

A Model Prediction of Pre-treatment HIV RNA: Application For the Use of Abacavir and Rilpivirine as the First-line Regimen for HIV-infected Patients in Resource-limited Settings

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Background

- Abacavir (ABC) and rilpivirine (RPV) are alternative antiretroviral drugs for treatment-naïve HIV-infected patients
- Both drugs are only recommended for patients who have pre-treatment HIV RNA <100,000 copies/mL
- In resource-limited settings, pre-treatment HIV RNA is not routinely performed and not widely available
- The aims of this study were to determine factors associated with pre-treatment HIV RNA <100,000 copies/mL and to construct a model to predict this outcome

Methods

- HIV-infected adults enrolled in the TAHOD were included if they had an HIV RNA measurement documented at the time of ART initiation
- The dataset was randomly split into a derivation data set (75% of patients) and a validation data set (25%)
- Factors associated with pre-treatment HIV RNA <100,000 copies/mL were evaluated by logistic regression adjusted for study site
- A prediction model and prediction scores were created

Results

- A total of 2,592 patients were included in the analysis
- Median [interquartile range (IQR)] age was 35.8 (29.9-42.5) years
- Median CD4 count at ART initiation was 147 (50-248) cells/mm³
- Median pre-treatment HIV RNA was 100,000 (34,045-301,075) copies/mL
- 49.3% had anemia, 10.8% had positive HBsAg, 8.3% had positive anti-HCV, 19.6% had positive syphilis serology, and 75.1% had HIV infection with CRF01_AE subtype

- Factors associated with pre-treatment HIV RNA <100,000 copies/mL were younger age (p <0.01), hemoglobin >13 g/dL for men or >12g/dL for women (p <0.01), positive HBsAg (p=0.01), higher CD4 count (p for trend <0.01), higher total lymphocyte count (p for trend <0.01), and no prior AIDS-defining illness (p <0.01)
- Receiver-operator characteristic (ROC) analysis yielded area under the curve of 0.70 [95% confidence interval (CI) 0.67-0.72] among derivation patients and 0.69 (95% CI 0.65-0.74) (Fig 1) among derivation patients and 0.69 (Fig 2)

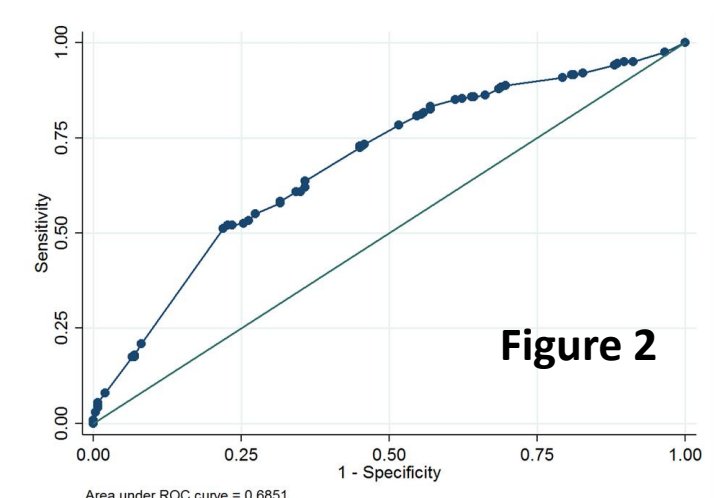
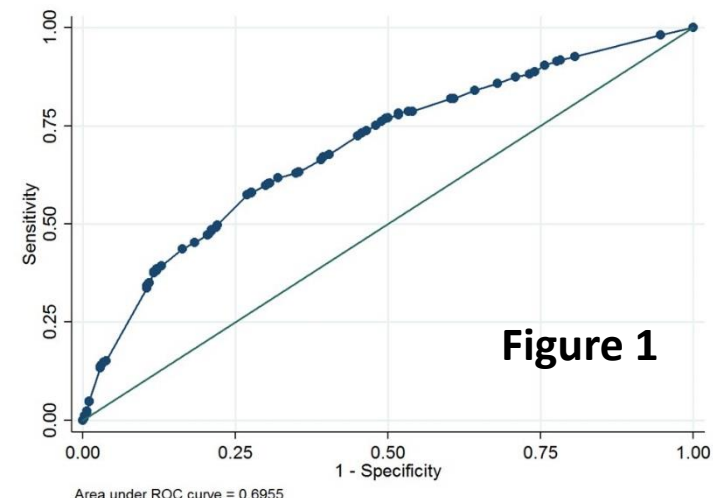


Table 2 Sensitivities, specificities, positive predictive values and negative predictive values of clinical prediction tool for pre-treatment HIV RNA <100,000 copies/mL among derivation patients (n=1,556)

| CPT score | N (%) | N (%) tests avoided | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|-----------|-------------|---------------------|-----------------|-----------------|---------|---------|
| >25.0 | 532 (34.2) | 1024 (65.8) | 48.2 | 79.0 | 68.2 | 61.9 |
| >20.0 | 701 (45.1) | 855 (54.9) | 60.4 | 69.4 | 64.9 | 65.1 |
| >15.0 | 929 (59.7) | 627 (40.3) | 73.8 | 53.5 | 59.8 | 68.6 |
| >10.0 | 1105 (71.0) | 451 (29.0) | 81.9 | 39.2 | 55.8 | 69.8 |
| >5.0 | 1312 (84.3) | 244 (15.7) | 91.5 | 22.4 | 52.5 | 73.8 |

Table 1 Clinical prediction tool scores for each variable for pre-treatment HIV RNA <100,000 copies/mL

| Variable | Score |
|---|-------|
| Age ≤30 years | +3.5 |
| Age >30 years | 0 |
| Body mass index <18.5 kg/m ² | 0 |
| Body mass index 18.5-29.9 kg/m ² | +2.5 |
| Body mass index ≥30 kg/m ² | +14.5 |
| Anemic (Hb <13 g/dL for men, <12g/dL for women) | 0 |
| Non-anemic | +7.0 |
| Hepatitis B surface antigen negative | 0 |
| Hepatitis B surface antigen positive | +5.0 |
| CD4 count ≥200 cells/mm ³ | +17.0 |
| CD4 count 100-199 cells/mm ³ | +5.5 |
| CD4 count <100 cells/mm ³ | 0 |
| No prior AIDS-defining illness | +8.5 |
| Prior AIDS-defining illness | 0 |
| Maximum Score | 55.5 |

Conclusions

- Certain risk factors and models for predicting pre-treatment HIV RNA <100,000 copies/mL might be useful to predict pre-treatment HIV RNA
- A model prediction for pre-treatment HIV RNA <100,000 copies/mL produced an area under the ROC curve of 0.70
- A larger sample size for prediction model development as well as for model validation is warranted