Implementation of Mental Health Service Has an Impact on Retention in HIV Care: A Nested Case-Control Study in a Japanese HIV Care Facility

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Abstract

Background: Poor retention in the care of patients with human immunodeficiency virus (HIV) is associated with adverse patient outcomes such as antiretroviral therapy failure and death. Therefore, appropriate case management is required for better patient retention; however, which intervention in case management is important has not been fully investigated. Meanwhile, in Japan, each local government is required to organize mental health services for patients with HIV so that a case manager at an HIV care facility can utilize them, but little is known about the association between implementation of the services and loss to follow-up. Therefore, we investigated that by a nested case-control study.

Methods: The target population consisted of all patients with HIV who visited Osaka National Hospital, the largest HIV care facility in western Japan, between 2000 and 2010. Loss to follow-up was defined as not returning for follow-up care more than 1 year after the last visit. Independent variables included patient demographics, characteristics of the disease and treatment, and whether the patients have received mental health services. For each case, three controls were randomly selected and matched.

Results: Of the 1620 eligible patients, 88 loss to follow-up cases were identified and 264 controls were matched. Multivariate-adjusted conditional logistic regression revealed that loss to follow-up was less frequent among patients who had received mental health services implemented by their case managers (adjusted odds ratio [95% confidence interval] 0.35 [0.16-0.76]). Loss to follow-up also occurred more frequently in patients who did not receive antiretroviral therapy (adjusted odds ratio [95% confidence interval], 7.51 [3.34-16.9]), who were under 30 years old (2.74 [1.36-5.50]), or who were without jobs (3.38 [1.58-7.23]).

Conclusion: Mental health service implementation by case managers has a significant impact on patient retention.

Introduction

Patients with human immunodeficiency virus (HIV) cannot currently be free of the virus, so they must regularly visit medical facilities and receive appropriate care to prevent acquired immunodeficiency syndrome (AIDS)-related or non-AIDS-related complications. Patients who do not receive regular HIV care tend to experience adverse outcomes such as antiretroviral therapy failure, hospitalization, AIDS-defining illness, and death [1–3].

One of the approaches to preventing loss to follow-up (LTFU) and facilitating better retention is case management. It is an attempt by health care providers to connect patients to adequate ancillary services. Case management has been shown effective [4–6], but it consists of various complex activities to keep patients from LTFU and the definition of case management differs somewhat among the previous reports.
Thus, it is clinically relevant to investigate which element of intervention in case management is particularly associated with these patients’ engagement in care.

Meanwhile, patients with HIV and poor mental health or psychological distress are prone to be lost to follow-up [7–9] and Japanese local governments staff therapists to provide psychotherapy at no charge as a mental health service upon requests from HIV care medical staff members. Therefore, case managers at HIV care facilities can easily utilize mental health services as resources, despite little evidence that mental health service introduction improves patient retention. Our aim is to investigate the association between mental health service implementation for patients by case managers and LTFU in HIV care.

Methods

Study design

We performed a nested case-control study within a cohort of patients with HIV at Osaka National Hospital, Japan.

Setting

The population of Japan is 127 million and adult HIV prevalence is reported to be 0.017% in 2011 [10]. The Japanese national health insurance system covers HIV treatment costs. Patients with HIV have an upper monthly limit for HIV-related medical payments of 5,000 to 20,000 Japanese yen (approximately $60–240 USD at the exchange rate in 2012), which also includes the cost for treatment of opportunistic infection or malignancy. This constitutes approximately 1.5% to 6% of the average monthly salary in Japan. Some local governments provide additional monetary support. People living on welfare benefits do not have to pay any medical expenses at all.

Osaka National Hospital is a tertiary hospital and is conveniently located for transportation. It is the largest HIV care facility in the western half of Japan, providing care for half of the infected patients reported in the area as of 2010.

Participants

The study cohort from which cases and controls were selected consisted of patients with HIV who visited the Department of Infectious Diseases at Osaka National Hospital between January 1, 2000 and September 30, 2010. Patients entered the cohort at their first hospital visit and were tracked until LTFU, death, or September 30, 2011. Patients excluded from the study were under 18 years old, did not intend to visit the hospital regularly (e.g., a tourist who needed an antiretroviral refill), or those who died within 1 year of their first visit.

Case management with and without implementation of mental health services

All patients were attended by trained nurses as their case managers. Case managers held a 1-h intake session with each patient at his initial visit. During the session, case managers inform patients of knowledge on HIV infection and emphasized the importance of seeing a physician regularly. They assessed each patient’s unmet social, economic, or psychological needs that hindered regular visits and coordinated a care plan. According to that plan, ancillary services for the patient were implemented. For example, if the patient had monetary or housing problems, the case manager introduced a social worker. If the patient had a psychological problem that hampered the maintenance of health (e.g., anxiety, feeling of stigma, interpersonal problems, or low self-efficacy), a case manager implemented mental health services. With regard to the mental health services, the hospital was staffed with trained psychotherapists during the study period and they provided psychotherapy with a client-centered approach to the patients for free. Each therapy session was on a one-on-one basis at intervals ranging from weekly to monthly, depending on the patient’s need. Other related medical staff members were able to view records of psychotherapy on charts and communicate with the therapist. Patients were permitted to see the therapists even if they did not regularly meet with their primary physician.

Study size

Approximately 60 cases were expected from the cohort in a preliminary investigation. The proportion of cases with independent variables was hypothesized as 20% and the proportion of controls with independent variables as 40%. With an alpha error of 5%, statistical power was calculated as 59% for 1:1 matching, 73% for 1:2 matching, 78% for 1:3 matching, and 83% for 1:4 matching. The study adopted 1:3 matching.

Loss to follow-up cases and controls

Loss to follow-up was defined as not returning for follow-up appointments more than 1 year after the last physician visit to the Department of Infectious Disease at Osaka National Hospital, excluding emergency care and subspecialty visits (e.g., dermatology or dentistry). If a physician referred the patient to another HIV care facility for subsequent medical care at the last visit, we did not consider that case to be LTFU. All patients with LTFU were selected as LTFU cases. For each LTFU case, we identified a risk set of patients from the study cohort who remained in regular care at the time LTFU occurred. Three controls were randomly selected from each risk set whose case matched both the calendar date within 90 days of entry into the cohort and the time spent in the cohort between LTFU cases and controls.

Variables

Independent variables were measured as either baseline variables or time-dependent variables. Baseline variables were recorded on charts by a nurse at the time of cohort entry using a standardized form. They were sex, route of infection (homosexual, heterosexual, or blood products), HIV testing motive (voluntary or provider-initiated), mental illness, illicit drug use, regular employment, welfare benefits, nationality, and key person. A key person was defined as the patient’s partner or anyone in a close relationship to whom the patient disclosed his serostatus. Time-dependent variables were evaluated as a status at index time, which was the date of last visit for LTFU cases or the corresponding date for controls.
Time-dependent variables included age (<30 years or ≥30 years), CD4+ lymphocyte count (<200/mm³, 200-499/mm³, or ≥500/mm³), history of AIDS, antiretroviral therapy, and whether mental health service had been implemented before the index time. Acquired immunodeficiency syndrome was diagnosed according to the definition of the Japanese Ministry of Health, Labour, and Welfare. All data were recorded in regular medical practice and extracted by chart review.

Statistical analysis

All analyses conserved the matched nature of the LTFU cases and controls. Odds ratios (ORs) between each independent variable and dependent variable (LTFU) were calculated using the Mantel-Haenszel method for binominal variables and conditional logistic regression for ordinal variables. After backward stepwise variable selection with a significance level of \( p > 0.20 \) for removal, we performed multivariate-adjusted conditional logistic regression analysis to calculate adjusted ORs. A two-sided \( p \)-value less than 0.05 was considered to be significant. All statistical analyses were performed using Stata 12.1 software (StataCorp LP, College Station, Texas, USA).

Ethics statement

Personal information other than the above-mentioned variables was not included in the dataset to protect patient confidentiality. According to the Ethical Guidelines for Epidemiological Research set by the Ministry of Education, Culture, Sports, Science, and Technology with the Ministry of Health, Labour and Welfare, Japan, individual informed consent was waived because only recorded clinical data was used and additional patient data were not collected. The Kyoto University Graduate School and Faculty of Medicine Ethics Committee and Institutional Review Boards at Osaka National Hospital waived the need for written informed consent from the participants and approved the research protocol.

Results

Of the 1715 patients with HIV in the hospital cohort, 1620 were eligible for the present study. Their mean age was 37.1 years and 1545 (95.4%) were male. The route of HIV infection was homosexual transmission in 1238 (76.4%) of patients, heterosexual transmission in 277 (17.1%), blood products in 34 (2.1%), and unidentified in 71 (4.4%).

A total of 88 LTFU cases were identified and 264 controls were selected from the cohort. The incidence of LTFU was calculated to be 1.32 per 100 person-years. The median time to LTFU was 14 months (interquartile range, 1.6-33 months). Forty LFTU cases (45.5%) resulted in absence within 1 year of the first visit. Six patients had only one hospital visit. The patients' demographics, disease status, and treatment characteristics are summarized in Table 1. Patients in the LTFU cases had an average age of 32.7 years (standard deviation, 9.3 years) and included 86 males (97.7%). Patients in the LTFU cases were younger than the controls and had a larger proportion of patients who underwent voluntary HIV testing or who lacked regular employment. Patients in the LTFU cases also had higher CD4+ lymphocyte counts and were less likely to have an AIDS diagnosis or to have received antiretroviral therapy than the controls. Sixty-eight (91.9%) of the 74 LTFU case patients without antiretroviral therapy had CD4+ lymphocyte counts higher than the threshold for the therapy recommended by the guidelines at the time LTFU occurred or were within 90 days from their first visit. Fourteen LTFU case patients had been on anti-retroviral therapy for the median of 31 months (range, 2-80 months).

Independent variables for LTFU are displayed in Table 2. Stepwise multivariate-adjusted conditional logistic regression revealed that the risk of LTFU in patients who had received mental health services implemented by a case manager was significantly low (0.35 [0.16-0.76], \( p = 0.008 \). Loss to follow-up occurred more frequently in patients who did not receive antiretroviral therapy (adjusted OR [95% confidence interval], 7.51 [3.34-16.9], \( p < 0.001 \), who were younger than 30 years old (2.74 [1.36-5.50], \( p = 0.005 \), and who lacked regular employment (3.38 [1.58-7.23], \( p = 0.002 \).

Discussion

This study found that patients who utilized mental health services introduced by a case manager were less likely to be LTFU.

Previous studies have demonstrated that case management is associated with better retention and survival of patients with HIV [11,12]. However, case management has been differently operationalized and which specific intervention by case managers improve patients' prognosis has not been fully elucidated [13,14]. What our result adds to this topic is that the mental health services based on a case manager's assessment of each patient's psychological aspects increased the chance for patients to receive regular care.

There could be several reasons for good retention of the patients who receive mental health services. Improved mental health as the result of the services could be related to good retention [15–17] and implementation of the services per se would be responsible for good engagement in care through making patients realize their own problems and tackling them. An understanding of a patient's psychological aspects by the case manager and other medical staff members through communication with therapists would also contribute to better continuity of care. We cannot say that mental health service implementation directly reduced LTFU because of unmeasured confounding factors such as a patient’s attitude to accepting a case manager’s advice. However, our results suggested that patients who did not accept mental health services were more at-risk for LTFU.

Patients with HIV younger than 30 years of age or without regular employment were less likely to engage in regular hospital visits. These results agree with previous reports that showed the independent factors for LTFU were young age and low socioeconomic status [18–22]. Similar to previous reports [21,22], not taking antiretroviral therapy also strongly predicted LTFU. Patients with HIV who did not receive antiretroviral therapy were over seven times more likely to withdraw from regular care. They were speculated to be asymptomatic.
because, in our data, 93.2% did not have an AIDS diagnosis. Furthermore, because these patients were free from the side effects of antiretroviral drugs, they might not have felt an urgent need for strict regular checkups. We cannot determine the exact reason why some patients were not receiving antiretroviral therapy at the time of LTFU, because whether or not to start the therapy depends partially on individual preference. However, they were not assumed to be eligible or prepared for the therapy because most of them had CD4+ lymphocyte counts higher than the threshold for the therapy recommended by the guidelines of the time [23], or were within 90 days from their first visit.

This study has some limitations. First, because it is not a randomized-controlled study but an observational study, we cannot determine the causal relationship between mental health service induction and good retention. However, it is obviously ineffective to deliver patient-centered psychotherapy to patients without the need and it is unethical to withhold it from patients who need it. An observational study is reasonable to investigate the association between the implementation of psychotherapy and retention in actual clinical practice. Second, the survival of the patients was not investigated and we could not obtain the prognosis of LTFU cases. However, the growing number of studies including ones without complete follow-up systems, such as nationwide databases, indicates that LTFU is associated with worse survival, which can support the clinical validity of the present findings [24–27]. The third limitation is generalizability. Our findings would be applicable to HIV care facilities where case manager have good access to mental health services, but the availability, contents, and charge of mental health services differ among settings and influence results.

Our study has several strengths. All of our LTFU cases and controls received case management, unlike most previous studies that evaluated the effectiveness of case management. Consequently, we were able to demonstrate an association between retention and mental health service use as an element of case management more clearly. Therapeutic trends such as criteria for antiretroviral therapy initiation, pill burden, and drug side effects are always changing and they must have affected results; however, this bias was accounted for because we matched entry dates into the cohort and time spent in the cohort between LTFU cases and controls. We suspected that CD4+ lymphocyte count and antiretroviral therapy at cohort entry affect the subsequent continuity of care and we dealt with these factors as time-dependent variables. Thus, we could evaluate the influence of these factors at the time LTFU occurred more appropriately.

Conclusions

Treatment of HIV has improved drastically, but care cannot be optimally offered if patients do not regularly keep hospital appointments. Paying attention to patients’ psychological problems and implementing adequate resources such as mental health services have significance in case management for better retention, and healthcare professionals must recognize that patients who do not utilize mental health services are at high risk of LTFU.

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Table 2. Independent variables for loss to follow-up in HIV care.

|                                | Crude ORs² | 95% CI³ | p-value | Adjusted ORs⁴ | 95% CI | p-value |
|--------------------------------|------------|---------|---------|---------------|--------|---------|
| Age                            |            |         |         |               |        |         |
| ≥30 years (reference)          |            |         |         |               |        |         |
| <30 years                      | 3.43       | 1.96-5.99 | < 0.001 | 2.74          | 1.36-5.50 | 0.005  |
| Sex                            |            |         |         |               |        |         |
| Male (reference)               |            |         |         |               |        |         |
| Female                         | 0.46       | 0.10-2.05 | 0.297   | 0.30          | 0.05-1.69 | 0.171  |
| Mental health service          |            |         |         |               |        |         |
| No (reference)                 |            |         |         |               |        |         |
| Implemented                    | 0.45       | 0.24-0.84 | 0.009   | 0.35          | 0.16-0.76 | 0.008  |
| Key person                     |            |         |         |               |        |         |
| No (reference)                 |            |         |         |               |        |         |
| Yes                            | 0.80       | 0.45-1.41 | 0.438   | 0.58          | 0.28-1.19 | 0.135  |
| Route of infection             |            |         |         |               |        |         |
| Homosexual (reference)         |            |         |         |               |        |         |
| Others                         | 0.75       | 0.42-1.34 | 0.327   |               |        |        |
| Regular employment             |            |         |         |               |        |         |
| Yes (reference)                |            |         |         |               |        |         |
| No                             | 2.46       | 1.38-4.39 | 0.002   | 3.38          | 1.58-7.23 | 0.002  |
| Welfare benefits               |            |         |         |               |        |         |
| No (reference)                 |            |         |         |               |        |         |
| Yes                            | 0.43       | 0.05-3.48 | 0.414   |               |        |        |
| HIV test motive                |            |         |         |               |        |         |
| Voluntary (reference)          |            |         |         |               |        |         |
| Others                         | 0.40       | 0.25-0.63 | <0.001  | 1.50          | 0.38-2.70 | 0.180  |
| Mental illness                 |            |         |         |               |        |         |
| No (reference)                 |            |         |         |               |        |         |
| Yes                            | 0.92       | 0.31-2.77 | 0.886   |               |        |        |
| Illicit drug use               |            |         |         |               |        |         |
| No (reference)                 |            |         |         |               |        |         |
| Yes                            | 1.25       | 0.67-2.33 | 0.492   |               |        |        |
| Nationality                    |            |         |         |               |        |         |
| Japanese (reference)           |            |         |         |               |        |         |
| Others                         | 1.00       | 0.32-3.09 | 1.000   |               |        |        |
| AIDS diagnosis                 |            |         |         |               |        |         |
| No (reference)                 |            |         |         |               |        |         |
| Yes                            | 0.19       | 0.07-0.51 | 0.002   |               |        |        |
| Antiretroviral therapy         |            |         |         |               |        |         |
| Yes (reference)                |            |         |         |               |        |         |
| No                             | 8.47       | 3.91-18.33 | <0.001  | 7.51          | 3.34-16.9 | < 0.001 |
| CD4+ lymphocyte count          |            |         |         |               |        |         |
| <200/mm³                       | (reference) |         |         |               |        |        |
| 200-499/mm³                    | 3.94       | 1.35-11.5 | 0.012   |               |        |        |
| ≥500/mm³                       | 6.11       | 2.01-18.6 | 0.001   |               |        |        |

² Odds ratio
³ Mantel-Haenszel method for binomial variables and conditional logistic regression for ordinal variables
⁴ Confidence interval
⁵ Stepwise, multivariate-adjusted conditional logistic regression

Author Contributions
Conceived and designed the experiments: ST T. Nakakura TY KY. Performed the experiments: ST T. Nakakura TY. Analyzed the data: ST. Contributed reagents/materials/analysis tools: T. Nakayama. Wrote the manuscript: ST T. Nakakura YT TS T. Nakayama.

References
1. Berg MB, Safren SA, Mimiaga MJ, Grasso C, Boswell S et al. (2005) Nonadherence to medical appointments is associated with increased plasma HIV RNA and decreased CD4 cell counts in a community-based HIV primary care clinic. AIDS Care 17: 902-907. doi: 10.1080/09540120500101658. PubMed: 16120506.
2. Giordano TP, Gifford AL, White AC Jr., Suarez-Almazor ME, Rabeneck L et al. (2007) Retention in care: a challenge to survival with HIV infection. Clin Infect Dis 44: 1493-1499. doi:10.1086/516778. PubMed: 17479948.
3. Fleishman JA, Moore RD, Conviser R, Lawrence PB, Korthuis PT et al. (2008) Associations between outpatient and inpatient service use
among persons with HIV infection: a positive or negative relationship? Healthy Serv Res 43: 76-95. PubMed: 18951519.
4. Gardner L, Metzch LR, Anderson-Mahoney P, Loughlin AM, del Rio C et al. (2005) Efficacy of a brief case management intervention to link recently diagnosed HIV-infected persons to care. AIDS 19: 423-431. doi:10.1097/01.aids.0000161772.51900.eb. PubMed: 16356607.
5. Cunningham WE, Wong M, Hays RD (2008) Case management and health-related quality of life outcomes in a national sample of persons with HIV/AIDS. J National Medical Association 100: 840-847.
6. Ashman JJ, Conviser R, Pounds MB (2002) Associations between HIV-positive individuals’ receipt of ancillary services and medical care receipt and retention. AIDS Care 14 Suppl 1: S109-S118. doi:10.1080/095401202220149993a. PubMed: 12204145.
7. Tobin CR, Cunningham W, Cabral HD, Cunningham CO, Eldred L et al. (2007) Living with HIV but without medical care: barriers to engagement. AIDS Patient Care STDs 21: 426-434. doi:10.1089/apc.2006.0138. PubMed: 17594252.
8. Sayles JN, Wong MD, Kinsler JJ, Martins D, Cunningham WE (2009) The association of stigma with self-reported access to medical care and antiretroviral therapy adherence in persons living with HIV/AIDS. J Gen Intern Med 24: 1101-1108. doi:10.1007/s11606-009-1068-8. PubMed: 19653047.
9. Blashill AJ, Perry N, Saffen SA (2011) Mental Health: A Focus on Stress, Coping, and Mental Illness as it Relates to Treatment Retention, Adherence, and Other Health Outcomes. Curr HIV/AIDS Rep 8: 215-222. doi:10.1007/s11999-011-0089-1. PubMed: 21822626.
10. Japanese. Foundation for AIDS Prevention (2011) AIDS incidence yearly Report Available: http://api-net.jfap.or.jp/status/index.html. Accessed: 12 January 2013.
11. Ko NY, Lai YY, Liu HY, Lee HC, Chang CM et al. (2012) Impact of the nurse-led case management program with retention in mortality among people with HIV-1 infection: a prospective cohort study. Int J Nurs Stud 49: 656-663. doi:10.1016/j.ijnurstu.2012.01.004. PubMed: 22269137.
12. Reisner SL, Marks G, Crepaz N, Liu A, Lyles CM (2012) Interventions to improve retention in HIV primary care: a systematic review of U.S. studies.Curr HIV/AIDS Rep 9: 313-325. doi:10.1007/s11999-012-0136-6. PubMed: 22996171.
13. Thompson MA, Mugavero MJ, Amico KR, Cargill VA, Chang LW et al. (2012) Guidelines for improving entry into and retention in care and antiretroviral adherence for persons with HIV: evidence-based recommendations from an International Association of Physicians in AIDS Care panel. Ann Intern Med 156: 817-833. doi:10.7326/0003-4819-156-11-201206050-00419. PubMed: 22393036.
14. Wilson MG, Husbands W, Makoroka L, Rueda S, Greenspan NR et al. (2012) Counselling, Case Management and Health Promotion for People Living with HIV/AIDS: An Overview of Systematic Reviews. AIDS Care panel. Ann Intern Med 156: 817-833. doi:10.7326/0003-4819-156-11-201206050-00419. PubMed: 22393036.
15. Scott-Sheldon LA, Kalichman SC, Carey MP, Fielder RL (2008) Stress management interventions for HIV+ adults: a meta-analysis of randomized controlled trials, 1989 to 2006. Health Psychol 27: 129-139. doi:10.1037/0278-6133.27.2.129. PubMed: 18377131.
16. Berger S, Schad T, von Wyl V, Eichler U, Zellweger C et al. (2008) Effects of cognitive behavioral stress management on HIV-1 RNA, CD4 cell counts and psychosocial parameters of HIV-infected persons. AIDS 22: 765-775. doi:10.1097/QAD.0b013e32826f11dc. PubMed: 18356607.
17. Li L, Lee SJ, Jiraphongsa C, Khumpton S, Iamsinthaworn S et al. (2010) Improving the health and mental health of people living with HIV/AIDS: 12-month assessment of a behavioral intervention in Thailand. Am J Public Health 100: 2418-2425. doi:10.2105/AJPH.2009.185462. PubMed: 20966372.
18. Giordano TP, Visneganarwala F, White AC Jr., Troisi CL, Frankowski RF et al. (2005) Patients referred to an urban HIV clinic frequently fail to establish care: factors predicting failure. AIDS Care 17: 773-783. doi:10.1080/0954012042333136652. PubMed: 16036264.
19. Robison LS, Westfall AO, Mugavero MJ, Kempf MC, Cole SR et al. (2008) Short-term discontinuation of HAART regimens more common in vulnerable patient populations. AIDS Res Hum Retr 24: 1347-1355. doi:10.1089/aids.2008.0083. PubMed: 19032064.
20. Hessol NA, Weber KM, Holman S, Robison E, Goparaju L et al. (2009) Retention and attendance of women enrolled in a large prospective study of HIV-1 in the United States. J Womens Health (Larchmt) 18: 1627-1637. doi:10.1089/jwh.2008.1337.
21. Ndiaye B, Ould-Kaci K, Salleron J, Bataille P, Bonnieve F et al. (2009) Incidence rate and risk factors for loss to follow-up in HIV-infected patients from five French clinical centres in Northern France - January 1997 to December 2006. Antivir Ther 14: 567-575. PubMed: 19578242.
22. Krishnan S, Wu K, Smurzynski M, Bosch RJ, Benson CA et al. (2011) Incidence rate of and factors associated with loss to follow-up in a longitudinal cohort of antiretroviral-treated HIV-infected persons: an AIDS Clinical Trials Group (ACTG) Longitudinal Linked Randomized Trials (ALLRT) analysis. HIV Clin Trials 12: 190-200. doi:10.1310/ HCT1204-190. PubMed: 22044855.
23. Guidelines for improving entry into and retention in care and antiretroviral therapy adherence in persons living with HIV/AIDS. J Gen Intern Med 24: 1101-1108. doi:10.1007/s11606-009-1068-8. PubMed: 19653047.
24. Tripathi A, Youmans E, Gibson JJ, Duffus WA (2011) The Impact of Retention in Early HIV Medical Care on Vivo-Immunological Parameters and Survival: A Statewide Study. AIDS Res Hum Retr 27: 751-758. doi:10.1089/aids.2010.0268. PubMed: 21142607.
25. Zhang Y, Dou ZH, Sun K, Ma Y, Chen RV et al. (2012) Association Between Missed Early Visits and Mortality Among Patients of China National Free Antiretroviral Treatment Cohort. Jaidj of Acquir Immune Defic Syndr 60: 59-67. doi:10.1097/QAI.0b013e18243c3df9. PubMed: 22517414.
26. Mugavero MJ, Lin HY, Willig JH, Westfall AO, Ulett KB et al. (2009) Missed visits and mortality among patients establishing initial outpatient HIV treatment. Clin Infect Dis 48: 246-256. doi:10.1086/595705. PubMed: 19072715.
27. Ndiaye B, Ould-Kaci K, Salleron J, Bataille P, Bonnieve F et al. (2009) Characteristics of and outcomes in HIV-infected patients who return to care after loss to follow-up. AIDS 23: 1786-1789. doi:10.1097/QAD.0b013e32832e3469. PubMed: 19531927.