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Prognostic Value of the VACS Index for Mortality in British Columbia, Canada

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BACKGROUND

- The Drug Treatment Program (DTP) at the BC Centre for Excellence in HIV/AIDS has been providing antiretroviral therapy (ART) free of charge to individuals living with HIV in British Columbia, Canada, since 1992. The HAART Observational Medical Evaluation and Research (HOMER) cohort is a prospective study of a subset of DTP participants initiating HAART regimens since 1996.

- The Veterans Aging Cohort Study (VACS) index[1,2], comprising routine measures of organ system injury alongside HIV indicators, more accurately predicts mortality compared to an index restricted to HIV markers alone[3].

- Evaluation of the VACS index within the Canadian context is necessary to validate its generalizability to Canadian patients.

- We aim to evaluate the prognostic value of the VACS index after 1 year of combination ART for mortality during follow-up compared to an HIV-restrictive index, overall and among subsets of patients reflecting this region's epidemic.

- We hypothesize the VACS index will remain more discriminative than the restrictive index, and that there may be differences in its predictive accuracy between subgroups of patients.

METHODS

- Participants from the HOMER study were included. Eligibility criteria included having values for all VACS index data elements after 1 year on combination ART.

- Previously established weights and cut-offs[2] were used to calculate VACS (age, CD4 count, HIV viral load, hemoglobin, FIB-4 [incorporates AST, ALT, platelets, age], eGFR, and HCV co-infection) and restricted (age, CD4 count, and viral load) index scores (**Table 1**).

- Cox regression models and C-statistics, along with net reclassification improvement (NRI) were used to test discrimination of the VACS vs. restricted index for all-cause mortality during follow-up[3].

Table 1. Established VACS and restricted index weights and cut-offs[2]

Component	Level	Points Assigned	
		Restricted Index	VACS Index
Age (years)	< 50	0	0
	50 to 64	23	12
	≥ 65	44	27
CD4 count (cells/mm³)	≥ 500	0	0
	350 to 499	10	6
	200 to 349	10	6
	100 to 199	19	10
	50 to 99	40	28
	< 50	46	29
Viral load (copies/mL)	< 500	0	0
	500 to 1x10⁵	11	7
	≥ 1x10⁵	25	14
Hemoglobin (g/dL)	≥ 14	-	0
	12 to 13.9	-	10
	10 to 11.9	-	22
	< 10	-	38
FIB-4	< 1.45	-	0
	1.45 to 3.25	-	6
	> 3.25	-	25
eGFR (mL/min)	≥ 60	-	0
	45 to 59.9	-	6
	30 to 44.9	-	8
	< 30	-	26
Hepatitis C co-infection	Yes	-	5
	No	-	0

RESULTS

- Of 1228 eligible participants, the median baseline age was 41 years (IQR 34-47), 10% (n=122) were women, and 24% (n=293) had hepatitis C co-infection (**Table 2**).

- In the median follow-up time of 6 years (IQR 3-10), a total of 140 (11%) deaths were reported (**Figure 1**).

- After 1 year of ART, the median (IQR) VACS and restricted index scores were 36 (32-44) and 10 (10-23), respectively (**Table 3**).

- Overall, compared to the restricted index, the VACS index showed greater discrimination for mortality (C-statistic 0.67 vs. 0.64, NRI=26%, p<0.001) (**Table 4**).

- The VACS index also demonstrated greater discrimination of mortality among individuals with injection drug use history (n=376) (C-statistic 0.67 vs. 0.61, NRI=29%, p<0.001), and among persons of Aboriginal ancestry (n=105) (C-statistic 0.71 vs. 0.65, NRI=22%, p<0.001) (**Table 4**).

Table 2. Baseline demographic and clinical characteristics (n=1228)

Variable	n	IQR / %
Age	41	34-47
Female	122	10%
IDU history	376	31%
ADI at baseline	178	15%
Aboriginal ancestry	105	9%
MSM	504	41%
HCV co-infection	293	24%
Follow-up time (years)	6	3-10

Note: IDU, *injection drug use*; ADI, *AIDS-defining illness*; MSM, *men who have sex with men*; HCV, *hepatitis C*

Figure 1. Predicted mortality during follow-up by VACS index scores after 1 year of combination ART
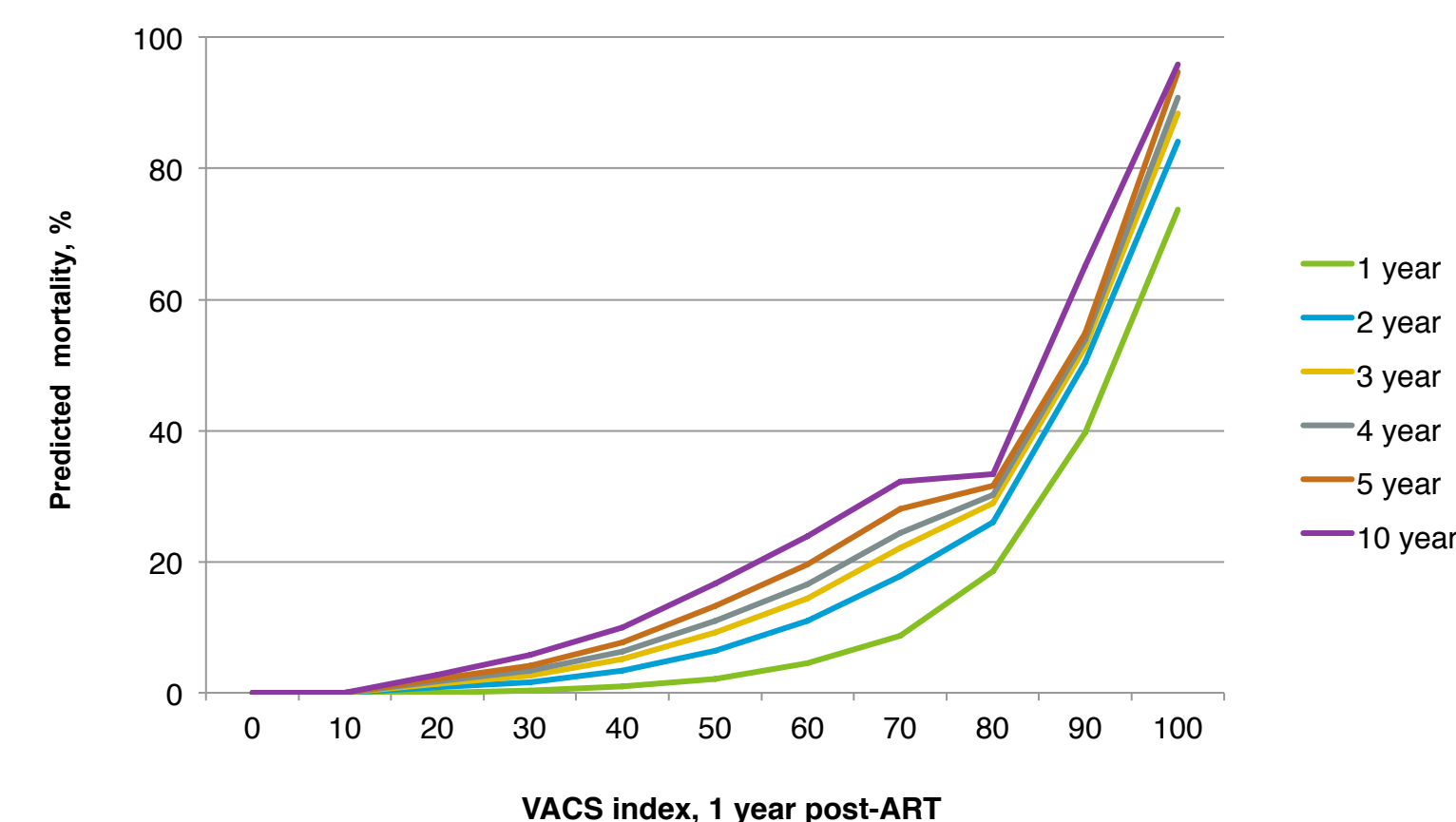

Table 3. VACS and restricted index scores at baseline and after 1 year of combination ART

	Baseline (median, IQR)	1 year (median, IQR)	Baseline (mean, SD)	1 year (mean, SD)
VACS	50 (43-66)	36 (32-44)	54 (15)	40 (14)
Restricted	35 (21-57)	10 (10-23)	41 (20)	18 (17)

Table 4. Discrimination of VACS vs. restricted index for all-cause mortality

	n	C-statistic (VACS)	C-statistic (restricted)	NRI	p-value
Overall	1228	0.67	0.64	26%	<0.001
Aboriginal ancestry	105	0.71	0.65	22%	<0.001
IDU history	376	0.67	0.61	29%	<0.001

Note: NRI, *net reclassification improvement*; IDU, *injection drug use*

CONCLUSIONS

- The VACS index is a better predictor of mortality compared to HIV markers alone within this British Columbian cohort; however, its discrimination varies within certain socio-demographic groups.

- The VACS index may prove a valuable prognostic tool, but practical use is limited by lack of collected data. The routine collection of all clinical and laboratory components used to calculate the VACS index is recommended as part of HIV management programs.

Acknowledgements

References

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