

Causes of Hospitalizations among HIV-infected Adults in the Highly-Active Antiretroviral Therapy Era

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Abstract

Background: Many studies have been described the declines of morbidity and mortality among HIV-infected patients during early highly active antiretroviral therapy (HAART) era. We aimed to determine the causes of hospitalization among HIV-infected patients in Thailand where the National AIDS Program has been established since 2001 with the availability and accessibility of HAART throughout the country afterward.

Method: A retrospective cohort study was conducted among HIV-infected adult patients who experienced hospitalization at Ramathibodi Hospital between January 2006 and June 2008. Factors associated with HIV-related causes of hospitalization were determined by logistic regression analysis.

Results: A total of 373 HIV-infected adults were included in the study. A mean (SD) age was 36.4 (10.8) years, 68% patients were male, and 62% had heterosexual risk. Of all, 135 (36%) were receiving HAART with a median (IQR) CD4 cell count of 114 (34-296) cells/mm³ and a median (IQR) HIV RNA of 3.7 (1.7-5.3) log copies/mL. Median (range) of duration of hospitalization was 4 (1-107) days and 40 (11%) patients were hospitalized at intensive care unit. HIV-related condition was diagnosed at discharged in 255 (68%) patients. There was no change in a trend of HIV-related condition as a cause of hospitalization during 2006-2008 (p=trend=0.323). Most common causes of hospitalizations were tuberculosis (71, 21%), *Pneumocystis jirovecii* pneumonia (38, 10%), and cryptococcal disease (19, 5%). For non-HIV-related causes, patients were hospitalized for surgery of ophthalmological condition (79, 20%) and for general surgical condition (39, 10%). Patients experienced hospitalization with HIV-related condition had lower proportion of co-morbidity (p=0.004), lower hemoglobin (p<0.001), lower white blood cell count (p=0.021), lower serum albumin (p<0.001), higher aspartate aminotransferase (p=0.004), higher alkaline phosphatase (p<0.001), lower CD4 cell count (p<0.001), and higher HIV RNA (p=0.014). By stepwise forward logistic regression, HIV RNA was associated for admission with HIV-related condition (OR 2.13 per 1 log, 95% CI 1.21-3.73, p=0.008). For the outcomes, 334 (89.5%) patients were discharged with clinical improvement, 32 (8.6%) patients died, and 7 (1.9%) patients were transferred to another hospital.

Conclusion: HIV-related conditions are still the major causes of hospitalizations among HIV-infected adults in Thailand even during the HAART era. Most patients presented with low CD4 cell count and higher HIV RNA levels were associated with hospitalization from HIV-related condition. National strategic HIV/AIDS plan should be scaled up for all aspects of diagnosis, treatment, and prevention.

Patients and Methods

- Retrospective cohort study was conducted among adult HIV-infected patients (≥15 years old) who were admitted to Ramathibodi Hospital (a 1,200-bed University Hospital, Bangkok, Thailand) between January 2006 and June 2008.
- Collected data from a hospital records search using the International Classification of Diseases 10th revision (ICD-10) codes to identify those patients.
- We divided the discharge diagnosis into HIV-related and non HIV-related conditions accordingly, to determine the impact of HIV infection to hospitalization.
- We excluded hospital admissions for pregnancy and child birth that were not associated with disease or injury.
- Logistic regression analyses to determine the factors associated with HIV-related hospitalization were performed
- All statistical analyses were performed using Stata statistical software version 10.0 (Stata Statistical Software: Release 10.0, Stata Corporation, College Station, TX, 2007).

Results

Table 1. Baseline Characteristics of 373 HIV-infected patients who were hospitalized during 2006-2008

| Characteristics | N = 373 |
|--|-----------------|
| Male gender, n (%) | 254 (68.1%) |
| Mean (SD) age at admission, years | 36.4 (10.8) |
| Median (IQR) duration of HIV diagnosis, months | 4.5 (0.02-41.8) |
| HIV route of acquisition, n (%) | |
| Heterosexual | 232 (62.2) |
| Unknown or other | 141 (37.8) |
| HIV serostatus on admission, n (%) | |
| Known | 282 (75.6) |
| On admission day or during admission period | 91 (24.4) |
| Current antiretroviral therapy, n (%) | 135 (36.2) |
| NNRTI-based regimen | 124 (91.8) |
| PI-based regimen | 11 (8.2) |

- Factors associated with higher odds of hospitalization with HIV-related condition were co-morbidity (OR 0.35, 95% CI 0.18-0.70, p=0.003), hemoglobin (OR 0.80, 95% CI 0.72-0.88, p<0.001), PMN percentage (OR 1.07 per 5%, 95% CI 1.00-1.14, p=0.047), lymphocyte count (OR 0.91 PER 5%, 95% CI 0.83-0.98, p=0.021), serum albumin (OR 0.90, 95% CI 0.86-0.94, p<0.001), alkaline phosphatase (OR 1.03 per 5 mg/dL, 95% CI 1.01-1.05, p=0.002), CD4 cell count (OR 0.84 per 50 cells/mm³, 95% CI 0.78-0.89, p<0.001), and HIV RNA (OR 1.58 per 1 log copies/mL, 95% CI 1.07-2.32, p=0.022).

Table 2 Final discharge diagnosis of hospitalization among HIV-infected adult patients during 2006-2008

| Final discharge diagnosis | N = 373 |
|---|-----------|
| HIV-related condition | |
| Tuberculosis | 71 (19.0) |
| <i>Pneumocystis jirovecii</i> pneumonia | 38 (10.2) |
| Cryptococcal disease | 19 (5.0) |
| Bacteremia | 12 (3.2) |
| Other viral infections | |
| Cytomegalovirus infections | 9 (2.4) |
| Parasitic infections | 7 (1.9) |
| Non-Hodgkin's lymphoma | 6 (1.6) |
| Other fungal infections | 4 (1.1) |
| Antiretroviral drug-related adverse effects | 4 (1.1) |
| Cervical cancer | 3 (0.8) |
| Other HIV-related conditions | 10 (2.7) |
| Non-HIV-related condition | |
| Surgical condition | |
| Ophthalmological condition | 74 (19.8) |
| General surgical condition | 39 (10.5) |
| Orthopedics condition | 9 (2.4) |
| Obstetrics-gynecology condition | 8 (2.1) |
| Otolaryngologic condition | 3 (0.8) |
| Medical condition | |
| Malignancy | 13 (3.5) |
| Others medical conditions | 29 (7.8) |

- By stepwise forward logistic regression, HIV RNA was associated for admission with HIV-related condition (OR 2.13 per 1 log, 95% CI 1.21-3.73, p=0.008). For the outcomes, 334 (89.5%) patients were discharged with clinical improvement, 32 (8.6%) patients died, and 7 (1.9%) patients were transferred to another hospital.
- Patients who were hospitalized with HIV-related condition were associated with lower proportion of discharges with clinical improvement (86.7% vs. 95.8%, p=0.008) and higher mortality (11% vs. 3.4%, p=0.015).

Table 3 Baseline characteristics of HIV-infected adult patients who were hospitalized stratified by discharged diagnosis

| Characteristics | Non-HIV-related (N=118) | HIV-related (N=255) | P-value |
|--|-------------------------|---------------------|---------|
| Male gender, n (%) | 82 (69.5) | 172 (67.4) | 0.722 |
| Mean (SD) age at admission, years | 38 (32.6-45) | 36.3 (30.9-44.8) | 0.404 |
| Median (IQR) duration of HIV diagnosis, months | 4.5 (0.0-43.6) | 4.7 (0.03-40.7) | 0.891 |
| Prior AIDS-defining condition, n (%) | 24 (20.3) | 60 (23.5) | 0.594 |
| Co-morbidity, n (%) | 20 (17) | 17 (6.7) | 0.004 |
| HIV serostatus on admission, n (%) | | | 0.437 |
| Known | 86 (72.9) | 196 (76.9) | |
| During admission period | 32 (27.1) | 59 (23.1) | |
| Current ART, n (%) | 43 (36.4) | 92 (36.1) | 1.000 |
| NNRTI-based regimen | 40 (93) | 84 (91.3) | |
| PI-based regimen | 3 (7) | 8 (8.7) | |
| Median (IQR) duration of receiving ART prior to admission, month | 18.1 (7.3-41.0) | 10.6 (2.6-33.7) | 0.084 |
| Positive HBsAg, n (%) | 6 (13) | 15 (12.9) | 1.000 |
| Positive anti-HCV, n (%) | 7 (18.4) | 21 (20.4) | 1.000 |
| Median (IQR) Hb, mg/dL | 12.6 (11.1-14.1) | 11.4 (9.3-12) | <0.001 |
| Median (IQR) WBC, cells/mm ³ | 7,500 (6,025-10,850) | 6,670 (5,120-9,710) | 0.021 |
| Median (IQR) PMN, % | 64 (51-78) | 70 (53-80) | 0.057 |
| Median (IQR) lymphocyte, % | 22 (14-34) | 19 (10-30) | 0.018 |
| Median (IQR) albumin, mg/dL | 38.4 (30.4-43) | 31.1 (23.2-36.2) | <0.001 |
| Median (IQR) AST, mg/dL | 34 (22-57) | 49 (31-84) | 0.004 |
| Median (IQR) ALT, mg/dL | 46 (33-66) | 44 (33-78) | 0.783 |
| Median (IQR) ALP, mg/dL | 97 (68-122) | 115 (87-199) | <0.001 |
| Median (IQR) CD4 cell count, cells/mm ³ | 294 (147-419) | 65 (23-199) | <0.001 |
| Median (IQR) HIV RNA, copies/mL | 49 (49-11,800) | 55,800 (49-38,900) | 0.014 |

Conclusion

- HIV-related conditions are still the major cause of hospitalizations among HIV-infected adults in Thailand even during the HAART era and almost 10 years after the National AIDS Program implementation.
- Most patients who presented with low CD4 cell count and higher HIV RNA levels were associated with HIV-related condition.
- National strategic HIV/AIDS plans should be scaled up for all aspects of diagnosis, treatment, and prevention.