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Feasibility of a Computer-Based Intervention Addressing Barriers to HIV Testing Among Young Patients Who Decline Tests at Triage

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Abstract

Young people face greatly increased HIV risk and high rates of undiagnosed HIV, yet are unlikely to test. Many also have limited or inconsistent access to healthcare, including HIV testing and prevention education, and prior research has documented that youth lack knowledge necessary to understand the HIV test process and to interpret test results. Computer-based interventions have been used to increase HIV test rates and knowledge among emergency department (ED) patients, including those who decline tests offered at triage. However, patients aged 18 – 24 years have been less likely to test, even after completing an intervention, compared to older patients in the same ED setting. The current pilot study sought to examine the feasibility and acceptability of a new tablet-based video intervention designed to address established barriers to testing among ED patients aged 18 – 24 years. In particular, we examined whether young ED patients would: agree to receive the intervention; complete it quickly enough to avoid disrupting clinical workflows; accept HIV tests offered by the intervention; demonstrate increased post-intervention knowledge; and report they found the intervention acceptable. Over 4 weeks, we recruited 100 patients in a high volume urban ED aged 18–24, all of whom declined HIV tests offered at triage. Almost all (98%) completed the intervention (mean time <9 mins), 30 percent accepted HIV tests offered by the tablets. Knowledge was significantly higher after than before the intervention ($t = -6.67$, $p < .001$) and patients reported generally high acceptability. Additional research appears warranted to increase post-intervention HIV testing.

In the United States, youth aged 13–24 years account for an estimated 22 percent of all new HIV cases, (Kann, Olsen, Kinchen, Morris, & Wolitski, 2016) and roughly 60 percent of

HIV infected youth remain undiagnosed. (Centers for Disease, 2012a) Fewer than one quarter of high school students who have had sexual intercourse, and one third of young adults have ever tested for HIV. (Van Handel, Kann, Olsen, & Dietz, 2016)

HIV risk increases within social networks and among populations with high HIV prevalence, as potential sex partners are more likely to be HIV infected. (Centers for Disease, 2012a, 2012b) Because of the increased HIV prevalence among African Americans as a group, African American youth face increased risk of HIV infection compared to other youth populations with similar levels of behavioral risk. (Centers for Disease, 2012b) Asymptomatic youth with undiagnosed HIV often do not seek testing, and low-income, African American youth in particular, may not have ready access to healthcare, (Dorell et al., 2011; Sznitman et al., 2011) HIV testing, or related health education.

Diagnosis is the essential first step in the HIV care continuum. (Hall et al., 2015) Accordingly, to increase the number of people who are routinely tested, New York State requires healthcare providers to offer HIV testing to all patients aged 13 – 64, with limited exceptions, (Health, 2012) including patients in hospital emergency departments (EDs). EDs provide important points of contact for youth and other populations with limited or inconsistent access to healthcare, and therefore offer potential opportunities for diagnosis and linkage to care. However, far more ED patients decline HIV testing compared to those who accept, (Aronson, 2015) and young ED patients are especially unlikely to test. Prior research indicates ED patients frequently decline HIV testing due to (possibly incorrect) perceptions of low self-risk, (Christopoulos et al., 2012; Czarnogorski et al., 2011) fear of a positive result, and stigma related to HIV infection and even to HIV testing. As a result, many young African American male patients may not disclose risk factors or fully engage in discussions of HIV testing and prevention with healthcare providers because they fear HIV-related stigma if they simply talk about risk, prevention, or testing. (Dorell et al., 2011) Despite recommendations to screen all adolescents and young adults for HIV, there was no national increase in the percentage of young adults tested from 2011 to 2013, and a significant decrease among young adult females. (Van Handel et al., 2016)

In a 2012 study, Aronson et al. recruited 160 ED patients who declined HIV testing offered by a triage nurse, and enrolled these patients in a brief (<15 minute) computer-based intervention designed to increase test rates. (Aronson, 2015) Approximately one third of these participants accepted an HIV test offered by computer at the end of the intervention, (Aronson, 2015) but patients aged 18–24 years ($n = 34$) were significantly less likely to test for HIV at the end of the intervention compared to older participants. (Aronson, 2013) Slightly less than 18 percent of participants aged 18 – 24 tested compared to 37.3 percent of participants older than 24, $\chi^2(1, 34) = 4.8$, $p < .05$.

When young people do test for HIV, many lack the knowledge necessary to understand test results. (Swenson et al., 2010) Swenson et al. (2010) surveyed more than 1,600 African American adolescents and found that more than 80 percent of respondents incorrectly answered that taking a test for HIV one week after having sex will tell a person if she or he has HIV (because HIV antibody tests detect antibodies that can take up to 90 days to develop, a person who has recently been exposed to HIV can potentially test negative at a

time when they are not only HIV positive, but in fact, are highly infectious). (Swenson et al., 2010)

Thus, interventions are needed not only to address barriers to testing among young people, especially those who decline testing when offered, but to effectively provide health education that potentially enables patients to better understand the importance of HIV testing and to more accurately interpret test results.

Feasibility and acceptability of an intervention targeting youth who decline HIV testing

Given the infrequency of HIV testing among youth and the high rates of undiagnosed HIV the current research sought to examine the preliminary feasibility and acceptability of a tablet-based intervention designed to increase HIV testing by ED patients aged 18 – 24, who had initially declined tests offered by a triage nurse. Because this population has been shown unlikely to test, both historically and in earlier studies we have conducted, it remained to be seen whether young adults who declined HIV testing in an ED would even agree to receive a brief intervention. Based on our prior work, we hypothesized that a well-crafted educational video could significantly increase knowledge and possibly HIV test rates among young ED patients, but again, we did not know whether an adequate sample of youth who initially declined testing would agree to participate in or complete our proposed intervention. Therefore, before starting the lengthy, and possibly expensive, process of developing a full intervention, we implemented a pilot study with a small sample of participants to examine: the basic feasibility of an intervention targeting young patients who decline testing offered at triage; and to gather data that could inform a more complete trial, should the current pilot appear feasible.

Specifically, we sought to explore the following questions:

First, would young adult ED patients who declined HIV testing at triage agree to receive a tablet-based intervention?

Second, if young patients aged 18 – 24 years did agree, would they complete the intervention (this includes watching a brief educational video and answering all pre-post knowledge test items)? Would completion times be short enough to deliver the intervention in an ED environment without interrupting clinical workflows? The mean wait time to see an ED healthcare provider is roughly 1 hour, with longer times in urban and high volume EDs. (Hing & Bhuiya, 2012)

Third, would patients who completed the intervention accept an HIV test offered by the tablet computers, and correctly answer a set of post-test questions measuring their understanding of the test process, and the meaning of a positive or negative HIV test?

Fourth, would participants indicate they found the intervention acceptable by responding favorably to an automated set of acceptability items delivered by the tablet computers at the end of the intervention?

Lastly, how might findings from the current study inform future research and practice?

Method and Sample

In March and April of 2015, our research team conducted a pilot study of a tablet-based intervention for patients aged 18 – 24 years in the main and pediatric treatment areas of a high volume emergency department in New York City. The ED serves approximately 130,000 patients each year, including a substantial number of patients from the Harlem area, which has one of the highest concentrations of HIV prevalence in New York. (Hygiene, 2010)

Participants

Research Assistants (RAs) recruited a convenience sample of 100 patients aged 18 – 24 years. Patients were 66 percent female. Forty six percent self-identified as Black or African American (this includes 16% Black Latino and 30% Black non-Latino). Twenty nine percent self-identified as White (13% White Latino and 16% White non-Latino). Most patients (70%) reported English was the language they most frequently spoke at home and 25% reported they spoke Spanish most frequently.

Procedure

RAs approached patients if medical records indicated they had declined an HIV test at triage, and were aged 18 – 24. Patients were excluded from the study if they were older than 24 or younger than 18, if they were intoxicated, unconscious, or otherwise unable to provide written consent in English. Patients were also excluded if they were known to be HIV positive, or were a prisoner. In addition, patients were excluded if they were in the most emergent need of medical care (e.g. gunshot victims). Lastly, patients were excluded if they were being treated by the physician who appeared in the video.

RAs were instructed to screen all eligible patients, and to approach patients after they had been seen by a physician and were waiting for the next step in their treatment (i.e. X-rays, lab test results, etc.). RAs first asked each eligible patient if they would like to know more about the study. If participants expressed interest, the RA then described the study further and presented informed consent documents detailing study procedures and emphasizing that participation was voluntary, could be discontinued at any time, and that non-participation would not impact patients' medical care. All consent materials were approved by governing Institutional Review Boards. Participants did not receive any incentives to complete the computer-based intervention. After providing written consent, patients used headphones and a relatively inexpensive tablet computer (\$269 at time of purchase) to complete the intervention in the same room where they were being treated. Intervention software was developed specifically for the current study, and was only available in English.

Intervention Components

The Information, Motivation Behavioral (IMB) Skills Model (Fisher & Fisher, 1992; Fisher, Fisher, Bryan, & Misovich, 2002) and Social Cognitive Theory (SCT) (Bandura, 1986, 1994) both posit that intervention content should be applicable to the recipients, and relevant

to their circumstances. Both also posit that delivering information alone will not result in behavior change. As described by IMB, information, motivation, and behavior must be collectively addressed. (Fisher & Fisher, 1992) Therefore, the intervention's pre- post knowledge test questions and the brief video explaining the answer to each question, were designed to address established barriers to youth HIV testing, including low perceived self-risk, (Czarnogorski et al., 2011), fear of stigma (Dorell et al., 2011), and to address previously established HIV-related knowledge deficits among young youth. (Swenson et al., 2010) All content was also designed to motivate young people to test for HIV.

Measures—The knowledge test was developed to address questions participants frequently answered incorrectly at pre-test in previous research, (Aronson, 2015; Swenson et al., 2010) as well as questions our research team hypothesized would motivate people to test. For example, one question asked whether testing for HIV one week after having sex would tell a person if he or she has HIV. As noted earlier in the current paper, young people answered this question incorrectly in prior studies, and misunderstanding HIV test results can potentially be very dangerous. (Swenson et al., 2010) Because qualitative data from the Aronson 2012 study show that learning specific details of the testing process from the intervention video (i.e. HIV tests can be administered without drawing blood and results can be available in 20 minutes) contributed to patients' decisions to test after completing a computer-based intervention in the ED, (Aronson, 2015) the current video strongly emphasized these points, and each also appeared as a question in the revised knowledge test. In addition, to emphasize potential HIV risk and motivate participants to test for HIV post-intervention, the knowledge test asked whether a person with HIV can look and feel healthy (the video explained that anyone who has sex is potentially at risk for HIV even if they and all their sex partners appear perfectly healthy). For the full list of questions and details on participant responses, please see Table 1.

To better understand participants' experience and to measure acceptability, after the intervention had been completed the tablets presented a set of items asking participants to click on a scale indicating how much they liked the intervention, how much they understood the intervention, how threatening they found the intervention, etc. The acceptance items also included three free response areas in which participants could type answers to questions about what they liked best about the intervention, what they liked least, and what suggestions they had for future changes to the intervention. Responses to the open ended items were analyzed by summarizing what each participant entered, organizing the responses based on emerging themes, and selecting representative direct quotes. For more details on the scale, the wording of each question, and participant response, please see Figure 1.

To examine feasibility, our design measured study enrollment rate, intervention completion rates and time to completion. We selected these measures because enrollment and completion rates can potentially be used to gauge patient interest in an intervention (if few patients participate or complete an intervention it would not appear feasible), and completion times can be used to judge suitability for a high volume clinical setting (long completion times could potentially interfere with patient care or staff work flows).

Video—To maximize the video’s perceived applicability and relevance to young patients in a Harlem area ED, again in line with IMB (Fisher et al., 2002) and SCT, (Bandura, 1994) we produced an educational video depicting a young African American physician speaking with a young African American patient. Because, as noted earlier, many young ED patients may underestimate their HIV risk and asymptomatic youth frequently do not test for HIV or other STIs, (Sznitman et al., 2011) the onscreen doctor in the pilot video repeatedly said that everyone is potentially at risk, and the only way a person can know their HIV status is to test. This dialogue was carefully developed to emphasize the importance of HIV testing without frightening participants. According to SCT, people need adequate knowledge of potential danger to warrant action, but interventions need not scare people in order to facilitate HIV preventive behavior. (Bandura, 1994) Further, according to a meta-analysis by Witte and Allen, overly frightening messages may, in fact, lead people to work toward controlling only their fear, instead of taking tangible action to avoid actual danger. (Witte & Allen, 2000)

Because existing research indicates stigma is an established barrier to testing, especially among young African American males, (Dorell et al., 2011) the overall intervention was designed to increase patient privacy, and to enable participants to accept an HIV test offered by a tablet computer without having to speak with a person, and without the risk of people nearby overhearing. The video also depicted two African American males (the physician and patient) discussing HIV testing, modeling the acceptance of an HIV test, and then showed the young, healthy looking onscreen patient receiving a rapid oral test, in an attempt to normalize HIV testing behavior and thereby lessen potential stigma.

Intervention protocol

The tablet computers first collected basic demographic data, and then presented 5 knowledge test questions. After participants had responded to the knowledge test questions, the tablets presented the video (approximately 1.5 minutes long). To increase the apparent realism of the video, the onscreen physician was an actual ED physician. The onscreen patient was a hospital volunteer and was selected, in part, because he was age concordant with the sample of 18 – 24-year-old patients. While speaking to the patient, the doctor clearly addressed each item in the knowledge test, and then administered a rapid oral HIV test. In the second part of the video, the doctor explained the test result, and addressed each item in the knowledge test a second time.

Immediately following the video, the tablets presented the post-test knowledge items. The post-test questions were exactly the same as the pre-test questions, but appeared in a different order under a line of text that read “We’d like to know if you might want to change your answers after watching the video.”

Once participants responded to all the post-intervention knowledge items, the tablets then asked if participants would like an HIV test. Possible responses were Yes or No.

After the participant responded to the offer of an HIV test, the tablets presented the acceptance items described earlier in the Measures section.

If participants clicked “Yes” in response to the offer of an HIV test, an ED staff member came to the hospital bed or exam room where the participant was receiving care and administered a rapid HIV test. All participants who tested for HIV received results before discharge.

Results

Would young adult patients agree to participate?

A team of four RAs approached a total of 217 participants during approximately four weeks of data collection. Among those participants, 11 were determined ineligible due to language issues, medical conditions, or the fact that the patient was being treated by the physician who appeared in the video. The study enrollment rate for eligible patients was 48.5 percent.

Completion rates and time to completion

Of 100 participants enrolled, 98 completed the entire intervention.

On average, participants required 8.47 minutes (SD = 6.28 minutes) to complete the entire intervention including all pre-post items, watching a video, and responding to the offer of an HIV test. The intervention video was 93 seconds long. Participants had the ability to pause, rewind, or fast-forward the video, and on average spent 2.13 minutes watching the video (SD = 4.20 minutes).

HIV test rates

At the end of the intervention, 30 participants (30%, 95% CI 22%–40%) accepted an HIV test offered by the tablet computer. Of these participants, 29 were tested for HIV by hospital staff and received their results before discharge (one left the ED before being tested).

Participant understanding of test processes and results

Participant responses to the five post-intervention knowledge test items range from a low of 88.7 percent correct to a high of 100 percent correct, per-item. (For more detail please see Table 1.) McNemar’s tests indicate significant pre-post increases for three items, and a significant decrease for 1 item.

A paired sample t-test indicates overall knowledge score increases per participant were statistically significant pre-post intervention ($t = -6.67$, $p < .001$).

Acceptability items

Participants completed a set of acceptability items, as described in the Methods section. Separate scales, detailed in Figure 1 along with participant responses, measured constructs including how interesting, useful, or threatening patients found the intervention. Each click was given a numeric value, determined by where they clicked on the scale. A click at the extreme left end of the scale (e.g. closest to “Not useful”) would receive a score of 0, while a click at the right end of the scale (closest to “Very useful”) would receive a score of 100. Clicks in between would receive a value based on their position relative to both ends of the

scale. The values of all participant clicks were later analyzed to determine the mean response for each item (please see Figure 1).

Overall, participants reported they found the intervention highly acceptable, especially in terms of ease of use and understandability. The low score on the item asking whether participants found the intervention threatening ($M = 22.5\%$, $SD = 29.4\%$) appears to indicate most patients found the intervention content only slightly threatening, while a few participants found the content highly threatening.

Participants also completed three free response questions, in which they typed responses using the tablet's onscreen keyboard, to indicate what they liked best about the intervention, what they liked least, and suggestions they had for future intervention designs. Participant responses were examined for emerging themes, as described in the Methods section. All but three participants completed all free response sections. Many entered only one or two words in response to each question: "The Video" or "Video" in response to what they liked best; "Nothing" in response to what they liked least. Analysis of longer answers indicates patient comments focused on the overall structure of the intervention, intervention content, and the way information was presented in the video. A selection of representative participant comments appears below:

Liked best—"The pre-test was the best part because it let me know what to listen for in the video." *20-year-old, non-Hispanic, Black male.*

"I like that things were repeated, it helped them stick in my mind" *22-year-old, non-Hispanic, White female.*

"The video was very clear" *20-year-old, non-Hispanic, White female.*

Liked least—"The questions in general. I hate questions." *21-year-old, non-Hispanic, Black male.*

"The guy in the video was really repetitive. I thought I was in the twilight zone" *20-year-old, non-Hispanic, Asian female.*

"The questions were too easy and I believe that there should be more." *20-year-old, non-Hispanic, Black male.*

Suggestions for improvement—"Tell the person taking the survey if they answered the HIV questions right or wrong" *24-year-old, non-Hispanic, Black female*

"Should have showed the perspective of more than one race" *21-year-old, non-Hispanic, Black female*

Discussion

As described earlier, young people face increased HIV risk, high rates of undiagnosed HIV, yet frequently do not test. (Centers for Disease, 2012a, 2012b) To address these issues, the

current pilot study offered a new tablet-based intervention to ED patients aged 18 – 24 who declined testing offered at triage.

In several ways, this pilot study indicates the basic feasibility and acceptability of the intervention. RAs quickly recruited a sample of young participants, all of whom had declined an HIV test only shortly before enrolling in the study. Almost all participants (98%) completed the intervention in a mean time of less than 9 minutes. At the end of the intervention, 30% of participants accepted an HIV test offered by a tablet computer, and participants generally reported the intervention was highly acceptable.

Implications for future research and practice

Slightly less than half of eligible participants (48.5 %) agreed to participate. Given that we recruited patients who came to the ED for reasons other than requesting an HIV test, and that all eligible patients initially declined HIV testing upon arrival, this enrollment rate can possibly be interpreted as high. However, for the intervention to be truly successful, additional research is warranted to determine why more than half of those approached declined to enroll in the study, and to examine how enrollment rates for future youth-targeted interventions can potentially be improved. An alternative strategy could be to approach all young patients, not only those who decline testing, to make sure everyone understands the importance of HIV testing, knows rapid testing is available in the ED, and understands how to interpret results before they accept or decline a test.

Additionally, much remains unknown about why young patients decline HIV testing in the ED. The current pilot did not ask patients about their testing history, so we do not know if participants had ever tested before, or if patients had tested recently, which could be a reason eligible patients declined to enroll in the study and could also explain why some patients declined to test at the end of the intervention. These questions warrant attention, possibly via qualitative or mixed methods research. If we determine many young patients are declining because they recently tested, it may warrant the development of additional content, such as a separate video, to encourage re-testing as appropriate, depending on time since the previous test and ongoing risk. Accordingly, because IMB and SCT both emphasize making interventions relevant and applicable to target populations, it may be helpful to explore how content can be tailored to behavioral risk (e.g. substance use, sex with multiple partners, etc). Intervention content can also potentially be tailored to participants' initial reason for not testing, or to their knowledge of HIV testing and prevention (different content can be delivered to participants based on higher or lower baseline knowledge scores). Each of the above strategies could increase rates of HIV testing post-intervention, which future research efforts should consider exploring in more detail.

Lastly, the pilot intervention did not address fear of a positive result as thoroughly as other barriers. The video mentioned treatment is available for those who test positive, but future iterations could emphasize the wide range of services offered to people diagnosed HIV positive, and in particular those designed to support youth.

This study also has several implications for practice. Because youth HIV test rates remain problematically low, the current intervention has potential to make a sizeable impact. If this

intervention were routinely delivered in settings where youth HIV testing is offered but underutilized (e.g. EDs, pediatric care settings, etc.) even a slight increase in test uptake could result in substantially more young people learning their HIV status. This, in turn, would lessen the number of people who unknowingly transmit HIV through unprotected sex, as people who become aware of their HIV infection frequently decrease their sexual risk behaviors. (Branson et al., 2006)

Still, it remains to be determined who is best-suited to implement a similar intervention on an ongoing basis. Research assistants administered the intervention for the current study, but that is not a sustainable solution. In a high volume clinical setting such as an ED, staff already face competing demands on their time and may not be able to accommodate additional responsibility. Additionally, increasing the number of patients who test for HIV could result in a greater number of youth who test positive and require referral to care, which is not a simple process. Indeed, navigating complex healthcare systems can require HIV-infected adolescents to utilize adult level skills, (Tanner et al., 2014) and, unfortunately, youth who do not possess these skills many not receive much needed treatment and support. (Philbin et al., 2014) To address these issues, our team is currently developing software that will use text messages to facilitate linkage to care for HIV positive youth, and to encourage engagement in prevention programs along with periodic HIV re-testing for youth who test negative. Lastly, and although this goes beyond the scope of the present study, utilizing future research efforts to better quantify the characteristics of those participants who choose to test post-intervention can help inform the development of more targeted practice efforts aimed to increase testing rates among specific subgroups of youth.

Limitations

The current intervention was designed to be very brief, so that it could be implemented in a high volume clinical setting without interfering with patient care or interrupting staff. As a result, the interval between the knowledge pre- and post-tests were very short. (The video was only 1.5 minutes long, so less than two minutes passed between the completion of the knowledge pre- test and the start of the knowledge post-test.) Therefore, it remains unknown how much information participants retained over a longer period of time (e.g. after leaving the ED). However, a primary goal of the study was to increase HIV test rates post intervention, and to provide participants with fundamental knowledge they would need to interpret an HIV test result. In that context, findings of significant knowledge increases immediately after watching the video may be a very valuable outcome.

An additional limitation is the fact that the current intervention was offered only to participants who understand English. As noted in the Participants section, 25% of our sample reported that they most frequently spoke Spanish at home. Because the hospital where we collected data serves a very large Spanish speaking population, development of a Spanish language version is an important next step.

Conclusions

The primary goals of the current research were to examine whether a new intervention designed to increase HIV testing and related knowledge among ED patients aged 18 – 24

years would be feasible and acceptable among a population that has historically been reluctant to test and has shown limited knowledge of HIV testing and prevention. Initial findings indicate patients were quickly recruited, and demonstrated increased knowledge and test rates following the intervention. Additional research to develop a revised, and possibly more thorough, intervention targeting young patients appears warranted. Given that CDC publications note the importance of focusing HIV testing efforts toward high risk groups in non-healthcare settings, (Seth, Wang, Collins, & Belcher, 2015) development of similar interventions for youth outside the ED appears warranted as well.

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Figure 1.
Mean Acceptability Scores ($N=98$).

Table 1

Knowledge Change from Pre- to Post-Test

Question	Pre-Test Item Accuracy (N = 99)	Post-Test Accuracy (N = 98)	Percent Change	χ^2	McNemar <i>p</i>
1) Using Vaseline or baby oil with condoms lowers the chance of getting HIV.	94.9% (n = 94)	88.8% (n = 87)	-6.0%	25.0	<i>p</i> < .001
2) Taking a test for HIV 1 week after having sex will tell a person if she or he has HIV.	69.7% (n = 69)	87.8% (n = 86)	26.0%	4.95	<i>p</i> < .001
3) A person with HIV can look and feel healthy.	99.0% (n = 98)	100% (n = 98)	1.0%	0	<i>p</i> = 1
4) HIV test results can be available in 20 minutes.	79.8% (n = 79)	98.0% (n = 96)	22.8%	1.10	<i>p</i> < .001
5) HIV testing can be done without drawing blood	63.6% (n = 63)	98.0% (n = 96)	34.4%	3.516	<i>p</i> < .001