease

• Depression affects around 120 million people worldwide
• Less than 25% of those affected have access to adequate treatment
• Depression is the third leading cause of burden of disease worldwide (DALYs)

DALY: disability-adjusted life years
Economic Impact of Depression in the US

Total Cost in US Dollars for the Year 2000 = $83.1 billion

- Workplace Costs: $51.5 billion
- Sick Days: 44%
- Productivity Loss: 18%
- Inpatient: 11%
- Outpatient: 8%
- Pharmaceutical: 12%
- Suicide-related Costs: $5.4 billion
- Direct Costs: $26.1 billion

‘Signs’ of Depression

- **S**—Suicidal preoccupation
- **I**—Interest/pleasure (↓)
- **G**—Gain/lose weight
- **G**—Guilty feelings
- **E**—Energy (↓)
- **C**—Concentration
- **A**—Affect (↓ mood)
- **P**—Psychomotor retardation
- **S**—Sleep disturbance

**DSM-IV-TR Major depression:**
5 of 9 x 2 weeks
1 of **BOLDED** must be present

**DSM-IV Dysthymia:**
2 of 6 x 2 years
no 2-month hiatus

Pearls for Psychiatric Management of Patients with MDD

2010 APA Guidelines

- Establish and maintain a strong therapeutic alliance
- Thorough diagnostic assessment
- Evaluate patient safety, suicidal risk
- Evaluate functional impairment and quality of life
- Measurement-based care
- Coordinate care with other clinicians
- Provide patient/family education
- Monitor for response and remission
- Evaluate treatment adherence
Considerations for Patient Evaluation

- **Medical conditions**
  - Complete medical evaluation and blood work
- **Medications**
  - Transplant anti-rejection agents
  - Chemotherapy agents
  - Interferon
  - Steroids
- **Psychiatric comorbidities**
- **Psychosocial stressors and antecedent events**
- **Rule out bipolarity**

APA. Practice guideline for the treatment of patients with major depressive disorder. 2010.
## Tools to Improve Accuracy in MDD: Diagnosis and Assessment of Outcomes

*Differentiate between tools for diagnosis & those to measure outcomes*

<table>
<thead>
<tr>
<th>Screening Tools</th>
<th>Diagnostic Tools</th>
<th>Monitoring Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHQ-9, PHQ-2</td>
<td>PHQ-9</td>
<td>PHQ-9</td>
</tr>
<tr>
<td>CES-D</td>
<td>MINI</td>
<td>QIDS/SR</td>
</tr>
<tr>
<td>HADS</td>
<td>SCID-CV</td>
<td>BDI</td>
</tr>
<tr>
<td>Zung SDS</td>
<td></td>
<td>CUDOS</td>
</tr>
<tr>
<td>MDQ</td>
<td></td>
<td>HADS</td>
</tr>
<tr>
<td>CIDI</td>
<td></td>
<td>IDS</td>
</tr>
</tbody>
</table>

**Tools listed in yellow are included in handouts**

BDI: Beck Depression Inventory; CES-D: Center for Epidemiological Studies Depression Scale; CUDOS: Clinically-Useful Depression Outcome Scale; HADS: Hospital Anxiety and Depression Scale; IDS: Inventory of Depressive Symptomatology; MADRS: Montgomery-Asberg Depression Rating Scale; MINI: Mini International Neuropsychiatric Interview; PHQ-2: Patient Health Questionnaire-2 item; PHQ-9: Patient Health Questionnaire-9 item; QIDS: Quick Inventory of Depressive Symptomatology (clinician and self-report); SCID-CV: Structured Clinical Interview for DSM-IV Axis Disorders-Clinician Version; Zung SDS: Zung Self-Rating Depression Scale; MDQ: mood disorder questionnaire; CIDI: WHO Composite International Diagnostic Interview

Gelenberg AJ. *J Clin Psychiatry*. 2010;71:e01
Measurement-Based Care for MDD

• Systematically using measurement tools to monitor progress and guide treatment choices
  – Regularly scheduled visits
  – Time efficient, validated tools
  – Regularly monitoring symptom improvement, side effects, medication adherence
  – Use a treatment algorithm with established critical decision points

APA. Practice guideline for the treatment of patients with major depressive disorder. 2010.
# Measurement-Based Care for MDD Assessment Tools

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Assessment Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic improvement*</td>
<td>QIDS-C/QIDS-SR (Quick Inventory of Depressive Symptomatology, Clinician Rated/Self-Report)</td>
</tr>
<tr>
<td></td>
<td>PHQ-9 (Patient Health Questionnaire)</td>
</tr>
<tr>
<td></td>
<td>BDI (Beck Depression Inventory)</td>
</tr>
<tr>
<td>Side effects</td>
<td>FIBSER (Frequency, Intensity, and Burden of Side Effects-Rating)</td>
</tr>
<tr>
<td>Medication adherence and reasons for nonadherence</td>
<td>BMQ (Brief Medication Questionnaire)</td>
</tr>
</tbody>
</table>
# MDD Treatment Options

## Pharmacotherapy

### Antidepressant Medications
- Selective Serotonin Reuptake Inhibitors (SSRI)
- Serotonin and Norepinephrine Reuptake Inhibitors (SNRI)
- Norepinephrine-dopamine Reuptake Inhibitors
- Mixed Selective Serotonin Reuptake Inhibitors and Receptor Blockers
- Tricyclic Antidepressants (TCA)
- Monoamine Oxidase Inhibitors (MAOI)

### Agents Used Adjunctively
- Lithium
- Thyroid Hormone
- Anticonvulsants
- Psychostimulants
- S-adenosyl methionine (SAMe)
- Atypical Antipsychotics
MDD Treatment Options
Nonpharmacological Therapy

• Psychotherapy
• Exercise
• Neuromodulation
  – Electroconvulsive Therapy (ECT)
  – Transcranial Magnetic Stimulation (TMS)
  – Vagus Nerve Stimulation (VNS)
  – Deep Brain Stimulation (DBS)
• Sleep deprivation with phase advancement
Treating Depression in the ‘Real World’

• Remission, not response, is the goal
• Should first treatment fail, either switching or augmenting is reasonable
• For most patients, remission requires repeated trials of “sustained, vigorously-dosed” antidepressant medication
• Likelihood of remission substantially decreases after two adequate treatment trials, suggesting need for more complicated regimens and psychiatric consultation

Mission: Remission

- **Response**
  - ≥ 50% reduction in symptom scores
- **Remission**
  - Function restored
  - Minimal to no residual symptoms
    - 17-item HAM-D ≤ 7
    - MADRS ≤ 10
- **Recovery**
  - Remission ≥ 6 months

Why Target Remission?

- Compared with patients who achieve full remission, those with *residual symptoms* have:
  - Greater risk of relapse and recurrence
  - More chronic depressive episodes
  - Continued professional and social impairment
  - Shorter duration between episodes
  - Ongoing increased risk of suicide
  - Increased overall mortality
  - Increased morbidity and mortality from comorbid medical disorders, including
    - Stroke, diabetes, myocardial infarction, cardiovascular disease, congestive heart failure, HIV

What Is Treatment-Resistant Depression?

- Failure of a patient to respond to at least 2 antidepressant trials of adequate dose, duration, and treatment adherence

Factors Associated with Treatment Resistance

- Misdiagnosis (e.g., bipolar disorder)
- Depression severity and chronicity
- Specific depressive subtypes
  - Psychotic depression, atypical depression, melancholic features
- Psychiatric comorbidities
  - Anxiety disorders, panic disorder, personality disorder
- Medical comorbidities
- Age at onset before 18 years
- Substance abuse
- Patient noncompliance with treatment
- Pharmacokinetics, pharmacogenetics

Strategies for Refractory Depression

- **Switch** to a different antidepressant (within class or across class)
- **Combine** the initial antidepressant with a second antidepressant
- **Augment** the treatment regimen with a non-antidepressant agent

Switching

• Different mechanism of action
  – Such as from an SSRI to a dual mechanism agent or to a predominantly noradrenergic/dopaminergic agent
• Reduce side effects
• Reduced risk of drug interactions
• Possibly cheaper
• Switch within class or across classes?

Combination

• Maximize benefit
• Target side effects of first agent (eg, insomnia, fatigue, sexual dysfunction)
• Increase adherence and lower drop-out rates
Augmentation

- Broadens the neurochemical targets
- Maximize therapeutic benefit associated with the first-line agent
- Allows more time for the current agent
- Avoid potential withdrawal symptoms

The Sequenced Treatment Alternatives to Relieve Depression (STAR*D) Trial (www.star-d.org)

• Primary outcome measured: *Remission*

• Largest clinical trial of depression to date
  – 7 years (1999–2006)
  – Enrolled 4,041 adult subjects

• Conducted in primary care as well as psychiatric settings (18 vs 23)

• Few exclusion criteria → “real world”

STAR*D Treatment Strategies and Options

Citalopram

BUP-SR | SERT | VEN-XR

CT | CT + CIT

CIT + BUP-SR | CIT + BUS

LEVEL 1

LEVEL 2

LEVEL 2A

LEVEL 3

LEVEL 4

SWITCH

AUGMENT

BUP-SR | VEN-XR

MIRT | NTP

Li + BUP-SR, SERT, VEN-XR, or CIT | T₃ + BUP-SR, SERT, VEN-XR, or CIT

TCP | MRT + VEN-XR

CIT: citalopram
CT: cognitive therapy
BUS: buspirone
BUP-SR: bupropion sustained release
Li: lithium
MIRT: mirtazapine
NTP: nortriptyline
SERT: sertraline
T₃: triiodothyronine
TCP: tranylcypromine
VEN-XR: venlafaxine extended release

STAR*D: Unresolved Symptoms Following Antidepressant Treatment

STAR*D = Sequenced Treatment Alternatives to Relieve Depression, n = 2,876

Depressive Symptoms (QIDS-SR Score) After Up to 12 Weeks Antidepressant Treatment

- Remission: ~33%
- Mild symptoms: ~28%
- Moderate symptoms: ~23%
- Severe symptoms: ~12%
- Very severe symptoms: ~4%

STAR*D Study (N = 2,876)
Meta-Analysis: Switch Within vs Across Classes – Remission

Poirier and Boyer, 1999
Lenox-Smith et al, 2001
Thase et al, 2001
Rush et al, 2006

Combined

Favors within-class switch
Favors across-class switch

Risk Ratio

Data from 4 clinical trials; n = 1496

Nonsignificant trend suggested that switch within class was better tolerated
MDD Case Discussion
### Mood Disorder Questionnaire - Rhonda

**INSTRUCTIONS:** Please answer each question as best you can.  

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Has there ever been a period of time when you were not your usual self and...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>... you felt so good or so hyper that other people thought you were not your normal self or you were so hyper that you got into trouble?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... you were so irritable that you shouted at people or started fights or arguments?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... you felt much more self-confident than usual?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... you got much less sleep than usual and found that you didn’t really miss it?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>... you were more talkative or spoke much faster than usual?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... thoughts raced through your head or you couldn’t slow your mind down?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... you were so easily distracted by things around you that you had trouble concentrating or staying on track?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>... you had much more energy than usual?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... you were much more active or did many more things than usual?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>... you were much more social or outgoing than usual, for example, you telephoned friends in the middle of the night?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>... you were much more interested in sex than usual?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>... you did things that were unusual for you or that other people might have thought were excessive, foolish or risky?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>... spending money got you or your family in trouble?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>2. If you checked YES to more than one of the above, have several of these ever happened during the same period of time?</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>3. How much of a problem did any of these cause you - like being able to work; having family, money or legal troubles; getting into arguments or fights?</td>
<td>No problem</td>
<td>Minor problem</td>
</tr>
</tbody>
</table>

---

No problem     Minor problem     Moderate problem     Serious problem
**Patient Health Questionnaire 9 (PHQ-9)**

**Name:** Rhonda

**Date:** Visit 0 (OB/GYN)

Over the last 2 weeks, how often have you been bothered by any of the following problems? (use “○” to indicate your answer)

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed, or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Trouble falling or staying asleep, or sleeping too much</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Feeling tired or having little energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Poor appetite or overeating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Trouble concentrating on things such as reading the newspaper or watching television</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead, or of hurting yourself in some way</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total:** 19

10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home or get along with other people

   - Not difficult at all _______
   - Somewhat difficult _______
   - Very difficult _______
   - Extremely difficult ✔
Patient Health Questionnaire 9 (PHQ-9)

Name: Rhonda

Date: Visit 1

Over the last 2 weeks, how often have you been bothered by any of the following problems?
(use “☐” to indicate your answer)

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed, or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Trouble falling or staying asleep, or sleeping too much</td>
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<td>3</td>
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<td>4. Feeling tired or having little energy</td>
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<td>5. Poor appetite or overeating</td>
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<td>2</td>
<td>3</td>
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<td>6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down</td>
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<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Trouble concentrating on things such as reading the newspaper or watching television</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Thoughts that you would be better off dead, or of hurting yourself in some way</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total: 15

10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home or get along with other people?

Not difficult at all  _____
Somewhat difficult  _____
Very difficult  _____
Extremely difficult  _____


**Generalized Anxiety Disorder 7 (GAD-7)**

**Name:** Rhonda

**Date:** Visit 1

Over the last 2 weeks, how often have you been bothered by any of the following problems? (use “✓” to indicate your answer)

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Several days</th>
<th>More than half the days</th>
<th>Nearly every day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feeling nervous, anxious or on edge</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Not being able to stop or control worrying</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Worrying too much about different things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Trouble relaxing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Being so restless that it is hard to sit still</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Becoming easily annoyed or irritable</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Feeling afraid as if something awful might happen</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total** 4
Factors Independently Associated With Greater Chance of Remission (STAR*D)

- Employment
- Greater income
- Greater education
- Caucasian
- Female gender
- No OCD or PTSD
- Greater functioning/quality of life

Major Depression: A Pathoetiologcal Risk Factor for Incident Chronic Medical Disorder

- Cardiovascular
- Osteoporosis
- Obesity
- Type II Diabetes Mellitus
- Neurodegenerative Disorders
Major Depressive Disorder May Have Systemic Consequences

1. Hypothalamus stimulates the pituitary gland to release excessive ACTH, continuously driving the adrenal gland

2. The adrenal gland releases excessive amounts of catecholamines and cortisol

3. Increase in catecholamines can lead to myocardial ischemia, diminished heart rate variability, and can contribute to ventricular arrhythmias

4. Increase in catecholamines causes platelet activation; increase in cytokines and interleukins may also contribute to atherosclerosis and eventual hypertension

5. Cortisol antagonizes insulin and contributes to dyslipidemia, type 2 diabetes, and obesity; increases in cortisol also suppress the immune system

Depression Is an Inflammatory Disorder

TNF-α (pg/ml)

Healthy comparison subjects (N = 20)  
No depression (N = 16)  
Lifetime major depressive disorder (N = 12)  
Current major depressive episode (N = 10)

IL-6 (pg/ml)

*P < 0.05

Depression and Intra-abdominal Fat


NS = Not significant
Greater Decline in Gray Matter Volume in Unremitted Compared with Remitted MDD Patients

- 3-year prospective study
- 38 patients vs 30 healthy controls
- Significantly greater decline in gray matter density was noted in non-remitted versus remitted major depressive disorder patients in:
  - Hippocampus
  - Anterior cingulate cortex
  - Dorsomedial prefrontal cortex
  - Dorsolateral prefrontal cortex
- Threshold was set at $P < 0.01$

Frodl TS, et al. Arch Gen Psychiatry. 2008;65:1156–1165. Copyright @ 2008 American Medical Association. All rights reserved.
STAR*D Cumulative Remission Rates

Algorithm for Managing Limited Improvement with First-line Antidepressant

1. Start and optimize a 1st-line antidepressant
   - Evaluate degree of improvement using a validated rating scale
   - If less than full remission
     - Evaluate side effects and residual symptoms
     - Add-on treatment with another agent (augment/combine)
     - Evaluate as treatment-resistant depression
     - Maintain
   - No improvement (< 20% change) or intolerant
     - Evaluate side effects and symptoms
     - Switch to a 2nd agent with evidence of superiority
     - Remission (score in normal range)
   - Some improvement (≥ 20% change) but not in remission
     - Evaluate side effects and residual symptoms
     - Evaluate as treatment-resistant depression
     - Remission (score in normal range)
     - Evaluate risk factors for recurrence

Olanzapine-Fluoxetine Combination for TRD MADRS Remission Rates


*P < 0.05 compared with fluoxetine
‡P < 0.05 compared with olanzapine
Olanzapine Augmentation: Metabolic and Endocrine Parameters


*P < 0.05

Mean Change

- Weight (Kg)
  - Olanzapine: 4.9
  - Placebo: 0.4

- Triglycerides (mg/dL)
  - Olanzapine: 39.8
  - Placebo: 15.9

- Total Cholesterol (mg/dL)
  - Olanzapine: 15.1
  - Placebo: 0.8

- Prolactin (µg/L)
  - Olanzapine: 3.4
  - Placebo: 0.9
Risperidone Augmentation for TRD

<table>
<thead>
<tr>
<th></th>
<th>Week 4</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risperidone</td>
<td>13.6% (16/118)</td>
<td>24.5% (26/106)</td>
</tr>
<tr>
<td>Placebo</td>
<td>6.0% (7/117)</td>
<td>10.7% (12/112)</td>
</tr>
</tbody>
</table>

P = 0.041 (Week 4)

P = 0.004 (Week 6)
Risperidone Augmentation
Side Effects

- Somnolence
- Dry mouth
- Increased appetite
- Weight gain

Aripiprazole Augmentation: Placebo-Controlled Trials

Aripiprazole Augmentation

![Bar chart showing the percentage of patients experiencing side effects such as akathisia, headache, restlessness, and fatigue under Aripiprazole and Placebo conditions across Studies 1, 2, and 3.](chart)

Quetiapine Augmentation: Pooled Analysis of 2 Randomized, Placebo-Controlled Trials

MADRS: Montgomery-Asberg Depression Rating Scale

Remission Rate at Week 6 (%)

MADRS Total Score at Week 6

Placebo + antidepressant (n = 303)
Quetiapine XR 150 mg/day + antidepressant (n = 309)
Quetiapine XR 300 mg/day + antidepressant (n = 307)

*P < 0.05; **P < 0.01; ***P < 0.001 vs placebo

MADRS remission defined as MADRS total score 8, 10, 12 at Week 6


MADRS: Montgomery-Asberg Depression Rating Scale
Quetiapine Augmentation: Metabolic and Endocrine Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Quetiapine 150 mg/day</th>
<th>Quetiapine 300 mg/day</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (Kg)</td>
<td>0.9</td>
<td>1.0</td>
<td>0</td>
</tr>
<tr>
<td>TG (mg/dL)</td>
<td>13.9</td>
<td>14.9</td>
<td>-5.2</td>
</tr>
<tr>
<td>Total Cholesterol (mg/dL)</td>
<td>4.3</td>
<td>6.8</td>
<td>-0.9</td>
</tr>
<tr>
<td>Prolactin (ng/ml)</td>
<td>2.7</td>
<td>1.3</td>
<td>2.0</td>
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Atypical Antipsychotic Augmentation Meta-Analysis

16 Trials, 3,480 patients
Atypical antipsychotic (AA) vs placebo

Response
- OR: 1.69 (95% CI 1.46-1.95); $P < 0.00001$
- Overall response rate for AA 44.2% vs 29.9% for placebo

Remission
- OR: 2.00 (95% CI 1.69-2.37); $P < 0.00001$
- Overall remission rate for AA 30.7% vs 17.2% for placebo

Discontinuation for Adverse Events
- OR: 3.91 (95% CI 2.68-5.72); $P < 0.00001$
- Pooled adverse event discontinuation rate for AA 9.1% vs 2.3% for placebo

AAs included olanzapine, risperidone, quetiapine, aripiprazole

Atypical Antipsychotics: Side Effect Burden

- Metabolic
  - Weight gain
  - Glucose intolerance/Type 2 diabetes
  - Lipid derangements, especially increased triglycerides
- Neurologic
  - EPS (akathisia, parkinsonism, tardive dyskinesia)
- Sedation/somnolence
- Hyperprolactinemia
- Blood dyscrasias

Augmentation with S-Adenosyl Methionine (SAMe) HAM-D Response and Remission Rates at 6 Weeks

HAM-D: Hamilton Depression Rating Scale

Switch Therapy or Add-on?

Monotherapy switch:
• No drug interactions
• No additive side effects
• Dosing simplicity

Add-on therapy:
• Faster onset of response
• Address specific residual symptoms or side effects
• Psychological advantage
• Late responders

Primarily a clinical decision (lack of evidence) based on whether there is at least a partial response to initial treatment

# Choosing an Add-on Strategy

<table>
<thead>
<tr>
<th>1st Line</th>
<th>Level 1 Evidence</th>
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<tbody>
<tr>
<td></td>
<td>Aripiprazole</td>
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<tr>
<td></td>
<td>Olanzapine</td>
</tr>
<tr>
<td></td>
<td>Quetiapine XR</td>
</tr>
<tr>
<td></td>
<td>Lithium</td>
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<tr>
<td></td>
<td><strong>Level 2 Evidence</strong></td>
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<td></td>
<td>Risperidone</td>
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<thead>
<tr>
<th>2nd Line</th>
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<tr>
<td></td>
<td>Bupropion</td>
</tr>
<tr>
<td></td>
<td>Mirtazapine/mianserin</td>
</tr>
<tr>
<td></td>
<td>Quetiapine</td>
</tr>
<tr>
<td></td>
<td>Triiodothyronine</td>
</tr>
<tr>
<td></td>
<td><strong>Level 3 Evidence</strong></td>
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<tr>
<td></td>
<td>Other antidepressant</td>
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<tr>
<th>3rd Line</th>
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<tr>
<td></td>
<td>Buspirone</td>
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<tr>
<td></td>
<td>Modafinil</td>
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<td><strong>Level 3 Evidence</strong></td>
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<td>Stimulants</td>
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Summary

- > 50% of patients treated for major depressive disorder fail to achieve remission with initial therapy ~‘Better is not well’
- Multiple factors are associated with treatment resistance
- STAR*D provides a framework for an evidence-based, individualized treatment plan
- Measurement-based care is essential
- Switch, combination, and augmentation for unresolved depression are evidence-based strategies to achieve remission
- Adjunctive treatment with atypical antipsychotics
  - Effective during acute phase of treatment; side effect burden is a concern
  - Long-term safety and efficacy not known
Supplementary Material
Treatment Outcome: Level 1

More than **Two-Thirds** of Patients Did Not Achieve Remission on Citalopram Monotherapy

- Average duration of time to remission ~ 7 weeks
- 40% required > 8 weeks to reach remission

HAM-D-17 = 17-item Hamilton Rating Scale for Depression
QIDS-SR-16 = 16-item Quick Inventory of Depressive Symptomatology – Self-Report
STAR*D Level 2
Switch or Augment

Randomize

Switch Options
- SER
- BUP-SR
- VEN-XR
- CT

Augmentation Options
- CIT + BUP-SR
- CIT + BUS
- CIT + CT

SER: sertraline; BUP-SR: bupropion sustained release; VEN-XR: venlafaxine extended release; CT: cognitive therapy; CIT: citalopram

STAR*D Level 2 Medication Switch


BUP-SR: bupropion sustained release
SERT: sertraline
VEN-XR: venlafaxine extended release
Level 2 Augmentation Outcomes: Remission Rates

BUP-SR: bupropion sustained release; BUS: buspirone

Remission Rates in Level 2 of STAR*D: Anxious vs Non-Anxious MDD


*P < 0.05

BUP: bupropion; SER: sertraline; VEN: venlafaxine; BUS: buspirone
STAR*D Level 3
Switch or Augment

Randomize

Switch Options
- MRT
- NTP

Augmentation Options
- L-2 Tx + Li
- L-2 Tx + THY

MRT: mirtazapine; NTP: nortriptyline; Li: lithium; THY: triiodothyronine (T₃)

Treatment Outcomes: Level 3 Switch


MIRT: mirtazapine; NTP: nortriptyline

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<thead>
<tr>
<th></th>
<th>HAM-D-17</th>
<th>QIDS-SR-16</th>
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<tr>
<td>MIRT</td>
<td>12.3</td>
<td>8.0</td>
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<tr>
<td>NTP</td>
<td>19.8</td>
<td>12.4</td>
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<tr>
<td>N = 121</td>
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</table>


MIRT: mirtazapine; NTP: nortriptyline
Treatment Outcomes: Level 3 Augmentation


- Lithium: N = 69, Remission (%): 15.9
- Thyroid: N = 73, Remission (%): 24.7
STAR*D Level 4

Randomize

Switch Options

TCP
VEN-XR + MRT

TCP: tranylcypromine; MRT: mirtazapine; VEN-XR: venlafaxine extended release

Level 4 Treatment Outcomes: Remission Rates

TCP: tranylcypromine; MRT: mirtazapine; VEN: venlafaxine extended release


TCP (N = 58)
- HAM-D-17: 6.9%
- QIDS-SR-16: 13.8%

VEN + MIRT (N = 51)
- HAM-D-17: 13.7%
- QIDS-SR-16: 15.7%
STAR*D Clinical Study Results
Remission Rates (HAM-D-17 < 8)

- **Level 1**
  - 11.9 weeks
  - Mono

- **Level 2**
  - 8-10 weeks
  - 1 failure
  - Augm

- **Level 3**
  - ≤ 14 weeks
  - 2 failures
  - Augm
  - Mono

- **Level 4**
  - ≤ 14 weeks
  - 3 failures
  - Augm
  - Mono

Mono = monotherapy
Augm = combination treatment