Published in final edited form as:

J Acquir Immune Defic Syndr. 2013 June ; 63(0 1): S44–S48. doi:10.1097/QAI.0b013e318293067b.

Tailored Treatment for HIV+ Persons with Mental Illness: The Intervention Cascade

Michael Blank, PhD¹ and Marlene Eisenberg²

¹Center for Mental Health Policy and Services Research, Perelman School of Medicine, Department of Psychiatry, University of Pennsylvania, Philadelphia, PA

²Center for the Studies of Addiction, Perelman School of Medicine, Department of Psychiatry, University of Pennsylvania, Philadelphia, PA

Abstract

The public health literature demonstrates disturbingly high HIV risk for persons with a serious mental illness (SMI), who are concurrently co-morbid for substance abuse (SA). Many HIV positives have not been tested, and therefore do not know their status, but for individuals who are triply diagnosed, adherence to HIV treatment results in meaningful reductions in viral loads and CD4 counts. Barriers to treatment compliance are reviewed, low threshold/low intensity community based interventions are discussed, and preliminary evidence is presented for the efficacy of the *Intervention Cascade*, defined as an integrated intervention delivered by specially trained nurses who individualize a treatment compliance intervention in real time as an adaptive response to demand characteristics of the individual.

Keywords

HIV risk; SMI co-morbid with substance abuse; treatment adherence; low-threshold/low intensity community-based interventions

EVIDENCE FOR HIGH RISK PROFILE FOR CO-MORBID SMI, HIV, & SA

A growing body of research documents that persons with a serious mental illness (SMI) are at increased risk for contracting and transmitting HIV (Rothbard, Blank, Staab, TenHave, Young, Berry, S.D., et al, 2009; Walkup, Blank, Gonzales, Safren, Schwartz, Brown, et al., 2008; DiClemente, Wingood, Blank, & Metzger, 2008). Multiple studies have confirmed the emerging rates of HIV within the SMI community. For example, in a study of metabolic and infectious disorders in 600 psychiatric inpatients (Rothbard, et al, 2009), over 10% were HIV infected; 32% had Hepatitis B, 21% had Hepatitis C and 22% had high cholesterol levels. In another study that used a service utilization model, Blank and colleagues (Blank, Mandell, Aiken and Hadley (2002), conducted a cross-sectional study to calculate the treated prevalence of SMI and HIV in the Medicaid population and the odds of receiving an HIV diagnosis given a diagnosis of SMI. When Medicaid claims data was merged with welfare recipient files, the treated period prevalence of HIV among Medicaid recipients

Correspondence to: Michael B. Blank, PhD, Center for Mental Health Policy and Services Research University of Pennsylvania, 3535 Market St., Room 3020, Philadelphia, PA 19104-3309, mblank2@mail.med.upenn.edu.

Financial Disclosures: From the * Center for Mental Health Policy and Services Research, Perelman School of Medicine, Department of Psychiatry, University of Pennsylvania, Philadelphia, PA; and the **Center for the Studies of Addiction, Perelman School of Medicine, Department of Psychiatry, University of Pennsylvania, Philadelphia, PA

Conflicts of Interest: None reported.

without an SMI diagnosis was .3% compared to .8% of those with a schizophrenia diagnosis. For those with a diagnosis of affective disorder, rates were 1.7% for a total risk among those with SMI of 1.6%. After controlling for sex, age, race, and time on welfare, the odds of having an HIV diagnosis given a diagnosis of schizophrenia was 1.52; the odds given a diagnosis of affective disorder was 3.87. Thus, the rate of HIV was significantly elevated among those with SMI. The risk associated with affective disorder was even higher than that observed for schizophrenia.

The addition of substance abuse (SA) profoundly raises the risk profile of co-morbid SMI and HIV seropositives resulting in alarmingly high rates of infection among those newly admitted to New York City inpatient psychiatric facilities (5–8%), among homeless mentally ill men (19%), and more still among persons dually diagnosed with SMI and SA (23%) (Susser et al., 1993). A large multi-site study of HIV prevalence among psychiatric inpatients and outpatients in Connecticut, Maryland, New Hampshire, and North Carolina found HIV rates of 3.1%, or roughly ten times the rate in the general population (Rosenberg, Trumbetta et al. 2001). Similarly, in a large sample of patients with schizophrenia spectrum disorders treated through the Veterans Affairs (VA) system, Himelhoch and his colleagues found an interaction whereby people with schizophrenia and co-morbid SA were at markedly greater risk for HIV infections. However, in the absence of an SA diagnosis, people with schizophrenia alone were actually at lower risk for HIV infections than the general VA population (Himelhoch, et al., 2007).

LOW RATES OF HIV TESTING

While the data solidly demonstrate an emerging epidemic within individuals diagnosed as SMI and SA, rates of HIV testing within this population are unfortunately low, resulting in significant numbers who are unaware of their serostatus. In a study that describes the frequency and associated factors of HIV testing among 150 psychiatric outpatients (N = 150) (Meade, Sikkema et al. 2005), up to 41% of participants had been HIV tested within the past year. A hierarchical linear regression model revealed that testing was related to lower educational attainment, higher HIV risk behavior, greater social support, homelessness, non-psychotic disorder, borderline personality disorder, and greater treatment utilization. After accounting for psychosocial and behavioral factors, psychiatric factors remained significant correlates of HIV testing. Although HIV testing occurred among a substantial proportion of participants, a sizeable majority was not tested. In addition, 45% of individuals engaging in the highest-risk behavior had not been tested within the prior year. Perhaps the most comprehensive study to date that evaluated predictors of HIV test results among community-based persons with SMI was completed by Desai and Rosenheck (Desai, Rosenheck et al. 2004). Using data from 5,890 SMI consumers from the Access to Community Care and Effective Services and Supports program (ACCESS), investigators found that 38.0% of consumers were tested for HIV in the 3 months after entry into the ACCESS program and 88.8% returned to receive their test results. Significant predictors of testing were prior testing experience, the presence of more severe psychiatric symptoms and substance abuse, greater concern about contracting HIV, those who were younger, less educated, minorities including African Americans, homeless for extended periods of time, a history of sexual assault, history of criminal justice system involvement, and higher levels of using physical health services. Receipt of testing results was lowest for consumers with SA problems. The investigators concluded that the majority of consumers enrolled in an intensive case management program were not tested for HIV during the 3-month period after program entry. However, for those who were tested, the vast majority received their results. More than any other, this study demonstrates that persons with mental illness should be offered HIV testing, that they will accept it, and then reliably return for results. These

findings further endorse the suggestion that testing should be incorporated into ongoing mental health programs and interventions.

NON-ADHERENCE TO HIV TREATMENT

For those who do get tested and know their HIV positive status, the impact that results from consistent compliance with highly active antiretroviral therapy (HAART) cannot be underestimated because knowledge about HIV serostatus results in significant reductions in viral loads and CD4 counts (Gill, Lima, Zhang, et al, 2010; Das, Chu, Santos, et al, 2010). Adherence to treatment has also been found to result in more globalized health benefits, more efficient use of case management services, and increased utilization of mental health and substance abuse treatment programs (Conviser & Pounds, 2002). Unfortunately, approximately half of those offered HIV treatment never enter treatment (Perkins, Meyerson, Klinkenberg, & Laffoon (2008; Ikard, Janney, Hsu, et al, 2005; Olatosi, Probst, Stoskopf, Martin, & Duffus, 2006). Perhaps even more discouraging are the large numbers who enter treatment but are not retained (Coleman, Boehmer, Kanaya, Grasso, Tan, & Bradford, 2007; Mocroft, Kirk, Aldins, et al, 2008) and then become at increased risk for viral resistance (Parianti, Massari, Descamps, et al, 2004). The timing of treatment is also important as early initiation of treatment has a potent effect on reduction of viral load (Sterne et al, 2009). In sum, the SMI are at high risk for HIV infection, are poorly integrated into a reliable HIV testing paradigm, and are non-adherent to HIV treatment when access is available resulting in higher viral loads and the potential for the development of antiretroviral (ARV) treatment resistant viral strains. The confluence of these factors suggests that persons with SMI may serve as a potent vector of HIV transmission.

THE EFFICACY OF LOW THRESHOLD/LOW INTENSITY BEHAVIORAL INTERVENTIONS

The literature suggests, then, the presence of numerous barriers to the reduction of HIV risk in those uninfected. For those already infected, there are barriers that stall or prevent the successful adherence to an HIV treatment regimen. Additionally, maladaptive belief systems could be outwardly expressed as either structural or endogenous barriers to treatment acceptance and/or adherence. Those at risk could be non-adherent to treatment because they perceive treatment cost to be prohibitive, transportation to treatment centers inadequate, and/or office based treatment that may not be available during the times when they are most in need. It is also possible that the considerable stigma associated with treatment may inhibit service utilization. In order to overcome these obstacles, interventions should ideally be designed to appeal to those individuals at highest risk yet who are least likely to seek and use traditional treatment programs. In addition, interventions should be easily accessible to people who would not normally know where to obtain treatment or who have not yet reached the severity of addiction that usually brings drug users to the attention of the treatment system (Lambert & Wiebel, 1990; Festinger, Lamb, Kountz, Kirby & Marlowe, 1995; Kwiatkowski, Booth, & Lloyd, 2000). These features are generally identified as characteristics of low threshold interventions.

The design of interventions considered low intensity may also be particularly constructive for increasing treatment adherence because they often allow for longer periods of intermittent contact with the expectation that some form of contact will serve to maintain treatment benefits over time. This ability to facilitate repeated or maintained treatment episodes is especially useful in addressing the cyclical nature of persons with mental illness, which is often characterized by relapse (Leshner, 1999). Low intensity treatments are particularly well-suited for high risk individuals because they can provide a bridge to more intensive treatment and allow for longer periods of intermittent contact with the expectation

that some form of contact will serve to maintain treatment benefits over time. They can also support maintenance of gains as infrequent “booster sessions” after the termination of treatment to help maintain treatment gains longer.

DESCRIPTION OF THE INTERVENTION CASCADE

In order to address both structural and subjective barriers to adherence to HIV treatment, we propose the *Intervention Cascade*, which is designed as an intentional process with the primary goal of actively coping with barriers to adherence and to instill confidence in an individual's ability to self-administer and monitor medication. The *Intervention Cascade* is derived from the “Theory of Reasoned Action”(TRA) (Figure 1) and the “Theory of Planned Behavior” (TPB) (Figure 2), which is particularly germane because of its emphasis on understanding the mechanisms underlying decisions to seek treatment and to change behavior. There has been considerable theoretical work to explain the relationship between the information about health behaviors and health behaviors themselves. The predecessor to most health models was the Health Belief Model (Rosenstock, 1966), which held that readiness to engage in health-related behavior change was related to four components: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. The TRA (Fishbein and Ajzen, 1975) extended this work by placing the individual in a socio-cultural context, and has proven particularly valuable in evaluating HIV prevention interventions. This well-tested theory holds that behaviors are mediated by intentions to perform them, which in turn are caused by attitudes toward performance as well as perceptions of subjective norms. Attitudes are based on an interaction between knowledge and an internal calculus of outcomes assessment, while normative beliefs interact with motivation. The inclusion of subjective norms is critical since HIV transmission by definition takes place in interaction with another person, either through high-risk sexual behavior or substance use-related behavior. The TPB is an extension of the TRA and includes self-efficacy (Bandura, 1989) as a predictor of intentions to engage in a specific behavior. Self-efficacy is an internal assessment of one's ability to perform behaviors related to successful completion of a task, which with regard to HIV prevention, are primarily safe sex practices or abstinence and substance-use-related risk reduction.

TRA/TPB has been shown to be effective in shaping the success of HIV preventive behaviors (Terry, Gallois, and McCamish, 1993), and has been used to guide myriad health behavior change interventions over the past three decades. In addition, intentions to change addictive behaviors have been found to be an important predictor of drug treatment outcomes. Individuals with the highest motivation for change appear to be the individuals most likely to complete drug treatment, and consequently display fewer risk behaviors (McLellan et al, 1996; Longabaugh et al, 1995). The TRA/TPB provides a theoretical framework within which to understand and interpret the cycling of treatment entry and retention as well as decision-making related to risk behavior.

Using the TPB as a guiding paradigm and the architecture of a low threshold/low intensity design, the *Intervention Cascade* is sensitive to the beliefs and behaviors of persons with mental illness who are at high risk for HIV by providing an opportunity to be responsive to the level of care needed via skilled practitioners. In a real sense, it provides continuity between the processes of identification of high risk individuals through HIV testing, increased access to HIV treatment, and then reinforced treatment adherence. The skeleton structure of the intervention is predicated upon the careful interplay between two necessary elements. First, the intervention must be a *nurse-led integrated disease management model* (NDMs) with expertise in SMI, SA, and injection drug use (ID),(Crespo-Fiero, 1997; Ingersoll, McIntosh, & Williams, 2000). In a real sense, this translates into the provision of weekly home-health nursing focused psycho-education aimed at insuring adherence to drug

treatment regimen, and integrated care across mental health, substance abuse, and infectious disease provides. If meeting with other care providers is needed, then the nurses accompany the patient to appointments or make collateral contacts with other care providers as needed. Often the nurses serve as intermediaries to ensure accurate and timely information exchange. Their specialized training also allows them to monitor side effects of medications, coordinate care for complex comorbid conditions, and advocate for the patients with their various specialty providers. In this way, specialty providers gain patients' confidence and enable services to be delivered with adherence supported and maintained.

The second necessary element is the assumption of *continuity of care*, which integrates care across inpatient and community providers, and is a process by which patient and the care providers are cooperatively involved in ongoing health care management working toward the goal of high quality, cost-effective medical care that is initiated immediately upon discharge from inpatient care to prevent lapses in treatment (Farrell, Blank, Koch et al., 1999). The timing of the intervention is important, as is the long-term patient-provider partnership that develops when the nurse knows the patient's history from personal experience and can integrate new information and decisions from a whole-patient perspective efficiently without extensive investigation or record review. The value of the trust that is engendered by this relationship cannot be underestimated.

The *Intervention Cascade* that is superimposed on the foundation of *nurse-led integrated disease management* and *continuity of care* is an integrated intervention delivered by specially trained nurses who then design and modify the intervention based on listening to the individual's communication and comprehension needs (Figure 3). Based on individual need, this may translate into the use of memory aid devices, education regarding side effects and other treatment aspects, and/or active community outreach. Some individuals may require more intensive didactic training or more frequent reinforcement and face-to-face meetings. Using concepts from The TRA, nurses assess attitudes toward medications and treatments, norms and beliefs about their use and monitor side effects. A primary goal of the cascade is to actively cope with barriers to adherence and to instill confidence in participants' abilities to self-monitor. The *Intervention Cascade* becomes operative when HIV treatment adherence falls below a prescribed set-point, in this case 80% adherence as measured by weekly self-report and pill counts. If either method of measuring adherence falls below 80%, the participant is considered to have fallen below threshold. When that occurs the *Intervention Cascade* shifts to the next higher level of intervention intensity. If 80% adherence is maintained for three observation periods (weeks), the *cascade* reverts back to the next lower level. If 80% adherence is not obtained, the *cascade* increases in intensity to the next highest level. The least intensive *cascade* level is the incorporation of the existing social support network (family, friends, neighbors, and significant others) to assist in reminders about the medication schedule, and to provide gentle and non-coercive support to adhere to treatments and attend appointments. We estimate that an additional 10% will meet the 80% threshold solely through the activation of social networks.

For the estimated 20% who still are not able to maintain 80% adherence, the next step in the *cascade* is to continue to promote adherence through the social support network, but to add increased contact with the NDM who will begin real time reminders using text messages when medications and other treatments need to be taken. The rationale here is that those who continue to be non-adherent will need more individualized persuasive communications in order to meet the adherence threshold of 80%. In those cases, NDMs will coordinate calls by case managers and social network members, as well as make phone calls themselves to encourage adherence. We estimate that an additional 5% will require the use of phone contact in real time to maintain 80% adherence. Finally, of the remaining 10%, we expect that an additional 5% will require directly observed therapy. This will be effective with an

additional 5% of the population, leaving 5% who will not respond to even the most aggressive treatment approach, and will be those who actively resist treatment.

PRELIMINARY EVIDENCE OF THE EFFICACY OF THE *INTERVENTION CASCADE*

Using a longitudinal experimental and control group design, Blank and colleagues randomly assigned participants to the PATH for Positives (PFP) intervention or control groups. PFP participants received the *Intervention Cascade* provided by an advanced practice nurse (APN) who delivered community-based care management at a minimum of one visit/week and coordinated their medical and mental healthcare for one year. In a randomized controlled trial (RCT), 238 community-dwelling HIV-positive subjects with SMI who were in treatment at urban public mental health clinics from 2004–2008 were sampled. The main outcome measures were viral load and CD4 count at baseline and 12 months, and costs. Longitudinal models for continuous log viral load showed that the *Intervention Cascade* group exhibited a significantly greater reduction in log viral load than did the control group at 12 months ($d = -0.384 \log_{10}$ copies/mm³ (95% CI = $-0.165, -0.606$, $p < 0.05$). Differences in CD4 from baseline to 12 months were not statistically significant. A cost analysis revealed a potential cost savings associated with the *Intervention Cascade* group of approximately \$600,000 per year. This project demonstrated the effectiveness of the *Intervention Cascade* via community-based APNs who delivered a tailored intervention to improve outcomes of individuals with HIV/SMI. It further demonstrated that persons with SMI can successfully adhere to HIV treatment and achieve undetectable viral loads when provided with appropriate supportive services that are flexible and coordinated with the individuals needs in real time (Blank, Hanrahan, Fishbein, Wu, Tennille, Ten Have, et al., 2011).

CONCLUSION

The *Intervention Cascade* has the strong potential to serve as an effective intervention for individuals dually diagnosed who are transitioning from inpatient psychiatric care to community based mental health treatment. Many persons with HIV who are undiagnosed are persons with mental illness and drug users who are marginalized from the healthcare system and from HIV testing and counseling resources (Eisenberg and Blank, 2004). To improve the diagnosis of HIV and linkage to HIV care among persons with mental illness who also use substances, better strategies of delivering case management and health care follow-up are required. Providing continuity of care via a nurse-led integrated disease model provides an opportunity to link infected individuals to HIV care services and adjunctive services including substance abuse treatment and social services. As a natural consequence of this program, the continuous relationship developed between nurse and patient is capitalized through the often long-term relationships that many persons develop with the treatment setting and their providers.

Acknowledgments

Preparation of this article was supported by the Penn Center for AIDS Research (CFAR), an NIH-funded program (P30 AI 045008) and NINR Grant #R01 NR008851 Nursing Intervention for HIV Regimen Adherence among SMI.

References

- Bandura A. Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology*. 1989; 25:729–735.

- Blank MB, Hanrahan NP, Fishbein M, Wu ES, Tennille JA, Ten Have TR, et al. A Randomized Trial of a Nursing Intervention for HIV Disease Management Among Persons With Serious Mental Illness. *Psychiatric Services*. 2011; 62:1318–1324. [PubMed: 22211211]
- Blank MB, Mandell DS, Aiken L, Hadley TR. Co-occurrence of HIV and serious mental illness among Medicaid recipients. *Psychiatric Services*. 2002; 53:868–873. [PubMed: 12096171]
- Coleman S, Boehmer U, Kanaya F, Grasso C, Tan J, Bradford J. Retention challenges for a community-based HIV primary care clinic and implications for intervention. *Aids Patient Care and Stds*. 2007; 21:691–701. [PubMed: 17919096]
- Conviser R, Pounds MB. The role of ancillary services in client-centered systems of care. *Aids Care-Psychological and Socio-Medical Aspects of Aids/HIV*. 2002; 14:S119–S131.
- Crespo-Fiero M. Compliance/adherence and care management in HIV disease. *Journal of the Association of Nurses in AIDS Care*. 1997; 8(4):43–54.
- Das M, Chu PL, Santos GM, Scheer S, Vittinghoff E, McFarland W, et al. Decreases in Community Viral Load Are Accompanied by Reductions in New HIV Infections in San Francisco. *Plos One*. 2010; 5:9.
- Desai MM, Rosenheck RA. HIV testing and receipt of test results among homeless persons with serious mental illness. *American Journal of Psychiatry*. 2004; 161:2287–2294. [PubMed: 15569902]
- DiClemente RJ, Wingood GM, Blank MB, Metzger DS. Future directions for HIV prevention research -Charting a prevention science research agenda. *JAIDS-Journal of Acquired Immune Deficiency Syndromes*. 2008; 47:S47–S48.
- Farrell SP, Blank M, Koch JR, Munjas B, Clement DG. Predicting whether patients receive continuity of care after discharge from state hospitals: Policy implications. *Archives of Psychiatric Nursing*. 1999; 13:279–285. [PubMed: 10618825]
- Eisenberg MM, Blank MB. HIV and serious mental illness: Prevalence and treatment issues. *Harvard Health Policy Review*. 2004; 5(2):48–54.
- Festinger DS, Lamb RJ, Kountz MR, Kirby KC, Marlowe D. Pretreatment dropout as a function of treatment delay and client variables. *Addictive Behaviors*. 1995; 20:111–115. [PubMed: 7785476]
- Fishbein, M.; Ajzen, I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley; 1975.
- Gill VS, Lima VD, Zhang W, Wynhoven B, Yip B, Hogg RS, et al. Improved Virological Outcomes in British Columbia Concomitant with Decreasing Incidence of HIV Type 1 Drug Resistance Detection. *Clinical Infectious Diseases*. 2010; 50:98–105. [PubMed: 19951169]
- Himelhoch S, McCarthy JF, Ganoczy D, Medoff D, Dixon LB, Blow FC. Understanding associations between serious mental illness and HIV among patients in the VA health system. *Psychiatric Services*. 2007; 58:1165–1172. [PubMed: 17766561]
- Ikard K, Janney J, Hsu LC, Isenberg DJ, Scalco MB, Schwarcz S, et al. Estimation of unmet need for HIV primary medical care: A framework and three case studies. *Aids Education and Prevention*. 2005; 17:26–38. [PubMed: 16401180]
- Ingersoll GL, McIntosh E, Williams M. Nurse-sensitive outcomes of advanced practice. *Journal of Advanced Nursing*. 2000; 32:1272–1281. [PubMed: 11115013]
- Kwiatkowski CF, Booth RE, Lloyd LV. The effects of offering free treatment to street-recruited opioid injectors. *Addiction*. 2000; 95:697–704. [PubMed: 10885044]
- Lambert, EY.; Wiebel, WW., editors. *The collection and interpretation of data from hidden populations*. United States National Institute on Drug Abuse; Washington, DC: 1990.
- Leshner AI. Science-based views of drug addiction and its treatment. *JAMA-Journal of the American Medical Association*. 1999; 282:1314–1316.
- Longabaugh R, Wirtz PW, Beattie MC, Noel N, Stout R. Matching treatment focus to patient social investment and support – 18 month follow-up results. *Journal of Consulting and Clinical Psychology*. 1995; 63:296–307. [PubMed: 7751491]
- McLellan AT, Woody GE, Metzger D. Evaluating the effectiveness of addiction treatments: Reasonable expectations, appropriate comparisons. *Milbank Quarterly*. 1996; 74:51. [PubMed: 8596524]
- Meade CS, Sikkema KJ. Voluntary HIV testing among adults with severe mental illness: Frequency and associated factors. *Aids and Behavior*. 2005; 9:465–473. [PubMed: 16323033]

- Mocroft A, Kirk O, Aldins P, Chies A, Blaxhult A, Chentsova N, et al. Loss to follow-up in an international, multicentre observational study. *HIV Medicine*. 2008; 9:261–269. [PubMed: 18400074]
- Olatosi BA, Probst JC, Stoskopf CH, Martin AB, Duffus WA. Patterns of engagement in care by HIV-infected adults: South Carolina, 2004–2006. *Aids*. 2009; 23:725–730. [PubMed: 19197194]
- Parienti JJ, Massari V, Descamps D, Vabret A, Bouvet E, Larouze B, et al. Predictors of virologic failure and resistance in HIV-Infected patients treated with nevirapineor efavirenz-based antiretroviral therapy. *Clinical Infectious Diseases*. 2004; 38:1311–1316. [PubMed: 15127346]
- Perkins D, Meyerson BE, Klinkenberg D, Laffoon BT. Assessing HIV care and unmet need: Eight data bases and a bit of perseverance. *Aids Care-Psychological and Socio-Medical Aspects of Aids/HIV*. 2008; 20:318–326.
- Rosenberg SD, Trumbetta SL, Mueser KT, Goodman LA, Osher FC, Vidaver RM, et al. Determinants of risk behavior for human immunodeficiency virus/acquired immunodeficiency syndrome in people with severe mental illness. *Comprehensive Psychiatry*. 2001; 42:263–271. [PubMed: 11458300]
- Rosenstock IM. Why people use health services. *Milbank Memorial Fund Quarterly-Health and Society*. 1966; 44:94–127.
- Rothbard AB, Blank MB, Staab JP, TenHave T, Young DS, Berry SD, et al. Previously Undetected Metabolic Syndromes and Infectious Diseases Among Psychiatric Inpatients. *Psychiatric Services*. 2009; 60:534–537. [PubMed: 19339330]
- Sterne JAC, May M, Costagliola D, de Wolf F, Phillips AN, Harris R, et al. Timing of initiation of antiretroviral therapy in AIDS-free HIV-1-infected patients: a collaborative analysis of 18 HIV cohort studies. *Lancet*. 2009; 373:1352–1363. [PubMed: 19361855]
- Terry, D.; Gallois, C.; McCamish, M. The theory of reasoned action: its application to AIDS preventive behavior. New York: Pergamon Press; 1993.
- Susser E, Valencia E, Conover S. Prevalence of HIV-infection among psychiatric patients in a New York city men's shelter. *American Journal of Public Health*. 1993; 83:568–570. [PubMed: 8460736]
- Walkup J, Blank MB, Gonzalez JS, Safren S, Schwartz R, Brown L, et al. The impact of mental health and substance abuse factors on HIV prevention and treatment. *JAIDS-Journal of Acquired Immune Deficiency Syndromes*. 2008; 47:S15–S19.

Figure 1.
Theory of Reasoned Action

Figure 2.
Theory of Planned Behavior

Estimated %Successful	Experimental	Control
	All Experimental receive basic intervention	Treatment-as-Usual
(70%) 80% Adherent	YES	NO
	Social Support	
(10%) 80% Adherent	YES	NO
	Beepers	
(5%) 80% Adherent	YES	NO
	Cell Phones	
(5%) 80% Adherent	YES	NO
	Directly Observed Therapy	
(5%) 80% Adherent	YES	NO

*The goal is 80% adherence. At weekly observational periods, if target is less than 80%, the next level of intensity is implemented until 80% adherence is maintained for three observation periods, then it reverts back to the lower level. If 80% is not obtained, then the intervention cascade increases to the next level of intensity.

Figure 3.