Leveraging Technology for the Delivery of Smoking Cessation Interventions

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A Brief History of Technology Applied to Health Behavior Interventions

1970s: Manualized Counseling
1980s: Video; Computerized Contacts
1990s: Internet, Tailored Print and Web
2000s: Interactive Web, mobile/wireless
2010s: Social Networking, smartphones
Why the Excitement?

- Engagement (novelty, graphics)
- Existing infrastructure incorporated in daily routine
- Standardized implementation
- Tailored, expert system personalization
- No time and space constraints
- Scalability
- Frequent or real-time monitoring
- Interactivity
- Rapidly expanding possibilities
My Quit Plan Home Page

You're Headed in the Right Direction
Good for you! Making the decision to quit smoking is the best thing you can do for yourself and the people you love. It can be hard work, but with preparation and practice you can be on your way to quitting for good.

Use your Quit Plan to get ready and remember to share it with your Quit Coach.

My Quit Plan Exercises

Healthy Habits
Pick healthy habits that will help you quit.

Triggers & Coping Skills
Learn about your triggers to smoke and how to cope with them.

Substitutes & Distractions
Pick substitutions and distractions you'll use instead of smoking.

Practice Quitting
Try out practice quits to prepare you for your Quit Date.

Learning from Past Quitts
Learn from your past quit attempts.

Manage My Weight
Learn tips for managing your weight while quitting.
Meta-Analyses of Internet-based Smoking Cessation

- Shalab & McEwen (2009)
  - 11 relevant trials
  - $RR = 1.8$ ($1.4 - 2.3$)

- Cochrane Review (2010)
  - 20 relevant trials
  - Inconsistent findings
  - Suggested tailored and frequent contacts are preferable

  - 9 trials
  - $RR = 1.4$ ($1.13 - 1.72$)
  - $9.9\%$ vs. $5.7\%$ abstinent at 1 yr.
Effect of smoking cessation programs vs control in random-effects meta-analysis of randomized controlled trials (RCTs)

QuitNet Outcomes

- 2005 smokers from almost 100K search engine users
- Randomly assigned
  - Basic Internet
  - Enhanced Internet
  - Enhanced Internet + telephone counseling
- 18 month multiple point abstinence (%)

Access and Interest

- Survey of 8467 Canadians
- Internet use by:
  - Smokers = 74%
  - Nonsmokers = 81%
- Smokers also used the internet less often than nonsmokers
- 40% of smokers were interested in an internet smoking cessation intervention
  - Cunningham (2008) J Med Internet Res 10, e37
Smoking Cessation Search Strategies

- Search behavior of 650K individuals
- 628 (0.1%) made cessation-related searches
- 76% of these reached a cessation website
- 34% reached “professional sites”
- Top 10
  1. cdc.gov
  2. whyquit.org
  3. quitnet.com
  4. quitsmoking.about.com
  5. quitsmoking.com
  6. cancer.org
  7. freedomlasertherapy.com
  8. ash.org.uk
  9. finalsmoke.com
  10. laserconcept.com

Utilization of Smoking Cessation Sites

- High satisfaction and 21% quit at 1 mo
- But 1-2 logins per user
  - Women used service more than men
  - Older and heavier smokers used more

Utilizing Social Networks

- Analysis of QuitNet users showed a weakly connected core similar to most online networks
  - 7500 active members
  - Small number of well-connected members
  - Even smaller number of highly active integrators
  - Core members predominately female, older, and abstinent
## Content of Internet-based Smoking Cessation (Bock et al., 2008)

<table>
<thead>
<tr>
<th>Guideline Components</th>
<th>Percent Adequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise Users to Quit</td>
<td>21</td>
</tr>
<tr>
<td>Personalized Advice to Quit</td>
<td>26</td>
</tr>
<tr>
<td>Assess Readiness to Quit</td>
<td>22</td>
</tr>
<tr>
<td>Assist with Quit Plan</td>
<td>56</td>
</tr>
<tr>
<td>Provide Practical Counseling</td>
<td>69</td>
</tr>
<tr>
<td>Provide Intra-tx social support</td>
<td>54</td>
</tr>
<tr>
<td>Recommend pharmacotherapy</td>
<td>43</td>
</tr>
<tr>
<td>Arrange follow-up</td>
<td>17</td>
</tr>
</tbody>
</table>
Increasing Demand and Use – Physician Referral

- QUIT-PRIMO links:
  - Provider system (ReferaSmoker) &
  - Patient system (Decide2Quit)
  - Houston et al (2010) Implement Science 5, 87

QUIT-PRIMO Web-delivered Intervention

ReferaSmoker
1. Refer A Smoker - An encrypted web form for direct enrollment of patients into the patient component at the time of visit
2. Practice Reports - Provider-specific reports of patient web activity compared with other participating practices
3. Practice Smoking Cessation Toolbox - information and tools for providers including:
   a. Case-based interactive education
   b. Patient handouts
   c. "Practice Action Plan" allows practices to create a specific plan for maximizing smoking cessation services
   d. Headlines - information on recent scientific advances in tobacco counseling and treatment emailed to providers

Decide2Quit
Targeted to readiness to change, the patient intervention site includes
1) Interactive calculators to assess readiness, triggers, symptoms, and a quit plan for those ready to quit
2) Educational content about seeking support from family and treatment from providers
3) Motivational email content encouraging social support and treatment seeking
4) Links to other high-quality information (smokfree.gov) and 1-800-QUIT-NOW
5) Secure messaging with a Tobacco Treatment Specialist
6) Peer to Peer Support Group

Secure Messaging System (SMS)
The SMS Allows HIPAA compliant messaging so that providers can send messages reinforcing patient activity in the intervention.
Abstinence Reinforcement via Technology

- Video confirmation of CO reading transmitted to provider who provided monetary incentives (contingency mgmt)
Interactive Voice Response

- Quit line counseling effective (RR = 1.37)
  - Proactive more effective than reactive
  - Dose-response relationship

- Augmenting reach with IVR
  - Automated calls at specified times
  - Assess smoking status, provide limited advice
  - Personal phone contact as requested or based on assessment data
  - In discharged CHD patients, 1 yr. abstinence rates of 46% vs. 35% in usual care quit line referral
# Mobile Phone Interventions

<table>
<thead>
<tr>
<th>Study</th>
<th>Quit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obermayer et al (2004)</td>
<td>17% at 6 wks</td>
</tr>
<tr>
<td>Rodgers et al (2005)</td>
<td>28% vs. 13% at 6 wks</td>
</tr>
<tr>
<td>Riley et al (2008)</td>
<td>42% at 6 wks</td>
</tr>
<tr>
<td>Whitaker et al (2008)</td>
<td>53% at 4 wks</td>
</tr>
<tr>
<td>Brendryen &amp; Kraft (2008)</td>
<td>38% vs. 24% at 12 mos</td>
</tr>
<tr>
<td>Brendryen et al (2008)</td>
<td>20% vs. 10% at 12 mos</td>
</tr>
<tr>
<td>Free et al (2009)</td>
<td>8% vs. 6% at 6 mos</td>
</tr>
</tbody>
</table>
The College Smoking Project

CSP Homepage

Welcome to
The College Smoking Project

The College Smoking Project (CSP) was funded with a grant from the National Cancer Institute.
For further information on grants from the National Institute of Health, go to http://www.nih.gov
**Smoking History**

Using the calendar below, enter the number of cigarettes you smoked each day for the last 14 days, beginning with yesterday and working back. Remember to consider any special events or changes in your normal routine which may have affected your smoking. This information will be used to determine not only your mean smoking level but what days of the week you tend to smoke more so be as specific as possible.

<table>
<thead>
<tr>
<th>Last week Day/Smokes</th>
<th>Two week ago Day/Smokes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, 5/27/2004</td>
<td>Thursday, 5/20/2004</td>
<td>Smokes: 15</td>
</tr>
<tr>
<td>Wednesday, 5/26/2004</td>
<td>Wednesday, 5/19/2004</td>
<td>Smokes: 12</td>
</tr>
<tr>
<td>Tuesday, 5/25/2004</td>
<td>Tuesday, 5/18/2004</td>
<td>Smokes: 14</td>
</tr>
<tr>
<td>Saturday, 5/22/2004</td>
<td>Saturday, 5/15/2004</td>
<td>Smokes: 22</td>
</tr>
<tr>
<td>Friday, 5/21/2004</td>
<td>Friday, 5/14/2004</td>
<td>Smokes: 21</td>
</tr>
</tbody>
</table>
Assessing Smoking Risk Situations

Below is a list of high risk smoking situations. Next to each, rate how strong you crave a cigarette. Click the continue button at the bottom of the page when you are finished.

### Eating & Drinking

<table>
<thead>
<tr>
<th>Situation</th>
<th>Craving</th>
</tr>
</thead>
<tbody>
<tr>
<td>After breakfast</td>
<td>Medium</td>
</tr>
<tr>
<td>After lunch</td>
<td>Low</td>
</tr>
<tr>
<td>After dinner</td>
<td>High</td>
</tr>
<tr>
<td>Drinking beer</td>
<td>Very High</td>
</tr>
<tr>
<td>Drinking coffee</td>
<td>Medium</td>
</tr>
<tr>
<td>Eating a snack</td>
<td>None</td>
</tr>
</tbody>
</table>

### Socializing

<table>
<thead>
<tr>
<th>Situation</th>
<th>Craving</th>
</tr>
</thead>
<tbody>
<tr>
<td>With other smokers</td>
<td>High</td>
</tr>
<tr>
<td>At a party</td>
<td>High</td>
</tr>
<tr>
<td>In a bar</td>
<td>High</td>
</tr>
<tr>
<td>On the phone</td>
<td>None</td>
</tr>
</tbody>
</table>

### Leaving non-smoking situations

<table>
<thead>
<tr>
<th>Situation</th>
<th>Craving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wake up</td>
<td>High</td>
</tr>
<tr>
<td>In a movie</td>
<td>Medium</td>
</tr>
<tr>
<td>Leaving work</td>
<td>High</td>
</tr>
<tr>
<td>Leaving class</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Being bored or relaxing

<table>
<thead>
<tr>
<th>Situation</th>
<th>Craving</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the car</td>
<td>Low</td>
</tr>
<tr>
<td>In my room</td>
<td>Low</td>
</tr>
<tr>
<td>Studying</td>
<td>None</td>
</tr>
<tr>
<td>Watching TV</td>
<td>None</td>
</tr>
<tr>
<td>Listening to music</td>
<td>None</td>
</tr>
</tbody>
</table>
The College Smoking Project

Bill Riley's CSP Page

Quit Date

Using the calendar below, click a day in the next month for your quit date. Based on your smoking pattern, the days when you smoke the least are Fri and Mon. In addition to a day when you smoke the least, pick a time when you do not think you will have much pressure on you.

My quit date is: 6/2/2004
Support Network

- Users have the option of specifying support persons for their program by creating a user name and password for each.

- The support person may log on the web site to view the user’s progress in quitting smoking.

- E-mail messages prompt the support person to leave messages to encourage the user’s progress.

- The educational modules contain tips on how to encourage and support the individual.
Text Messages

- **Preparation Stage:**
  - Message associated with likely situation: “If you typically experience cravings after a meal, try getting up from the table and taking a walk.”
  - Reminders of days to quit day
  - Encouragement to seek out support
  - SOS: On demand text messaging support
Text Messages

- **Action (Quit) Stage:**
  - Multiple messages throughout the day
  - Encouragement to remain quit and tips to deal with cravings and withdrawal
  - SOS Messages
  - Automatic contact to support people
Text Messages

- **Maintenance (Relapse Prevention) Stage:**
  - Start of day contact with days quit
  - Gradually decreasing number of messages each day as abstinence maintained
  - Messages timed in advance of high risk situations
  - Provided relapse prevention strategies
Percent Quit at 6 weeks

- Completed Study (N = 31)
  - 24 hr. Quit: 65%
  - Quit at 6 weeks: 43%

- Intent to Treat (N = 46)
  - 24 hr. Quit: 32%
  - Quit at 6 weeks: 22%
Additional Results

- Only 29 of 46 initialized the program
- Of those who actually received text messages, the quit rate was 34% (28% validated)
- Of those still smoking:
  - cigarettes per week decreased from 76 to 32
  - NDSS scores reduced significantly
Follow-up Study with Proactive Initiation

- Strong theoretical basis (SCT, Self-Reg)
- Multicomponent: web, sms, email, IVR
- Intensive contacts
- One year quit rates:
  - 22.3% vs. 13.1%
  - 20% vs. 7%
## Mobile Reducing the Digital Divide

### Leapfrogging the Digital Divide

- 285 million US mobile phone users
- 2/3 of adults worldwide use mobile phones
- Disproportionately higher use in US minority groups
- Higher use in younger populations, including risk taking adolescents

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### Demographics of internet users

Below is the percentage of each group who use the internet, according to our May 2010 survey. As an example, 79% of adult women use the internet.

<table>
<thead>
<tr>
<th>Internet users</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total adults</strong></td>
<td>79%</td>
</tr>
<tr>
<td>Men</td>
<td>79</td>
</tr>
<tr>
<td>Women</td>
<td>79</td>
</tr>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>White, Non-Hispanic</td>
<td>80%</td>
</tr>
<tr>
<td>Black, Non-Hispanic</td>
<td>71</td>
</tr>
<tr>
<td>Hispanic (English-speaking)</td>
<td>82</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>65%</td>
</tr>
<tr>
<td>30-49</td>
<td>87</td>
</tr>
<tr>
<td>50-64</td>
<td>78</td>
</tr>
<tr>
<td>65+</td>
<td>42</td>
</tr>
<tr>
<td><strong>Household Income</strong></td>
<td></td>
</tr>
<tr>
<td>Less than $30,000/yr</td>
<td>63%</td>
</tr>
<tr>
<td>$30,000-$49,999</td>
<td>84</td>
</tr>
<tr>
<td>$50,000-$74,999</td>
<td>89</td>
</tr>
<tr>
<td>$75,000+</td>
<td>95</td>
</tr>
<tr>
<td><strong>Educational attainment</strong></td>
<td></td>
</tr>
<tr>
<td>Less than High School</td>
<td>52%</td>
</tr>
<tr>
<td>High School</td>
<td>67</td>
</tr>
<tr>
<td>Some College</td>
<td>90</td>
</tr>
<tr>
<td>College +</td>
<td>96</td>
</tr>
<tr>
<td><strong>Community type</strong></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>81%</td>
</tr>
<tr>
<td>Suburban</td>
<td>82</td>
</tr>
<tr>
<td>Rural</td>
<td>67</td>
</tr>
</tbody>
</table>

Source: The Pew Research Center’s Internet & American Life Project, April 29-May 30, 2010. Tracking Survey, N=2,252 adults, 18 and older, including 744 cell phone interviews. Interviews were conducted in English. Margin of error is ±2%. 
Mobile Intruding in Smokers’ Lives

- Assess status in real-time
  - Smoking behavior
  - Triggers
  - Intention and motivation
  - Mood

- Intervene:
  - Frequently throughout the day
  - In the context of the behavior
  - Based on prior assessment information
Cautionary Tale

- In 1950s, mobile neighborhood TB screenings were innovative
- But the added salience and convenience did not substantially increase screenings
- Researchers learned that perceived threat, benefit, and barriers of getting screened were more critical than the innovative delivery
- Led to the Health Belief Model and the various health behavior theories that followed