Improving HIV Outcomes among HIV-infected Patients Diagnosed with Cancer and Followed in an Integrated, Multidisciplinary, Infectious Disease/ Cancer Clinic

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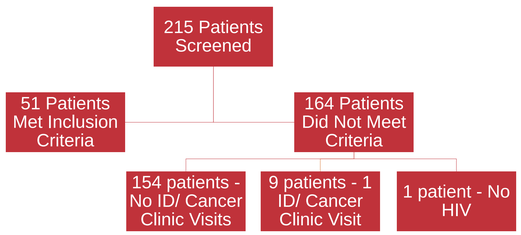
Background

- HIV increases the risk of developing AIDS-defining cancers (ADCs) and non-AIDS-defining cancers (NADCs) and increases mortality rates in cancer patients.[1,2]
- Dually diagnosed patients need to coordinate their treatment schedules with both HIV and cancer specialists. ART adherence is vital because maintaining virologic suppression has been associated with improved cancer outcomes.[3,4,5]
- HIV-infected prison inmates with access to multidisciplinary, subspecialty care via telemedicine had greater virologic suppression and higher CD4 counts.[6]
- Integrated HIV services (HIV specialists, pharmacists, social workers, and psychiatrists) at VA facilities were associated with an increased likelihood of virologic suppression.[7]
- We investigate whether management of HIV-infected patients with cancer in a multidisciplinary infectious disease (ID)/ cancer clinic with ID specialists, oncologists, pharmacists, social workers, and palliative care specialists would result in better virologic suppression and patient outcomes.
- We hypothesized that patients with HIV and cancer who are seen in a multidisciplinary setting will have lower viral loads/ greater virologic suppression and higher CD4 counts.

Methods

Retrospective chart review was performed for HIV-infected patients who were diagnosed with any cancer between January 1, 2012 to December 31, 2016 and followed in the ID/ Cancer clinic established in November 2011. Patients were identified by ICD-9 codes.

Inclusion criteria were:
- ≥ 18 years old
- HIV infection
- Diagnosis of malignancy during the specified study period
- Must be seen at least 2 times in the multidisciplinary ID/ Cancer clinic



Demographics, social histories, comorbidities, cancers (including treatments), opportunistic infections/ adverse events, ID/ Cancer clinic visits, HIV treatment status, ART regimens, and laboratory values (including CD4 counts and viral loads) were collected. Data was compared to historical controls from our site seen between 2007-2011. HIV suppression was defined as HIV-1 RNA of ≤400 copies/mL.

Results

Cohort Characteristics
- The pre- cohort included 548 patients and the post- cohort included 51 patients.
- Patients seen in the pre- cohort had a higher median age, greater proportion of African Americans, fewer Caucasians, and higher frequency of hepatitis C co-infection compared to the post- cohort.
- The post- cohort had a greater proportion of patients with stage IV disease compared to the pre- cohort.
- In both cohorts, less than half were on HIV therapy at the time of cancer diagnosis.

CD4 Count and Viral Load/ Virologic Suppression
- The post- cohort generally had a lower baseline mean CD4 count at cancer diagnosis and higher baseline median HIV viral load (not statistically significant), although viral suppression at cancer diagnosis was similar when compared to the pre- cohort.
- At study end, a greater percentage of patients in the post- cohort achieved viral suppression compared to the pre- cohort (p=0.09).
- Patients followed in the integrated clinic (post- cohort) were **1.41 (95% CI, 0.91, 3.53) times more likely** to be virally suppressed at end of follow up vs. patients from the pre- cohort.

Follow-Up Visits
- Average time in days between visits following initial cancer diagnosis was 81 (95% CI 75, 86) among pre- cohort patients compared to 51 (95% CI 35, 66) among post- cohort patients (p=0.0004).
- Post- cohort had greater 1- and 2- year follow up compared to the pre–cohort.

Figure 1: Engagement in Care

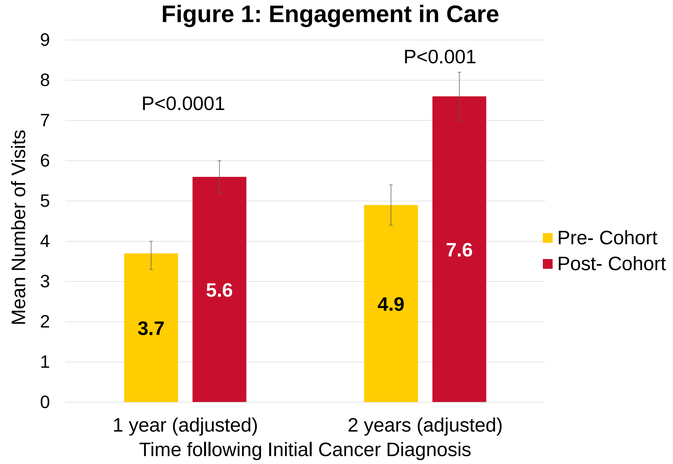


Table 1: Baseline characteristics of HIV-infected patients with cancer by clinic status

Characteristic	Pre- cohort	Post- cohort	p-value
Age at cancer diagnosis (years), median (IQR)	51 (43 – 57)	46 (36 - 53)	<0.01*
Sex, n (%)			0.38†
Male	428 (78)	37 (72)	
Female	120 (22)	14 (27)	
Race, n (%)			0.02‡
African American	473 (86)	37 (73)	
White	70 (13)	14 (27)	
Hispanic	5 (1)	0 (0)	
Transmission, n (%)			0.09‡
Intravenous Drug Use	214 (39)	13 (26)	
Heterosexual	185 (34)	17 (33)	
Men who have sex with men	105 (19)	18 (35)	
Transfusion	3 (1)	0 (0)	
Unknown	41 (7)	3 (6)	
Smoking, n (%)			0.12‡
No	100 (18)	15 (29)	
Yes	445 (81)	36 (71)	
Unknown	3 (1)	0 (0)	
Hepatitis B, n (%)			0.41‡
No	503 (92)	49 (96)	
Yes	45 (8)	2 (4)	
Hepatitis C, n (%)			0.01†
No	308 (56)	38 (75)	
Yes	240 (44)	13 (25)	
Cancer stage at diagnosis, n (%)			<0.0001†
1	83 (15)	4 (8)	
2	68 (12)	5 (10)	
3	82 (15)	4 (8)	
4	176 (32)	27 (53)	
Not Applicable	51 (9)	7 (14)	
Unknown	88 (16)	4 (8)	
HIV treatment status at cancer diagnosis, n (%)			0.91†
Yes	239 (42)	22 (43)	
No	326 (58)	29 (57)	

*Wilcoxon rank sum test
†Chi-square test
‡Fisher's exact test

Table 2: CD4 cell counts of HIV-infected patients with cancer at baseline and end of follow up by clinic status

	Pre- Cohort		Post- Cohort		Wilcoxon rank sum p-value
	Median	IQR	Median	IQR	
Baseline CD4	274	120 - 462	171	70 - 310	0.20
End of study	238	96 - 464	250	129 - 382	0.63

Table 3: Viral loads of HIV-infected patients with cancer at baseline and end of follow up by clinic status

	Pre- Cohort			Post- Cohort			P-value
	Median	IQR	Suppression (%)	Median	IQR	Suppression (%)	
Baseline viral load	1,985	0 - 69,364	42%	16,802	83 - 84,215	40%	0.65
End of study	48	0 - 5,880	63%	0	0 - 403	**75%**	0.09

Discussion

- HIV-infected patients with cancer in the post- cohort were younger (46 vs 51, p<0.01), had lower rates of hepatitis C co-infection (25% vs 44%, p=0.01), and had more advanced stage 4 cancer (53% vs 32%, p <0.0001) compared to the pre- cohort.
- Patients dually diagnosed with HIV and cancer in the post- cohort typically presented with a higher baseline viral load at the time of cancer diagnosis but were **1.41 times more likely to be virologically suppressed at the end of follow-up compared to the pre- cohort.**
- Post- cohort patients at baseline had a lower CD4 count (171) which increased to 250 at study end vs. the pre- cohort where the median CD4 count decreased from 274 at baseline to 238 at study end.
- Patients seen in the post- cohort had fewer days between their first follow up visit (51) versus 81 in the pre- cohort (p=0.0004). Average number of 1- and 2-year follow-up visits were both significantly higher in the post-cohort (5.6 and 7.6 respectively) compared to the pre- cohort (3.7 and 4.9; p <0.0001 and p<0.001 respectively). Improvement in outcomes may be partially attributed to closer follow up with providers who were able to address a wide variety of patient needs during their visit with the ID physician.
- Integrating HIV care into Cancer Centers may improve treatment outcomes as it pertains to virologic suppression and CD4 counts.
- Further research is required to investigate the impact of multidisciplinary care on other endpoints (e.g. ART adherence, adverse events, opportunistic infections) to fully elucidate the benefits of a holistic approach to care for this unique population of patients.

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