

Are Smokers with HIV Using Information and Communication Technology? Implications for Behavioral Interventions

Geetanjali Chander · Cassandra Stanton · Heidi E. Hutton · David B. Abrams · Jennifer Pearson · Amy Knowlton · Carl Latkin · David Holtgrave · Richard D. Moore · Raymond Niaura

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Abstract Smoking is highly prevalent among persons living with HIV/AIDS (PLWHA) and associated with adverse outcomes including malignancy and cardiovascular disease. Information and communication technology (ICT) may be effective in disseminating cessation interventions among PLWHA. This study examines the prevalence of ICT use among 492 PLWHA attending an urban clinic and characteristics associated with ICT use. Participants completed a survey of demographics, smoking status, and ICT use. Factors associated with ICT use were examined with logistic regression. Overall, 63% of participants smoked with 73% of smokers owning their own cell phone. Use of other modalities was lower, with 48% of smokers reporting any internet use, 39% text messaging, and 31% using email. Higher education was associated with the use of all modalities. Cell phone interventions may have the broadest reach among PLWHA, though with *almost* half using the internet, this may also be a low-cost means of delivering cessation interventions.

Keywords HIV · Technology · Smoking · Interventions

Introduction

The prevalence of smoking among persons living with HIV/AIDS (PLWHA) is three times the United States national average, with estimates ranging from 50 to 70% [1, 2]. Smoking is associated with an increased risk of bacterial pneumonia, COPD, cardiovascular disease, malignancies, and lower health related quality of life among PLWHA [3–5]. As survival improves, interventions targeting smoking cessation are increasingly important in reducing morbidity and mortality among HIV infected individuals.

To date, smoking cessation trials among PLWHA appear promising, but have been limited. Lloyd-Richardson et al. [6] compared brief advice combined with nicotine replacement therapy (NRT) to a more intensive motivationally-enhanced intervention with NRT among PLWHA, and reported 7 day point prevalence abstinence at 6 months post-delivery of approximately 10% in each group. Ingersoll et al. [7] compared motivational interviewing plus NRT to self-help plus NRT among 40 PLWHA, and found no difference between the groups, but reported an overall quit rate of 22% at 3 months. Finally, Vidrine et al. [8] compared cell-phone counseling plus NRT to brief advice plus NRT, and reported 7 day point prevalence abstinence of 17% in the cell phone group, compared to 6% in the brief advice group. Given the magnitude of smoking prevalence among PLWHA, their multiple social stressors, and psychiatric and substance-related comorbidities, additional strategies to improve current cessation rates are essential [9].

Information and communication technology (ICT), which includes the world wide web/internet, email, cell

G. Chander (✉) · H. E. Hutton · R. D. Moore
Johns Hopkins Medical Institutions, Johns Hopkins University,
1830 E. Monument Street, Office 8060, Baltimore,
MD 21287, USA
e-mail: Gchande1@jhmi.edu

C. Stanton
Department of Psychiatry and Human Behavior, Brown
University School of Medicine, Providence, RI, USA

D. B. Abrams · R. Niaura
Schroeder Institute for Tobacco Research and Policy,
Washington, DC, USA

J. Pearson · A. Knowlton · C. Latkin · D. Holtgrave
Johns Hopkins Bloomberg School of Public Health,
Johns Hopkins University, Baltimore, MD, USA

phones and text messaging, is now being more widely adopted as a low-cost broad-reach means of delivering smoking cessation interventions. A recent systematic review of the literature has demonstrated the efficacy of interactive web-based smoking cessation programs in the general population [10]. In addition, a recent Cochrane Review of randomized trials examining the effectiveness of cell phone based interventions on smoking cessation suggests that this method of contact can be effective for short term smoking cessation [11]. While there is a dearth of trials specifically among PLWHA, Vidrine et al.'s [8] findings in their cessation trial with this population suggests that proactive cellular telephone counseling for smokers living with HIV/AIDS may be promising.

While ICT-based interventions offer an attractive alternative or adjunct to traditional face-to-face counseling, uptake of these technologies may be highly variable, particularly among urban HIV infected individuals with limited financial resources. Examining ICT use among HIV infected smokers is critical in determining the feasibility of its use in smoking cessation interventions among this group. We sought to determine, (1) the prevalence of smoking, (2) the use of ICT among PLWHA accessing HIV care in an urban clinic, and (3) socio-demographic characteristics associated with ICT use.

Methods

This was a cross-sectional study of English speaking PLWHA receiving care in the Johns Hopkins HIV Clinic between August 2009 and December 2009. The Johns Hopkins HIV Clinic provides primary and HIV care services to HIV infected individuals living in the Baltimore area. It is an urban clinic, where 74% of attendees live below the federal poverty level. Participants completed a 10 min, 16 item, self-administered survey querying, (1) demographics including age, race, sex, and education, (2) smoking status using the two item heavy smoking index [12] and (3) frequency of ICT use, including cellular phone, text messaging, email and internet (see Table 1 for questions and response options). We assessed ICT use with the following questions: (1) how often do you use the internet? “never”, “once per month”, “less than 1 day per week”, “1–6 days per week”, or “daily”; (2) How often do you text message? “never”, “once per month”, “less than 1 day per week”, “1–6 days per week”, or “daily”; (3) Do you use a cell phone? “I don't use a cell phone”, “I use other people's cell phone”, or “I have my own”; (4) Do you have an email account? yes/no. We also surveyed location of internet use, including home, friends or relatives, school, work, the library, or other and abstracted

patient-reported HIV risk factor from the participant's medical record.

Oral informed consent was obtained and participants received a two dollar bill for their participation. The institutional review board of the Johns Hopkins University School of Medicine approved this study.

We performed descriptive statistics, tabulating the demographic characteristics and the overall prevalence of smoking and ICT use in the whole sample. We then compared participant characteristics by smoking status, using Pearson's chi-square test for categorical variables and Wilcoxon–Mann–Whitney test for continuous variables. We then used multivariable logistic regression to examine the associations between age, race, sex, education, and smoking status and ICT use for each modality separately. Outcomes were dichotomized into any use versus no use of the individual technology. Statistical analysis was performed using Stata version 10.0 for windows (Stata-Corp, College Station, Texas, USA).

Results

We surveyed 492 individuals over a 3 month period. Overall, 63% of our sample reported current smoking. Forty percent of current smokers smoked their first cigarette within 5 min of waking and 36% within 30 min of waking. The majority smokers (90%) reported smoking less than 1 pack of cigarettes per day. Characteristics of our sample, stratified by smoking status, are presented in Table 1. The median age of the sample was 49 (IQR: 44–54), 83% of participants were African American, 50% were male, and 47% had less than a high school education. Smokers were more likely to be male, have a history of injection drug use (IDU), and have less than a high school education.

Use of ICT among Smokers

Table 1 presents ICT use by reported smoking status. Seventy three percent of the current smokers owned and used their own cell phone, while 12% used cell phones, but not their own. Internet, text messaging, and email use were lower, with 48% of current smokers reporting any internet use, 39% reporting any text messaging, and 31% reporting any email. Frequency of internet and text messaging also varied. A little over half of internet users accessed the internet at least weekly. Of those who used text messaging, half were daily users. Ninety four percent of smokers who used text messaging daily owned their own phone; however, 51% of individuals who owned their own phone, never used text messaging (results not shown). Location of

Table 1 Demographic characteristics of HIV infected individuals, overall and by smoking status

Characteristic	Overall n = 492 (%)	Current smokers n = 311 (%)	Non-smokers n = 181 (%)
Age (median + IQR) ^a	49 (44–54)	49 (44–53)	48 (42–54)
Age (categorical)			
≥50	223 (45)	144 (46)	79 (44)
40–49	183 (37)	122 (39)	61 (34)
<40	86 (18)	45 (15)	41 (22)
Race			
African American	410 (83)	260 (83)	150 (83)
Caucasian	66 (13)	43 (14)	23 (13)
Other ^b	16 (4)	8 (3)	8 (4)
Sex (% male) ^c	246 (50)	167 (54)	79 (44)
Education ^c			
<High school	229 (47)	161 (52)	68 (38)
High school	109 (22)	67 (22)	42 (23)
>High school	153 (31)	83 (26)	70 (39)
HIV risk factor ^{c,d}			
Injection drug use	233 (48)	173 (56)	60 (33)
MSM	71 (15)	42 (14)	29 (16)
Heterosexual transmission	284 (58)	170 (54)	114 (63)
Cell phone use ^c			
No	72 (15)	48 (15)	27 (15)
Uses own cell phone	370 (76)	225 (73)	145 (81)
Uses friend/relative's	47 (9)	38 (12)	9 (4)
Text messaging ^c			
Never	278 (56)	191 (61)	86 (47)
Once per month	32 (7)	14 (5)	18 (10)
Less than once/week	33 (7)	19 (6)	14 (8)
1–6 days/week	46 (9)	24 (8)	22 (12)
Daily	103 (21)	62 (20)	41 (23)
Internet use ^c			
Never	233 (47)	162 (52)	71 (39)
Once per month	54 (11)	38 (12)	16 (9)
Less than once/week	34 (7)	25 (8)	9 (5)
1–6 days/week	64 (13)	30 (10)	34 (19)
Daily	107 (22)	56 (18)	51 (28)
Internet location ^d (n = 260) ^e			
Home	172 (66)	94 (63)	78 (71)
Friend/relative's house	65 (25)	43 (29)	22 (20)
School	26 (10)	13 (9)	13 (12)
Work	51 (20)	20 (13)	31 (28)
Library	76 (29)	44 (29)	32 (29)
Other	28 (11)	16 (11)	12 (11)
Email (% yes) ^b	188 (38)	97 (31)	91 (51)

Data are n (%) unless otherwise indicated

^a Interquartile range

^b Other category: 0.2% Asian; 3.0% self-classified as other

^c $P < 0.05$

^d Categories not mutually exclusive

^e Sample limited to those who use the internet

internet use was also diverse, though the majority accessed the internet from home.

Factors Associated with ICT Use

In multivariable analysis of the entire sample of 492 individuals, higher educational status was associated with increased use of each ICT modality (Table 2). Increasing age was associated with decreased use of the internet, email or text messaging, but not cellular phones. Specifically, individuals ≥ 50 were the least likely to use internet, text messaging or email in this sample. Men who have sex with men (MSM) had an increased odds of internet, text messaging, and email compared to women, though their cell phone use did not differ. Current smoking was associated with decreased email or text messaging, though there was no difference in cell phone or internet use between current smokers and non-smokers.

Discussion

In this sample of HIV infected individuals engaged in care, smoking prevalence was high, with 65% currently smoking and three quarters of smokers smoking within 30 min of waking. Information and communication technology use varied by modality, with cell phone use most common.

These results suggest that cell phone based interventions may have the broadest reach in this population, though with nearly 50% of smokers using the internet, this may also be a low-cost means of delivering smoking cessation interventions.

The high smoking prevalence in our sample is comparable to recent reports of smoking prevalence rates among PLWHA in other parts of the country. Among samples of HIV infected individuals in New York City, the smoking prevalence has ranged between 59 to 66% [1, 13]. In a multi-ethnic sample in Houston, the prevalence was 47% [14]. Studies consistently demonstrate higher than general population rates of smoking among PLWHA. To date, reasons for the higher prevalence of smoking among PLWHA have not been fully elucidated, though Vidrine and others [15] have outlined a number of factors associated with both HIV and smoking that may contribute to this increased prevalence, including education level, income, increasing age, alcohol use [14], and illicit drug use [1].

Cell phones were the most frequently used form of ICT. Our findings are comparable to other studies of urban samples and to data from a U.S. national survey of adult cell phone use which demonstrates that use is becoming ubiquitous among different age groups and race/ethnicities [16, 17]. In the most recent Pew Internet and American Life Project, 82% of American adults owned cell phones [17]. These findings suggest that cell phone based

Table 2 Multivariable analysis of factors associated with information and communication technology use (odds ratio and 95% confidence interval) (N = 492)

Characteristic	Cell phone	Internet	Text messaging	Email
Age				
≥ 50	1.0	1.0	1.0	1.0
40–49	1.21 (0.70–2.10)	2.63 (1.65–4.21)	2.13 (1.37–3.31)	1.99 (1.19–3.31)
<40	1.96 (0.87–4.41)	4.72 (2.50–8.89)	6.25 (3.40–11.48)	6.07 (3.14–11.71)
Sex				
Female	1.0	1.0	1.0	1.0
Male-non MSM	1.02 (0.59–1.79)	0.86 (0.55–1.36)	1.10 (0.71–1.71)	0.95 (0.58–1.58)
Male-MSM	0.73 (0.36–1.59)	2.24 (1.14–4.40)	1.57 (0.87–2.81)	2.32 (1.22–4.40)
Race				
African American	1.0	1.0	1.0	1.0
Caucasian	0.75 (0.35–1.56)	1.11 (0.59–2.10)	0.86 (0.48–1.54)	1.56 (0.83–2.95)
Other	0.66 (0.18–2.46)	1.69 (0.50–5.74)	1.88 (0.61–5.85)	1.37 (0.41–4.60)
Education				
<High school	1.0	1.0	1.0	1.0
High school	1.87 (0.95–3.68)	2.31 (1.40–3.83)	1.64 (0.99–2.71)	2.30 (1.32–4.02)
>High school	2.12 (1.15–3.93)	8.22 (4.88–13.86)	3.27 (2.05–5.22)	10.96 (6.39–18.79)
Current smoker				
No	1.0	1.0	1.0	1.0
Yes	1.10 (0.66–1.86)	0.78 (0.51–1.21)	0.66 (0.44–0.99)	0.54 (0.34–0.84)

MSM men who have sex with men

interventions may have the broadest reach particularly among older patients treated in clinic settings.

Another less studied but low-cost method is disseminating information and engaging PLWHA through web-based interventions. Nearly 50% of smokers in our sample reported using the internet, with a little over half of internet users using the internet at least weekly. Higher educational attainment was strongly associated with the use of web-based technologies, which may reflect access as well as computer literacy. Disparities in computer ownership and use are narrowing, even among those with very low incomes [18, 19]; In fact a large study of low-income public housing residents reported that more than half owned home computers [18]. Moreover, a recent study of PLWHA in NYC reported that 56 and 51% had home access to a computer and the internet, respectively. Sixty-nine percent had ever used the internet, and 48% had ever used the internet for health-related purposes [19]. Thus, as the digital divide in internet access and use narrows, this may also be a low-cost means of disseminating smoking cessation interventions. Even if this modality were to effectively reach only half of this population, this would still represent a significant number of smokers living with HIV/AIDS whose health and quality of life could be impacted.

Both text messaging and email use have shown promise in smoking cessation interventions [20, 21] though their use was lower in this sample, particularly among individuals over 50 years old. To date, text messaging continues to be used less by older individuals [17]. Given the varied use of these technologies, it may be prudent to design and test interventions that can be disseminated across a variety of ICT modalities. For example, similar interventions could be delivered via internet, cell phone browser, or messages via email/text. This approach would allow for patient preferences, and address issues related to variable access to or use of different ICT modalities.

Limitations of this study include its cross-sectional design, which limits our ability to make causal associations. In addition, this survey was conducted in a single urban clinic, which may limit its generalizability to other HIV care settings. Finally, we did not assess barriers to use of these modalities, and more specifically, whether costs associated with cell phone minutes and text messaging, would limit their use in behavioral interventions.

In summary, the use of ICT for smoking cessations interventions among PLWHA is promising, with cell phones potentially having the broadest reach. Given the high prevalence of smoking among PLWHA there are clear health-benefits to establishing the efficacy and cost-effectiveness of these approaches to reach and treat this patient population. Future randomized clinical trials are clearly needed to establish the feasibility, acceptability, and

efficacy of these modalities both for primary intervention delivery as well as adjuncts to pharmacotherapies. As the digital divide narrows, we need to develop all methods possible to expand our reach and offer PLWHA a variety of tools to choose from to help promote and sustain tobacco cessation and healthy, longer lives.

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