Time to First Hospitalization by CD4 Count among People with HIV in a Large Southeastern Cohort

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BACKGROUND

PWH remain at increased risk of hospitalization, despite advances in HIV treatment.

While CD4 is strongly associated with HIV-related outcomes, its time-varying **relationship with hospitalization risk** remains poorly understood.

We evaluated how **time to first hospitalization** following HIV care initiation **differs by time-varying CD4 count and calendar year of care initiation** in the **University of North Carolina CFAR HIV Clinical Cohort (UCHCC).**

METHODS

Inclusion criteria:

✓ Adult PWH participating in the UCHCC who **established care at the UNC ID clinic from 1996-2023**
- **Care initiation**: ≥2 visits in a 12-month period

Primary outcome:

✓ Time to first **all-cause hospitalization**

✓ Contrast patient characteristics by one-year risk of hospitalization using unadjusted RRs

Statistical analysis:

✓ We used **Aalen-Johansen** estimators to evaluate the **relationship between time-varying CD4** (in 90-day intervals) **and time to first hospitalization**

✓ Patients were censored at the earliest of:
- loss to follow-up (3 years with no HIV care visit), death, or administrative censoring (12/31/2024)

✓ Models were **adjusted** for time-updated age and sex

✓ We assessed **effect measure modification** by calendar period of HIV care initiation (1996-2007; 2008-2017; 2018-2024)

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RESULTS

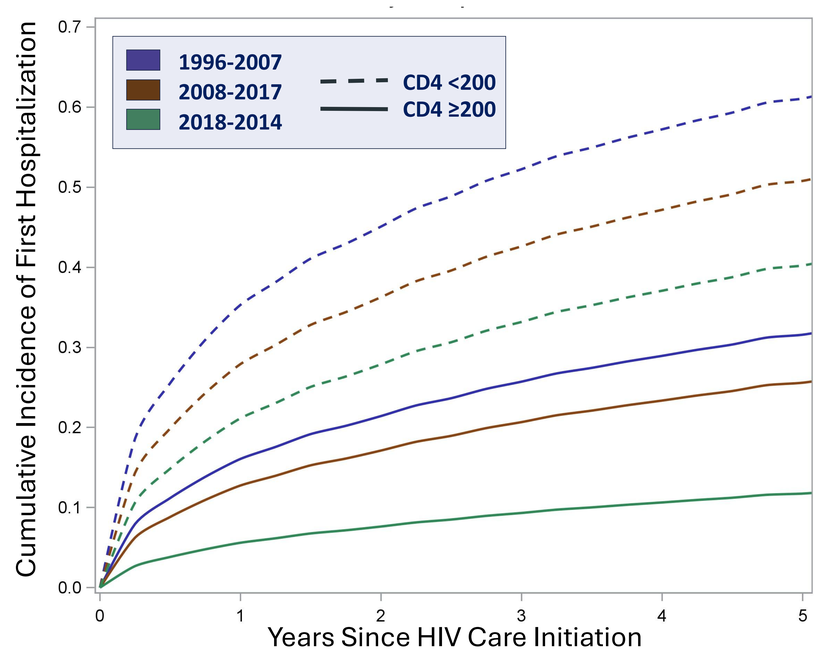
Current CD4 cell count was strongly associated with time to first hospitalization among PWH from 1996-2024.

Table. Clinical and demographic characteristics at UNC HIV care initiation. n=4,769 PWH

		Hospitalized within 1 year		
		Yes n=916 N (%)	**No** n=3,853 N (%)	**RR (95% CI)** unadjusted
Age (years)	18-44	630 (69%)	2747 (71%)	Ref.
	45-64	272 (30%)	1038 (27%)	1.1 (1.0, 1.3)
	65+	14 (2%)	68 (2%)	0.9 (0.6, 1.5)
Sex	Male	637 (70%)	2847 (73%)	Ref.
	Female	279 (30%)	1006 (26%)	1.2 (1.0, 1.3)
Race	White	221 (24%)	1204 (31%)	Ref.
	Black	596 (65%)	2228 (58%)	1.4 (1.2, 1.6)
	Hispanic, any	74 (8%)	249 (6%)	1.5 (1.2, 1.9)
	Other	25 (3%)	172 (4%)	0.8 (0.6, 1.2)
Insured	Yes	550 (60%)	2100 (56%)	Ref.
	No	366 (40%)	1670 (44%)	0.9 (0.8, 1.0)
HIV RNA level copies/uL	<200	199 (22%)	1158 (30%)	Ref.
	≥200	714 (78%)	2674 (70%)	1.4 (1.2, 1.7)
1996-2007, CD4 cells/mm³	<200	329 (41%)	564 (16%)	Ref.
	≥200	206 (26%)	1190 (35%)	0.4 (0.3, 0.5)
2008-2017, CD4 cells/mm³	<200	86 (11%)	200 (6%)	0.8 (0.7, 1.0)
	≥200	140 (18%)	951 (28%)	0.3 (0.3, 0.4)
2018-2024, CD4 cells/mm³	<200	16 (2%)	73 (2%)	0.5 (0.3, 0.8)
	≥200	21 (3%)	460 (13%)	0.1 (0.1, 0.2)

Figure. Cumulative Incidence of Time to First Hospitalization

Stratified by time-updated CD4 and calendar year of HIV care initiation, adjusted for sex and time-updated age



CONCLUSIONS

1. **Nearly one quarter of PWH were hospitalized** within one year of entering care, reflecting substantial early clinical vulnerability often driven by late presentation and advanced immunosuppression at entry.

2. **Current CD4 was a powerful and consistent predictor** of time to first hospitalization across calendar year, underscoring that low CD4 remains a robust marker of short-term clinical risk in the modern ART era.

3. As PWH age and experience greater multimorbidity, **understanding of factors driving hospitalization, including CD4 at entry to care,** will be essential for improving outcomes early in care.