Current CD4 Count, More than Baseline, Predicts Loss to Follow-up from HIV Care

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Introduction

- As interest in **test and treat strategies** increases, the ability to retain patients in care, long-term, is increasingly important
- For such strategies to succeed, we need to be able to identify patients at **high risk for dropping out of care** not just at baseline, but over time
- Our objective was to describe the association between a patient's **current CD4 count and loss to follow-up**

Study Setting

- **Themba Lethu Clinic**
  - Public sector HIV clinic with NGO support located in Johannesburg
  - Dispensing ARVs since 2004
  - Seen more than 30,000 patients
  - Over 12,000 patients currently receiving treatment

Methods

- **Inclusion criteria:**
  - ART naïve adult patients (≥18 years old)
  - Initiated between April 1, 2004 - December 31, 2011
  - Initiation a standard first-line regimen:
    - Stavudine, zidovudine, or tenofovir with either lamivudine or emtricitabine and either nevirapine or efavirenz
- **Exclusion criteria:**
  - Received previous outpatient treatment
  - Never had a CD4 count taken
- Patients followed until they became lost to follow-up
- Censored at death, transfer, or close of dataset (Jan 2013)

Definitions

- **Baseline CD4 count:**
  - 3 months prior to 7 days post ART initiation
- **Current CD4 count:**
  - 6 (+/- 2) month intervals from ART initiation until leaving care or close of the dataset
- **Lost to follow-up:**
  - ≥3 months late for a scheduled visit with no subsequent visit

CD4 Count Monitoring

SA National ART Guidelines	Recommendation for CD4 Monitoring
2004	Baseline then 6 monthly thereafter
2010	Baseline, month 6, 1 year, and then yearly thereafter
2013	Baseline and 1 year on ART

Statistical Methods

- **Compared two models of LTF:**
  - "Standard" Cox proportional hazards model
  - Time-varying Cox proportional hazards model
- **Both unadjusted and adjusted**
  - Adjusted for sex, age at ART initiation, baseline WHO stage, BMI, anemia, and tuberculosis co-infection

Cox Proportional Hazards Models

- Time-to-event (survival) analyses
- "Standard" Cox proportional hazards model
  - Explanatory variables do not change over time
    - Sex, age at ART initiation, baseline clinical characteristics
- Time-varying Cox proportional hazards model
  - Explanatory variable(s) changes over time
    - CD4 count at each medical visit

Results – Patient Characteristics

Variable	Exposure	Lost to Follow-up	Not Lost to Follow-up
Total		4175 (24.7%)	12706 (75.3%)
Sex	Male	1804 (43.2%)	4701 (37.0%)
	Female	2371 (56.8%)	8005 (63.0%)
Age	Median (IQR)	35.4 (30.2 – 42.0)	37.1 (31.8 – 43.8)
Baseline CD4 Count (cells/mm^3)	Median (IQR)	90.0 (32.0 – 161.0)	95.0 (35.0 – 170.0)
WHO Stage	I/II	1923 (46.1%)	6384 (50.2%)
	III/IV	2252 (53.9%)	6322 (49.8%)
BMI	Median (IQR)	20.7 (18.5 – 23.6)	21.8 (19.2 – 25.1)
Hb (g/dL)	Median (IQR)	10.7 (9.1 – 12.3)	10.9 (9.4 – 12.4)

Results
Baseline CD4 Model

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Baseline CD4 (cells/mm^3)		
<50	1.13 (1.01, 1.25)	0.96 (0.85, 1.08)
50-99	0.97 (0.86, 1.09)	0.90 (0.79, 1.03)
100-199	1.00 (0.90, 1.11)	1.02 (0.91, 1.15)
≥200	Reference	Reference

Adjusted for sex, age at ART initiation, baseline WHO stage, BMI, anemia, and tuberculosis co-infection

Results
Current CD4 Count Model

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Current CD4 (cells/mm^3)		
<50	3.10 (2.60, 3.70)	2.72 (2.20, 3.36)
50-99	2.01 (1.66, 2.44)	1.85 (1.48, 2.33)
100-199	1.53 (1.30, 1.81)	1.57 (1.30, 1.90)
≥200	Reference	Reference

Adjusted for sex, age at ART initiation, baseline WHO stage, BMI, anemia, and tuberculosis co-infection

Conclusions

- While baseline CD4 count showed no association with loss to follow-up, having a low current CD4 count is strongly associated with loss
- Ongoing monitoring of CD4 count can help to identify patients at increased risk of dropping out of care

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Current CD4 Count Model with Restricted Cohort (April 2004 – March 2009)

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Current CD4 (cells/mm^3)		
<50	2.38 (1.83, 3.09)	2.15 (1.59, 2.92)
50-99	1.61 (1.22, 2.14)	1.49 (1.08, 2.06)
100-199	1.34 (1.05, 1.71)	1.34 (1.02, 1.77)
≥200	Reference	Reference

Also adjusting for current viral load

	Unadjusted HR (95% CI)	Adjusted HR (95% CI)
Current CD4 (cells/mm^3)		
<50	3.10 (2.60, 3.70)	2.70 (1.85, 3.94)
50-99	2.01 (1.66, 2.44)	1.99 (1.37, 2.88)
100-199	1.53 (1.30, 1.81)	1.47 (1.13, 1.90)
≥200	Reference	Reference