Pharmacotherapeutic Treatment of Nicotine and Alcohol Dependence

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Frances Levin, MD is a consultant for GW Pharmaceuticals and receives study medication from US Worldmed. This planning committee for this activity has determined that Dr. Levin’s disclosure information poses no bias or conflict to this presentation.

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System Requirements

• In order to complete this online module you will need Adobe Reader. To install for free click the link below:
The overarching goal of PCSS-MAT is to make available the most effective medication-assisted treatments to serve patients in a variety of settings, including primary care, psychiatric care, and pain management settings.
Educational Objectives

• At the conclusion of this activity participants should be able to:
  ▪ Discuss pharmacotherapeutic treatment options for nicotine dependence
  ▪ Discuss pharmacotherapeutic treatment options for alcohol dependence
Outline

• Overview of treatment guidelines for nicotine dependence

• Review of specific medication options with prescribing information

• Overview of FDA-approved medications for the treatment of alcohol dependence

• Agents under investigation in the treatment of alcohol dependence

• Pharmacogenetics and the treatment of alcohol dependence
Smoking and Psychiatric Illness

Kalman, 2005: Comorbidity of smoking in patients with psychiatric and substance abuse disorders.
Pre-mature Death

• About half of all smokers will die from the effects of smoking\(^1\)

• On average, smokers die 10 to 14 years earlier than non-smokers\(^1,2\)

• The probability of dying in middle age increases threefold in smokers vs. non-smokers.\(^1\)

• However, quitting at age 50 halves the mortality risk and quitting at 30 almost completely eliminates it.\(^1\)

1. Doll et al., 2006
2. MMWR, April 2002
Clinical Practice Guideline Treating Tobacco Use and Dependence: 2008 Update

- Chronic disease requiring multiple interventions and quit attempts.
- Consistent ID smokers & current smoking status
- Use effective medication unless contraindicated NRT, Bupropion SR and Varenicline
- Both Counseling & med effective - combo more effective - use together.
- Telephone quit lines effective - ↑ access & use
- Use motivational therapy in smokers unwilling to make quit attempt - can ↑ future attempts

Fiore et al., 2008
“5 A’s” Model

1. Ask about tobacco use.
2. Advise to quit.
3. Assess willingness to quit.
4. Assist in quit attempt.
5. Arrange follow-up.
Meds vs. Counseling

- Combination of medication and counseling together is more effective than either alone
- Adding counseling to medication increases quit rates
- Two or more counseling sessions improve quit rates
- Adding meds to counseling also improves outcomes
Nicotine Replacement Therapy

• Appropriate first-line medication
  - Nicotine gum (OTC) – low compliance
  - Nicotine inhaler (prescription) lowest compliance
  - Nicotine lozenge (OTC)
  - Nicotine nasal spray (prescription)
  - Nicotine patch (OTC) – highest compliance

• Efficacy: Increase success 1.5-2 fold compared to placebo, equally efficacious
NRT

Drug Interactions

• Smoking increases the metabolism of some other drugs and after successful smoking cessation drug levels may increase
  ▪ Methadone and buprenorphine
  ▪ Antipsychotic medications
  ▪ Antidepressants
  ▪ Some heart medications
NRT General Precautions

• Common Adverse effects: Headache, dizziness, sleep disturbances, vivid dreams, nausea, vomiting, indigestion, local irritation at administration site.

• Rare: Irregular heart rhythms, rapid heart beat, palpitations, chest pain, BP changes.
  ▪ Increased blood insulin levels & insulin resistance
  ▪ Dizziness, lightheadedness, insomnia, & irritability 1-25%

• Contraindications: Hypersensitivity to nicotine Cardiovascular Disease
  ▪ NRT not independent risk factor
  ▪ Use with caution 1st 2 wks after a heart attack, heart rhythm irregularities, & chest pain
Nicotine Patch

- 7mg/24h, 14mg/24h, 21mg/24h or 5mg/16h, 10mg/16h, 15mg/15h

- Peak concentration: 6-12h with initial lag 1-2h

- Smoking > 10 cigarettes/d
  - Weeks 1-6 use one 21mg patch per day
  - Weeks 7-8 use one 14mg patch per day
  - Weeks 9-10 use one 7mg patch per day

- Smoking < 10 cigarettes/d
  - Weeks 1-6 use one 14mg patch per day
  - Weeks 7-8 use one 7 mg patch per day
Nicotine Patch

• Cost
  ▪ Nicotine patch 21mg/24h, 14mg/24h, & 7mg/24h for 14 patches $27.99 ($ from drugstore.com)

• Administration Notes
  ▪ If have vivid dreams/sleep disturbances, remove at bedtime and reapply in the morning
  ▪ If crave cigarettes on awakening wear for 24 h

• Additional side effects
  ▪ Mild skin irritation, usually delayed
  ▪ Moderate irritation in 36%
  ▪ Severe reaction requiring discontinuation in 12%
Nicotine Gum

• Dosage
  - Smokers <25 cigarettes a day use 2 mg gum
  - Smokers >25 cigarettes a day use 4 mg gum

• Use 1 piece every 1-2 hours for the 6 wks, then 1 pc. every 2-4 hours wks 7-9, then 1 pc. every 4-8 hours wks 10-12

• No more than 24 pieces in 24 hours

• Fixed schedule maybe more helpful than using ad lib
Nicotine Gum

• Peak nicotine concentration 15-30 min

• Specific Adverse effects with gum- mechanical (sore jaw) & pharmacological (throat irritation, burning in mouth)

• Instructions: chew & “park” between cheek and gum for long periods
  ▪ Avoid eating/drinking before, during, & after use.
  ▪ Absorption ↓ by acidic environment (juice, soda, coffee)

• FDA Category C

• Cost: 4 mg box of 170 pieces $49.99*

* Prices from drugstore.com
Nicotine Lozenge

• 2 mg / 4 mg
• Heavy smokers (>25 cig/day) or 1st cigarette within 30 min of waking
• Light smokers (< 25 cig/day) use 2 mg
• Instructions
  ▪ Weeks 1-6: 1 lozenge every 1-2 hours
  ▪ Weeks 7-9: 1 lozenge every 2-4 hours
  ▪ Weeks 10-12: 1 lozenge every 4-8 hours
• Maximum 5 lozenges/6h or 20 loz/24h
Nicotine Lozenges

- Additional side effects: mild mucosal irritation, on 4 mg also increased h/a & coughing
- Avoid acidic beverages 15 min before and during use
- High dose lozenges may be more efficacious in highly dependent smokers
- Cost: Both 4mg & 2mg for box of 72 pieces $37.59

Comes in flavors!
Nicotine Inhaler
Nicotine Inhaler

- 10 mg/cartridge delivers 4 mg of nicotine
- Peaks 15-20 min
- Nicotine vapor absorbed through mucosa
- Each cartridge provides about 20 minutes of active puffing
  - 80 deep draws or 300 shallow puffs
  - Therapeutic effect best by frequent continuous puffing for 20 minutes.
  - Ten puffs on inhaler = one puff of cigarette
Nicotine Inhaler

• **Usual Dose:** 6-16 cartridges/day
  - Weeks 1-12, use 6-16 cartridges/day
  - Weeks 13-14 gradual taper
  - No optimal taper recommended
  - Max 16 cartridges/day

• **Additional contraindication:** hypersensitivity to menthol
Nicotine Inhaler

• Additional Side effects: cough, throat irritation, rhinitis, bronchitis, relapse of asthma

• Acidic beverages interfere with absorption. Water only for 15 min before or during use

• May be particularly helpful for smokers with <20 cig/d and high behavioral dependence

• Cost: Inhaler and 168 cartridges $189.76*
Nicotine Nasal Spray

- Nicotine content: 10 mg/mL
- Peak concentration: 4-15 minutes
- Venous concentration 2-12 ng/mL
- Most closely approximates the time course of plasma nicotine levels from smoking than other forms of NRT
Nicotine Nasal Spray

• Dosage: One dose = 2 sprays (1 in each nostril)
  ▪ 0.5 mg/spray or 1 mg/per dose
  ▪ Weeks 1-8: 1-2 doses/h with at least 8 doses/d
  ▪ Weeks 9-14: gradual taper

• Maximum dose: 5 doses/h or 40 doses/d

• Additional side effects: coughing, nasal irritation, exacerbation of asthma, transient changes in sense of smell & taste

• Higher abuse potential

• 10ml of spray 35.45*

*Langston Info Services
Choice of NRT

- Equally efficacious
- Patch: GI, nasal & mouth irritation eliminated
- Patch: steady blood levels
- Spray most closely mimics smoking plasma nicotine levels
- Inhaler may assist with behavioral aspects
Bupropion SR

• Precautions
  ▪ Situations with increased risk of seizures.
  ▪ Bipolar Disorder - Increased risk of manic/mixed episode with antidepressant treatment alone
  ▪ Hepatic impairment
  ▪ Renal impairment

• Seizure risk: on 300 mg/d incidence of 0.1%
  ▪ In depression - predisposing factors were alcohol with possible alcohol abuse, history of head trauma
Bupropion SR (Zyban, Wellbutrin SR)

- Appropriate first line treatment
- Action:
  - Weak inhibitor of norepinephrine reuptake
  - Weak inhibitor of dopamine reuptake
  - Noncompetitive inhibitor of NAcCh receptors
- Doubles odds of quitting
- Nearly 20 RCT relatively less withdrawal symptoms and craving compared to placebo
- Weight gain less during active treatment.
Bupropion SR

• Dosage
  ▪ 150 mg for 3 days then
  ▪ 150 mg twice a day at least 8h apart.
  ▪ Start treatment 1 week before quit date.
  ▪ Continue treatment 7-12 weeks.
  ▪ In presence of severe hepatic cirrhosis reduce dose to max of 150 mg every other day.

• If no progress by 7th week unlikely pt will quit.
Bupropion SR

• Side Effects
  - 300 mg/d 8-12% discontinuation rates due to side effects
  - Most common tremor, rash, h/a, hives
  - Insomnia & dry mouth more likely than placebo

• Cost
  - Bupropion SR 150 mg # 60 $75.99 (generic)
Varenicline (Chantix)

- Appropriate first line treatment

- Action: nicotine partial agonist
  - Mimics nicotine → moderate & sustained dopamine release
  - Blocks subsequent nicotine dopamine release

- Triples odds of quitting compared to placebo

- Precautions
  - Significant renal disease or on dialysis - reduce dose
  - May experience impaired driving ability or operate heavy equipment
Varenicline

- FDA Category C

- FDA Warning February 2008
  - Depressed mood, agitation, behavioral changes, suicidal ideation, & suicide reported during smoking cessation attempts with varenicline. Patients should tell providers about psychiatric history and clinicians should monitor for changes in mood / behavior.
<table>
<thead>
<tr>
<th>DRUG</th>
<th>Estimated Abstinence Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varenicline (Chantix) (2mg/day)</td>
<td>33.2</td>
</tr>
<tr>
<td>Varenicline (1mg/day)</td>
<td>25.4</td>
</tr>
<tr>
<td>Nicotine nasal spray</td>
<td>26.7</td>
</tr>
<tr>
<td>Nicotine patch (6-14 wks)</td>
<td>23.4</td>
</tr>
<tr>
<td>High dose nicotine patch (&gt;24mg)</td>
<td>26.5</td>
</tr>
<tr>
<td>Long-term nicotine patch (&gt;14wks)</td>
<td>23.7</td>
</tr>
<tr>
<td>Nicotine gum (6-14 wks)</td>
<td>19.0</td>
</tr>
<tr>
<td>Long-term nicotine gum (&gt;14 wks)</td>
<td>26.1</td>
</tr>
<tr>
<td>Nicotine inhaler</td>
<td>24.8</td>
</tr>
<tr>
<td>Bupropion (Zyban)</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Fiore 2008
Electronic Cigarettes (e-cig)

- Battery-powered Vaporizer
- Delivers Nicotine
- Risk vs. Benefit Uncertain
  - ? initiate smoking
  - ? useful in cessation
### FDA-Approved Medications for Alcohol Dependence

<table>
<thead>
<tr>
<th>Medication</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>disulfiram (Antabuse®)</td>
<td>Aldehyde dehydrogenase 1949</td>
</tr>
<tr>
<td>naltrexone (Revia®, Depade®)</td>
<td>Opioid receptor 1994</td>
</tr>
<tr>
<td>acamprosate (Campral®)</td>
<td>Glutamate receptor 2004</td>
</tr>
<tr>
<td>Extended-release naltrexone (Vivitrol®)</td>
<td>Opioid receptor 2006</td>
</tr>
</tbody>
</table>
Medications Tested in Alcohol Dependence

- Aversive agents (disulfiram)
- Serotonin reuptake inhibitors (fluoxetine, sertraline, citalopram)
- Serotonergic agents (ondansetron)
- Opiate antagonists (naltrexone, nalmefene)
- Acamprosate
- Anticonvulsants (topiramate, divalproex)
- Antipsychotics (quetiapine, olanzapine)
Naltrexone in the Treatment of Alcohol Dependence: Primary Outcome

Cumulative Relapse Rate*

*Time to first episode of heavy drinking; $P<.01$

Long-acting IM Naltrexone

- **Primary Efficacy Measure, Event Rate Of Heavy Drinking:**
  - 380 mg group significantly better than placebo ($p < 0.03$)
  - ~48% reduction in median heavy drinking days
    - Baseline 19.3, Placebo 6.0, 380 mg 3.1
  - Benefits observed in both actively drinking and abstinent patients

- **Significant AEs**
  - Mild to moderate nausea (33%), fatigue (20%), decreased appetite

- **Well Tolerated / Favorable Liver Enzyme Profile**

- **AE Drop-outs**
  - 14% (380 mg ND), 7% (190 mg ND), 7% (placebo); $P=0.01$

- **Injection Site Pain**
  - 380 mg vs. placebo (12% vs. 9%, respectively; $P=0.04$)

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Heavy drinking defined as ≥ 5 drinks/day for men; ≥ 4 drinks/day for women; naltrexone 380 mg vs. placebo, $P=.03$; naltrexone 190 mg vs. placebo, $P=.07$

Garbutt JC et al., *JAMA*. 2005; 293:1617-1625
Project COMBINE

- 1,383 Recently abstinent alcoholics
- Naltrexone, acamprosate or combination
- Medical management, behavioral intervention or combination
- Naltrexone group had significant decrease in drinking outcomes
- No effect of acamprosate alone or in combination with naltrexone

Anton et al., JAMA, 2006
Acamprosate

• Acamprosate is #1 selling alcohol medication in U.S.

• Acamprosate is not being actively marketed by Forest Pharmaceuticals in U.S.

  - A significant effect across various treatment endpoints
  - Men and women respond equally to acamprosate
Topiramate

- Targets: GABA, glutamate AMPA and kainate, L-type Ca channels, Na channels
- Approved for treating seizures and migraine
- 17-site trial with 371 alcohol dependent patients: efficacious in improving treatment outcome
- Side-effects: paresthesia, taste perversion, anorexia, difficulty with concentration

Johnson et al., JAMA 298:1641-1651, 2007
Gabapentin

- Targets: GABA, glutamate
- Approved for treating seizures, pain
- Three independent, single-site studies demonstrate efficacy in improving drinking outcome in alcohol dependent subjects

Mason et al., Addict Biol 14(1):73-83, 2009
• Target: 5-HT\textsubscript{3} antagonist
• Approved for treating nausea and vomiting
• Single-site trial with 283 alcohol dependent patients: efficacious in improving treatment outcome with specific genotype
• Side-effects: Fatigue
• FDA Alert: Risk of developing prolongation of the QT interval
• Dosing: 8-24 mg/day for nausea versus .33 mg/day for alcohol
Two genetic variants of serotonin transporter gene

- 5-regulatory region with long form (L) that possesses 44 additional base pairs versus the short (S) form (LL versus LS/SS)

- Rs 1042173 (TT versus TG/GG) in the 3-untranslated region

Varenicline

- Targets: nicotinic α4β2
- Approved for nicotine dependence
- Reduced drinking in human lab study and small clinical trial
- Results of a multi-site clinical trial of 200 alcohol-dependent smokers and nonsmokers pending

McKee et al., *Biol Psychiatry* 66:185-190, 2009
Mitchell et al., *Psychopharmacol* online, 2012
Antidepressants (SSRIs)

Depressed Alcoholics

- Antidepressants work well to reduce depression in depressed alcoholics. Impact on drinking is mixed

- SSRI (sertraline) in combination with naltrexone was most effective in improving drinking outcome in depressed alcoholics

Pettinati et al., Am J Psychiatry 167:668-675, 2010
Sertraline and Alcohol

Prospective trial in 134 alcohol-dependent subjects
  Early onset vs. late onset
  LL vs. LS/SS variants of the serotonin transporter gene

Treatment effect varied by onset of alcoholism and genotype

Results
  All LS/SS subjects (early and late onset) experienced no response to sertraline (75% of population)
  LL subjects with early onset had increased consumption with sertraline

Krantzler et al., 2011
## Positive Genetic Influences in Alcohol Pharmacotherapy

<table>
<thead>
<tr>
<th>Medication</th>
<th>Genetic Variant</th>
<th>Outcome Moderated</th>
<th>Notable Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topiramate</td>
<td><strong>GRIK1</strong> (rs2832407)</td>
<td>Heavy drinking days (%); side effects</td>
<td>Kranzler et al., 2014 (2); Ray et al., 2009 (4)</td>
</tr>
<tr>
<td>Naltrexone</td>
<td><strong>OPRM1</strong> (Asn40Asp), (rs1799971), <strong>DRD4 VNTR</strong></td>
<td>Heavy drinking days (%); abstinence rates; relapse to heavy drinking</td>
<td>Anton et al., 2008 (12); Kim et al., 2009 (13); Oslin et al., 2003 (14); Tidey et al., 2008 (15)</td>
</tr>
<tr>
<td>Ondansetron</td>
<td><strong>LL/LS/SS (5-HTTLPR)</strong>, (rs1042173), <strong>SLC6A4 (5-HTTLPR)</strong></td>
<td>Drinks per drinking day; days abstinent (%)</td>
<td>Johnson et al., 2011 (9)</td>
</tr>
<tr>
<td>Sertraline</td>
<td>5-HTTLPR triallelic <strong>SLC6A4</strong></td>
<td>Heavy drinking days (%); drinking days (%)</td>
<td>Kranzler et al., 2011 (8)</td>
</tr>
<tr>
<td>Acamprosate</td>
<td><strong>GATA4</strong> (rs1327367)</td>
<td>Relapse</td>
<td>Kiefer et al., 2011 (10)</td>
</tr>
<tr>
<td>Disulfiram</td>
<td><strong>DBH</strong> (rs161115)</td>
<td>Adverse events</td>
<td>Mutschler et al., 2012 (11)</td>
</tr>
</tbody>
</table>
Conclusions

• Across two decades, solid advances in medications development

• Many exciting possibilities
References


References (cont.)


PCSS-MAT Mentoring Program

• PCSS-MAT Mentor Program is designed to offer general information to clinicians about evidence-based clinical practices in prescribing medications for opioid addiction.

• PCSS-MAT Mentors comprise a national network of trained providers with expertise in medication-assisted treatment, addictions and clinical education.

• Our 3-tiered mentoring approach allows every mentor/mentee relationship to be unique and catered to the specific needs of both parties.

• The mentoring program is available, at no cost to providers.

For more information on requesting or becoming a mentor visit: pcssmat.org/mentoring
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