Published in final edited form as:

J Acquir Immune Defic Syndr. 2010 May 1; 54(1): 109–110. doi:10.1097/QAI.0b013e3181cbd34b.

Is antiretroviral therapy adherence substantially worse on weekends than weekdays?

Marcus Bachhuber, BS¹, Warren B Bilker, PhD^{1,3}, Hao Wang, MS¹, Jennifer Chapman, MPH¹, and Robert Gross, MD, MSCE^{1,2,3}

Marcus Bachhuber: marcus.bachhuber@gmail.com; Warren B Bilker: warren@mail.med.upenn.edu; Hao Wang: haow@mail.med.upenn.edu; Jennifer Chapman: jchapman@mail.med.upenn.edu; Robert Gross: grossr@mail.med.upenn.edu

¹Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania School of Medicine, Philadelphia, PA, United States

²Division of Infectious Diseases/Department of Medicine, University of Pennsylvania School of Medicine, Philadelphia, PA, United States

³Center for Education and Research on Therapeutics, University of Pennsylvania School of Medicine, Philadelphia, PA, United States

To the Editor

Antiretroviral adherence is central to HIV treatment success^{1–3}. Many patient and system barriers to adherence have been identified and serve as targets for intervention studies^{4–9}. Disruption of daily routine is thought to be an important barrier to adherence. Although they are commonly periods of more leisurely activity, weekends represent a change in routine from the more structured activity of weekdays. If disruption of routines on weekends results in missed doses, intervention designers could target this time for particular attention. However, if weekends are not particularly high risk, more attention could be paid to established barriers. Unfortunately, little research has been done to determine the effect of day of the week on medication adherence. Therefore, we examined differences in adherence on weekends compared with weekdays in HIV-infected individuals on stable antiretroviral regimens.

Methods

We conducted an observational cohort study of HIV-infected participants with HIV RNA <75 copies/ml on standard regimens including efavirenz¹⁰. Adherence was measured using microelectronic monitors (MEMS, Aardex, Switzerland) for the 90 days prior to a censoring event of either viral load >1000 copies/ml or 12 months, whichever came first. Weekends were defined as Friday 5pm to Sunday 5pm and weekdays as the rest of the week. Percent adherence was calculated separately for weekends and weekdays for each participant using the following formula: $100 \times (\# \text{ doses taken} / \# \text{ doses prescribed})$. The paired data were compared using the Wilcoxon signed-rank test. The study was approved by the study site IRBs; all participants provided written informed consent.

Corresponding Author: Robert Gross MD MSCE, Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania School of Medicine, 804 Blockley Hall, 423 Guardian Drive, Philadelphia, PA 19104-6021, Telephone: 215-898-2437, Fax: 215-573-5315.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Results

The cohort consisted of 116 participants with 94 (81%) males, 76 (66%) African-American, 30 (26%) White, 32 (28%) with a history of injection drug use, and a median CD4 count of 433 cells/mm³. Median adherence on weekdays was statistically significantly higher than on weekends (95.3% vs. 93.2%; $p=0.012$) with a median absolute difference 0.9% (interquartile range: -2.9%, +9.9%). Adherence was better for 63 participants (54%) on weekdays, 46 (40%) on weekends, and was the same for 7 (6%).

Comment

Weekends were associated with slightly lower antiretroviral adherence. While statistically significant, the absolute difference was small. Although strict adherence is particularly important for antiretroviral therapy, the clinical implication of this small difference is likely to be marginal even in the HIV setting where the treatment is relatively unforgiving.

Previously published studies of medication adherence on weekends are few. In contrast to our findings, two small studies, one of antihypertensives¹¹ and the other of topical treatment for psoriasis¹², noted a disproportionately high number of missed doses on weekends. In the context of HIV, a cross-sectional study of adherence to HAART noted that 22.1% of participants reported missing a dose of medication the previous weekend¹³. Our results might have differed from those because we studied individuals with prior treatment success who may have had relatively high levels of adherence prior to enrolling.

Our study highlights the importance of tailoring adherence interventions to patients' needs rather than on widely assumed risk factors. Although a majority of participants had better adherence on weekdays as might be expected, a significant number had better adherence on weekends. One possible explanation is that we used a fixed "weekend" period, whereas participants may have had a more regular routine on Saturday and Sunday rather than the traditional Monday-Friday workweek. For many participants, however, the "weekend" may still have entailed a different routine even if the participant was working because any children cared for by the participant were not in school and other household members may have been off work. Therefore, given the observed difference, albeit slight, we recommend that clinicians query patients regarding their "weekends" and other periods with disrupted routines, such as vacations, so as to develop plans for ensuring adherence on those days. For designers of adherence interventions, weekend and weekday differences warrant exploration with participants, but should not be *de facto* considered a time at particularly high risk for non-adherence.

Acknowledgments

We are grateful for the support of the National Institutes of Health which supported this research through the University of Pennsylvania Center for AIDS Research Clinical Core (P30-AI45008), Career Development Awards K08MH01584 (RG), and an Agency for Healthcare Research and Quality (AHRQ) Centers for Education and Research on Therapeutics cooperative agreement (HS10399). Additional support was provided via a contract with Bristol-Myers Squibb and a Young Investigator award from GlaxoSmithKline. RG had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. The sponsors of this study had no role in the study design; in the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication. Bristol-Myers Squibb was provided with a copy of the manuscript prior to submission and provided comments for consideration.

References

1. Gross R, Bilker WB, Friedman HM, Strom BL. Effect of adherence to newly initiated antiretroviral therapy on plasma viral load. *AIDS* 2001;15(16):2109–2117. [PubMed: 11684930]

2. Paterson DL, Swindells S, Mohr J, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Ann Intern Med* 2000;133(1):21–30.
3. Bangsberg DR, Hecht FM, Charlebois ED, et al. Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. *AIDS* 2000;14(4):357–366. [PubMed: 10770537]
4. Cook RL, Sereika SM, Hunt SC, Woodward WC, Erlen JA, Conigliaro J. Problem drinking and medication adherence among persons with HIV infection. *J Gen Intern Med* 2001;16(2):83–88. [PubMed: 11251758]
5. Arnsten JH, Demas PA, Grant RW, et al. Impact of active drug use on antiretroviral therapy adherence and viral suppression in HIV-infected drug users. *J Gen Intern Med* 2002 May;17(5):377–381. [PubMed: 12047736]
6. Ammassari A, Murri R, Pezzotti P, et al. Self-reported symptoms and medication side effects influence adherence to highly active antiretroviral therapy in persons with HIV infection. *J Acquir Immune Defic Syndr* 2001;28(5):445–449.
7. Chesney MA. Factors affecting adherence to antiretroviral therapy. *Clin Inf Dis* 2000;30:S171–S176.
8. Graham J, Bennett IM, Holmes WC, Gross R. Medication beliefs as mediators of the health literacy-antiretroviral adherence relationship in HIV-infected individuals. *AIDS Behav* 2007 May;11(3):385–392. [PubMed: 17053858]
9. Starace F, Ammassari A, Trotta MP, et al. Depression is a risk factor for suboptimal adherence to highly active antiretroviral therapy. *J Acquir Immune Defic Syndr* 2002 Dec 15;31:S136–S139. [PubMed: 12562037]
10. Gross R, Bilker WB, Wang H, Chapman J. How long is the window of opportunity between adherence failure and virologic failure on efavirenz-based HAART? *HIV Clin Trials* 2008 May–Jun;9(3):202–206. [PubMed: 18547907]
11. Kruse W, Rampmaier J, Ullrich G, Weber E. Patterns of drug compliance with medications to be taken once and twice daily assessed by continuous electronic monitoring in primary care. *Int J Clin Pharmacol Ther* 1994 Sep;32(9):452–457. [PubMed: 7820327]
12. Carroll CL, Feldman SR, Camacho FT, Manuel JC, Balkrishnan R. Adherence to topical therapy decreases during the course of an 8-week psoriasis clinical trial: commonly used methods of measuring adherence to topical therapy overestimate actual use. *J Am Acad Dermatol* 2004 Aug;51(2):212–216. [PubMed: 15280839]
13. Leserman J, Ironson G, O'Leirigh C, Fordiani JM, Balbin E. Stressful life events and adherence in HIV. *AIDS Patient Care STDS* 2008 May;22(5):403–411. [PubMed: 18373416]