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Brief communication

Hospitalization rates, length of stay and in-hospital mortality in a cohort of HIV infected patients from Rio de Janeiro, Brazil

Lara E. Coelho, Sayonara R. Ribeiro, Valdilea G. Veloso, Beatriz Grinsztejn, Paula M. Luz*

Fundação Oswaldo Cruz (FIOCRUZ), Instituto Nacional de Infectologia Evandro Chagas, Rio de Janeiro, RJ, Brazil

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ABSTRACT

In this study, we evaluated trends in hospitalization rates, length of stay and in-hospital mortality in a cohort of HIV-infected patients in Rio de Janeiro, Brazil, from 2007 through 2013. Among the 3991 included patients, 1861 hospitalizations occurred (hospitalization rate of 10.44/100 person-years, 95% confidence interval 9.98–10.93/100 person-years). Hospitalization rates decreased annually (per year incidence rate ratio 0.92, 95% confidence interval 0.89–0.95) as well as length of stay (median of 15 days in 2007 *vs.* 11 days in 2013, *p*-value for trend < 0.001), and in-hospital mortality (13.4% in 2007 to 8.1% in 2013, *p*-value for trend = 0.053). Our results show that, in a middle-income setting, hospitalization rates are decreasing over time and non-AIDS hospitalizations are currently more frequent than those related to AIDS. Notwithstanding, compared with high-income settings, our patients had longer length of stay and higher in-hospital mortality. Further studies addressing these outcomes are needed to provide information that may guide protocols and interventions to further reduce health-care costs and in-hospital mortality.

Introduction

Combination antiretroviral therapy (ART) has led to a reduction in the rates of hospitalization among HIV-infected patients.[1,2] Immunological improvement and gain in life expectancy achieved as a result of ART also modified causes of hospitalizations, and, in most recent years, non-AIDS events surpassed AIDS-related as the main cause of hospitalization in high income settings.[2–4] Simultaneously, duration of hospitalizations (*i.e.* length of stay) and in-hospital mortality[1,5] among HIV-infected patients decreased over time. Nevertheless, there is a need to assess hospitalizations, length of stay, and in-hospital mortality in late ART era since they provide updated information on morbidity and health care utilization among HIV-infected patients, which are essential to evaluate health

* *Corresponding author.*
E-mail address: lara.coelho@ini.fiocruz.br (L.E. Coelho).
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care provision, guide health policies and project its associated costs. In this study, we sought to assess trends in hospitalization rates, length of stay, and in-hospital mortality in a cohort of HIV-infected patients from Rio de Janeiro, from 2007 through 2013.

Methods

Instituto Nacional de Infectologia Evandro Chagas (INI, formerly known as Instituto de Pesquisa Clínica Evandro Chagas/IPEC) is a reference center for research and care of HIV-infected patients, in Rio de Janeiro, Brazil, since 1986. INI provides primary, specialty and tertiary care for HIV-infected patients and it includes an outpatient facility, an emergency department, a day-clinic, and an inpatient care unit (comprising an intensive care unit), all funded by the Brazilian National Health System. Patients followed at INI have free-of charge access to all available facilities. A longitudinal database maintains in-hospital and outpatient clinical information on patients receiving HIV care. Cohort procedures and results were published eslwhere.[6,7]

The present study included HIV-infected adults (≥18 years of age at cohort enrollment), enrolled in the INI cohort between 01 January 1986 and 01 December 2013, who were alive and in active care (at least one medical visit) after 01 January 2007. Follow-up started on 01 January 2007 or the date of cohort enrollment, whichever occurred last, and it ended on 31 December 2013, date of death, or last clinical visit (medical visit, CD4, HIV viral load or any blood exam) whichever occurred first. Lost to follow-up was defined as not having a clinical visit after 01 January 2013 for those known not to be deceased. Information regarding vital status was exhaustedly checked using the patients' medical charts and by linkage with the Rio de Janeiro mortality database (up to 31 December 2013) using a previously validated algorithm.[8]

The primary cause of a hospitalization was inferred from discharge reports. All diagnoses listed in the discharge report were classified using the 10th Edition of the International Classification of Disease (ICD-10), into 24 different categories.[9] Since some ICD-10 codes could be allocated to several categories, we considered a hierarchical classification protocol with a decreasing order of priority as follows: AIDS-events, non-AIDS malignancies, infections, and then systemic events.[9] To determine the primary cause of a hospitalization, one or more ICD-10 codes listed in the discharge reports were hierarchically classified as follows: AIDS-defining diseases, non-AIDS cancer, cardiovascular disease, bacterial infections, fungal infections, viral infections, parasitic infections, digestive diseases, renal diseases, respiratory diseases, neurologic diseases, endocrine diseases, hematological diseases, psychiatric diseases, viral hepatitis, non-viral hepatitis, dermatological diseases, rheumatologic diseases, trauma, gynecologic disease, toxicities, others, and sings and symptoms.

Socio-demographic and clinical features were compared among included patients by study period (2007–2009, 2010–2011, 2012–2013) using Kruskal–Wallis test for continuous variables and Chi-square for categorical variables. Annual hospitalization rates, defined as the number of hospitalizations divided by the person-years (PY) of follow-up, were calculated per 100 PY; Poisson regression models were used to estimate trends in hospitalization rates. Length of stay (LOS) was calculated by subtracting hospital admission date from date of discharge and adding 1; linear regression models were used to estimate trends in LOS. In-hospital mortality, defined as the number of hospitalizations that ended in death divided by the total number hospitalizations, were calculated; logistic regression models were used to estimate trends of in-hospital mortality.

Results

A total of 3991 patients, enrolled from June 1986 until November 2013, were followed from 01 January 2007 until 31 December 2013, accounting for 17,822 PY of follow-up. One hundred and eighty nine patients (4.7%) were deemed loss to follow up, yielding a loss to follow up rate of rate of 1.06/100 PY. The study population aged slightly through the years and the proportion of patients with 60 years or more increased from 5.1% in 2007–2009 to 7.1% in 2012–2013 ($p < 0.001$, Table 1). Likewise, the median CD4 counts (419 cells/mm^3 in 2007–2009 to 542 cells/mm^3 in 2012–2013, $p < 0.001$), the proportion of patients on ART (80.9% in 2007–2009 *vs.* 90.8% in 2012–2013, $p < 0.001$) and the proportion of patients with a HIV viral load under 400 copies/mL (54% in 2007–2009 *vs.* 69.5% in 2012–2013, $p < 0.001$) significantly increased through the years.

During the study period, there were 1861 hospitalizations, yielding an overall hospitalization rate of 10.44/100 PY (95% confidence interval [CI] 9.98–10.93/100 PY). Hospitalization rates decreased annually (from 10.52/100 PY in 2007 to 7.28/100 PY in 2013, per year incidence rate ratio [IRR] 0.92, 95% CI 0.89–0.95) mainly due to a decrease of AIDS-related hospitalizations (from 5.17/100 PY in 2007 to 2.78/100 PY in 2013, per year IRR 0.88, 95% CI 0.84–0.92). Non-AIDS related hospitalization also decreased with a borderline significant trend (from 5.34/100 PY in 2007 to 4.49/100 PY in 2013, per year IRR 0.96, 95% CI 0.92–1.00; Table 2). Moreover, throughout the years the proportion of non-AIDS related hospitalizations gradually increased and accounted for the majority of the hospitalizations in the last three years of the study period. Bacterial infections (53.4%, $n = 507$), cardiovascular diseases (18.6%, $n = 177$), and viral infections (10.3%, $n = 98$) represented the three most common causes on non-AIDS hospitalizations during the study.

Following the trends of hospitalization rates, the overall LOS decreased significantly over the study period (median of 15 days in 2007 *vs.* 11 days in 2013, p-value for trend < 0.001) as well as the LOS of non AIDS-related hospitalizations (median of 11 days in 2007 *vs.* 8 days in 2013, p-value for trend $= 0.038$) and of AIDS-related hospitalizations (median of 19 days in 2007 *vs.* 16 days in 2013, p-value for trend $= 0.036$). Overall, in-hospital mortality decreased during the study period (from 13.4% in 2007 to 8.1% in 2013, per calendar year increase odds ratio 0.92, 95% CI 0.85–1.00), as well as in-hospital mortality of non-AIDS related hospitalizations (from 14.7% in 2007 to 5.6% in 2013, per calendar year increase odds ratio 0.84, 95% CI 0.74–0.96). In-hospital mortality of AIDS related hospitalizations remained stable throughout the study period and,