The Cost-Effectiveness of Smoking Cessation for Patients with Psychiatric Illness

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Overview of Presentation

1. Smoking in psychiatric illness
2. Value of smoking cessation
3. Methods
4. Findings from four cessation trials
5. Areas for future study
Smoking in psychiatric illness
Smoking prevalence

- Current smoking prevalence much higher than general population (McClave, 2010; Kinder, 2008; Lasser, 2000)
  - 59.1% in schizophrenia
  - 46.4% in bipolar disorder
  - 31.6% in Veterans with PTSD
  - vs. 18.3% in those without mental health diagnosis
Smoking behavior

- Persons with psychological problems smoke more heavily
- Nearly half of all U.S. cigarette consumption is by those with mental illnesses (Lasser, 2000)
Health impacts of smoking

- Smoking is an important contributor to the excess mortality risk of persons with mental illness.
- Schizophrenia
  - Mortality risk is 2.5 times the expected (Saha, 2007)
  - Smokers have 2.1 times the mortality risk of non-smokers with schizophrenia (Kelly, 2009)
- Veterans with PTSD have 2.1 times the expected mortality risk (Boscarino, 2006)
- After adjusting for smoking status, it is only 1.26 times the expected (Barnett, 2015b)
Poll question

What is your primary interest?

- Smoking cessation services
- Methods for economic evaluation
Value of smoking cessation
What do we mean by value?

- Cost per unit of benefit relative to standard care
- Incremental cost-effectiveness ratio
Cost per quit

- Review of 14 studies found median cost of $3,000 per quit (Ronckers, 2005)
- Is this sufficient value?
- How much should society pay for a “quit”?
Cost Utility Analysis

- Benefits measured as Quality Adjusted Life Years (QALYs)
- U.S. approves interventions that cost less than $100,000/QALY
Cost per QALY

- Brief physician advice $1,240-$3,620/QALY (Cromwell, 1997)
- Addition of pharmacotherapies to counseling $1,133-$1,774/QALY (Song, 2002)
- Varenicline for prevention of relapse in recent quitters $3,413/QALY (Taylor, 2011)
- Many smoking cessation interventions are high value (well below $100,000/QALY)
Cost-effectiveness for psychiatric patients

- Cost-effectiveness in these patients not previously studied
- Smoking cessation may be less cost-effective in psychiatric settings that in primary care settings
Why may cessation services may be less cost-effective?

- Smokers with psychiatric illness:
  - less likely to quit
  - more likely to relapse
  - have lower quality of life
  - have a higher risk of death from non-smoking causes
Methods
Methods used in randomized trials of smoking cessation

- Costs
  - Micro-costing of intervention
  - Claims data
  - Patient self report of “outside of system” care

- Quality of life measures

- Model long-term effects of intervention
Micro-cost via direct measurement

- Determine cost of innovative intervention
- Activity survey to find hours of effort by different types of staff
- Labor cost by type of staff
- Supplies, equipment and space
Claims data

- Care in system where patient enrolled
- Sites included
  - Multi-site VA trial
  - UCSF Langley Porter Psychiatric Hospital
  - SF County Mental Health, Substance Abuse
  - Kaiser Permanente
- Charges adjusted by ratio of costs to charges
Patient self-report

- Utilization not in claims data
- Patient self-report utilization
- Obtain hospital bill for inpatient stays
- Unit costs
  - Reimbursement schedule
  - Provider cost
  - Payer cost
Quality of life measures

- Quality of Well-Being
- Health Utilities Index
- SF-12 mapped to utilities
Long-term costs and outcomes

- Cost are incurred at outset
- Benefits of quitting realized over the long run
- Markov model: projects long-run effect of quitting given age, gender distribution of trial participants
Markov model of long-term effects of quitting

- Current Smoker
- Former Smoker
- Dead

**Current Smoker**
- Long Term Quit Rate to Former Smoker
- Current Smoker Mortality Rate

**Former Smoker**
- Long Term Relapse Rate from Current Smoker
- Former Smoker Mortality Rate

**Dead**

**Mortality Rates**
- Current Smoker Mortality Rate
- Former Smoker Mortality Rate

**Long-term Quit and Relapse Rates**
- Long Term Quit Rate
- Long Term Relapse Rate
Parameters

- Relapse (varies with time since quit)
- Quit rates (varies with age)
- Mortality rates (relative risk by smoking status, age, & gender)
- Cost and qualify of life in smokers and former smokers (vary by age & gender)
Uncertainty

- Is this result statistically significant?
- Probabilistic sensitive analysis
  - Includes variance observed in trial
  - Estimated distribution of other model parameters
  - Repeated random draws (Monte Carlo simulation)
Findings from Four Randomized Clinical Trials
The patients and treatment settings

- Psychiatric inpatients
- Veterans in PTSD treatment
- Outpatients seeking treatment for depression
- Veterans in alcohol treatment
Trial 1: Stepped care for psychiatric inpatients

- University psychiatric hospital
- 223 smokers with Serious Mental Illness
Trial 1: Randomization groups

- Experimental intervention:
  - Computer assessment of readiness to change + tailored feedback, workbook
  - 10 weeks of nicotine replacement therapy (NRT)

- Control invention:
  - Pamphlet and brief advice to quit
### Trial 1: Findings

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cessation services cost</td>
<td>$189</td>
<td>$37</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Mental health costs</td>
<td>$15,728</td>
<td>$22,185</td>
<td>n.s.</td>
</tr>
<tr>
<td>18 month abstinence</td>
<td>18.75%</td>
<td>6.80%</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>
Trial 1: Cost per quit

\[
\frac{\$189 - \$37}{18.75\% - 6.8\%} = \frac{\$152}{11.95\%} = \$1,271/quit
\]
Other trial-specific model parameters

- **Age**
  - Mean 39.9 years

- **Quality of life**
  - Estimated from SF-12 (Brazier, et al)
  - 76% of age & gender norms
Trial 1: Incremental Cost-effectiveness Ratio

\[
\frac{\$184,057 - \$184,014}{15.223 - 15.122} = \frac{\$43}{0.101} = \$428/QALY
\]
Trial 1: CE acceptability curve
Trial 2: Smoking cessation integrated with PTSD treatment

- VA outpatient mental health programs
- 943 smokers with PTSD motivated to quit
Trial 2: Randomization groups

- Experimental intervention:
  - Smoking cessation services from PTSD provider
  - 8 counseling sessions + monthly boosters
  - NRT and other pharmacotherapy

- Control Intervention:
  - Referred to smoking cessation clinic
## Trial 2: Findings

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Cessation services cost</td>
<td>$1,286</td>
<td>$551</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>All health costs</td>
<td>$24,171</td>
<td>$25,303</td>
<td>n.s.</td>
</tr>
<tr>
<td>18 month abstinence</td>
<td>8.9%</td>
<td>4.5%</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>
Trial 2: Cost per quit

\[
\frac{1,286 - 551}{8.9\% - 4.5\%} = \frac{735}{4.4\%} = \$16,697/\text{quit}
\]
Other trial specific model parameters

- **Age**
  - Mean 54.6 years

- **Quality of Life**
  - Determined by Quality Well Being (QWB) assessment
  - 65.2% of age & gender norms
Trial 2: Incremental Cost-effectiveness Ratio

\[
\frac{146,645 - 145,809}{7.054 - 7.028} = \frac{836}{0.026} = 32,257/QALY
\]
Trial 2: CE acceptability curve
Trial 3: Stepped care for outpatients in treatment for depression

- University psychiatric clinic
- 163 smokers with unipolar depression
Trial 3: Randomization groups

- **Experimental intervention:**
  - 3 computer assessment of readiness to change + tailored feedback, workbook
  - Up to 6 counseling sessions
  - 10 weeks of nicotine replacement therapy (NRT) and bupropion for relapse

- **Control invention:**
  - Pamphlet and list of cessation programs
## Trial 3: Findings

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group</th>
<th>Control Group</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Cessation services cost</td>
<td>$363</td>
<td>$22</td>
<td>$&lt; 0.001</td>
</tr>
<tr>
<td>Mental health costs</td>
<td>$4,151</td>
<td>$4,442</td>
<td>n.s.</td>
</tr>
<tr>
<td>18 month abstinence</td>
<td>24.6%</td>
<td>19.1%</td>
<td>$&lt; 0.05</td>
</tr>
</tbody>
</table>
Trial 3: Cost per quit

\[
\frac{\$363 - \$22}{24.6\% - 19.1\%} = \frac{\$341}{5.5\%} = \$6,204/quit
\]
Trial 3: Incremental Cost-effectiveness Ratio

- Tested “willingness to pay” based on assumption of 1.2 QALY gained per successful quit
  - This represents ICER of $5,170/LY
- Estimate did not consider effect of mental health on value of quitting
Trial 4: Intensive cessation services for alcohol-dependent smokers

- VA outpatient alcohol treatment program
- 162 smokers in treatment for alcohol dependence
Trial 4: Randomization groups

- **Experimental intervention:**
  - 16 counseling sessions
  - 24 weeks of nicotine replacement therapy (NRT) and bupropion for relapse

- **Control intervention:**
  - Referral to smoking cessation clinic
## Trial 4: Findings

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<th>Control Group</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Cessation services cost</td>
<td>$1,649</td>
<td>$25</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Health care costs</td>
<td>$47,685</td>
<td>$33,620</td>
<td>n.s.</td>
</tr>
<tr>
<td>52 week abstinence</td>
<td>19.6%</td>
<td>15.8%</td>
<td>n.s.</td>
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</table>
## Summary

<table>
<thead>
<tr>
<th></th>
<th>Smokers enrolled in psychiatric stay</th>
<th>Cessation integrated with PTSD</th>
<th>Cessation in outpatient psychiatry clinic</th>
<th>Integrated alcohol treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control abstinence</strong></td>
<td>6.8%</td>
<td>8.9%</td>
<td>19.1%</td>
<td>15.8%</td>
</tr>
<tr>
<td><strong>Intervention abstinence</strong></td>
<td>18.8%</td>
<td>4.5%</td>
<td>24.6%</td>
<td>19.6%</td>
</tr>
<tr>
<td><strong>$/Quit</strong></td>
<td>$1,271</td>
<td>$16,697</td>
<td>$6,204</td>
<td>NA</td>
</tr>
<tr>
<td><strong>$/QALY</strong></td>
<td>$428</td>
<td>$32,257</td>
<td>$5,170/LY</td>
<td>dominated</td>
</tr>
</tbody>
</table>
Areas for Future Study
Types of cessation services

- Integrated care vs. dedicated cessation services
- How much counseling?
- How long should the NRT last?
- All smokers vs. motivated smokers
- Use of initial “stage-based” counseling
Methodological challenges

- Variations in definition of quit
- Quality of life measures
- Costs other than cessation services incurred during the trial
Methodological challenges

- Better model parameters
  - Spontaneous quit and relapse
  - Cost
  - Mortality
- Exclusion of costs attributable to longer survival
Lessons

- Direct cost of smoking cessation services is what matters
- Other health care costs not affected by treatment group assignment
  - Guidelines specify we gather these data
- Many smoking models ignore other health care costs
References to the trials

Other references cited

Other references cited (continued)


