Prevalence and Predictors of Viral Suppression among People Living with HIV in British Columbia, Canada: Findings from the SHAPE Study

A. Bever[1], K. Salters[1], T. McLinden[1], C. Wang[1], N. Bacani[1], J. Barath[1], P. Sereda[1], L. Ti[1,2], S. Parashar[1,3], C. Olatunbosun[4], G. McGowan[5], R. Hogg[1,3], R. Barrios[1]

1. BC Centre for Excellence in HIV/AIDS, Vancouver, Canada; 2. University of British Columbia, Vancouver, Canada; 3. Simon Fraser University, Burnaby, Canada; 4. St. Paul's Ambulatory Pharmacy, Vancouver, Canada; 5. Ministry of Health, Victoria, Canada

Background

- Antiretroviral therapy (ART) is free for people living with HIV (PLWH) in the province of British Columbia (BC), Canada.
- Despite universal ART and progress made by the **Seek and Treat for Optimal Prevention of HIV/AIDS (STOP HIV/AIDS)** program, which aims to improve access to HIV testing, treatment and supportive care in BC, inequities in ART uptake and therapeutic outcomes exist.
- The **STOP HIV/AIDS Program Evaluation (SHAPE)** study was initiated in 2016 to evaluate progress of the STOP HIV/AIDS program.
- Socio-structural determinants of progression along the HIV cascade of care are monitored to provide information for addressing health disparities and barriers to care.
- Viral load suppression (VLS) is the final clinical marker in the HIV cascade of care and an important indicator of treatment success.

Objective: This analysis examines prevalence and predictors of VLS to help identify and respond to gaps in care among PLWH in BC.

Methods

- The SHAPE study is a longitudinal cohort of PLWH who reside in BC, aged ≥19 that aims to recruit 810 individuals from January 2016 to August 2018.
- Participants will complete 3 surveys over 36 months in order to gain insight into their HIV care experiences, with clinical follow-up ongoing.
- Purposive sampling is used to build a cohort that is inclusive of key socio-demographic and clinical characteristics of PLWH in BC, including: gender, age, ethnicity, income, geography, HIV risk type, and Hepatitis C co-infection.
- VLS (outcome) was defined as viral load <50 copies/mL based on 2 or more consecutive viral load measurements spanning ≥ 3 months.
- Univariable and multivariable regression models were used to quantify the association between key explanatory variables and VLS.
- Cox proportional hazards regression quantified the effect of selected variables on time from ART initiation to VLS.

Results

- 503 participants completed a baseline survey as of August 2 2017 (**Table 1**), of whom 477 met the inclusion criteria (≥ 3 months of viral load data available) and 408 (85.5%) achieved VLS.
- In multivariable regression analyses, being older (vs. <40 years) was associated with VLS. Participants who were homeless or who self-identified with HIV transmission groups other than men who have sex men (MSM) only were less likely to achieve VLS (**Table 2**).
- Multivariable Cox proportional hazards modeling of time to VLS confirmed the importance of age and HIV risk type as predictors of VLS (**Table 3**).
- Differences in time to VLS by key social indicators were not significant (**Figures 1 & 2**).

Table 1: Participant characteristics at time of enrollment

Variable	% (n=503)
50 years or older	51.5%
Indigenous ancestry	19.8%
HCV co-infection	30.6%
HIV risk:	
MSM	55.5%
IDU	18.7%
Both MSM and IDU	5.8%
Neither MSM nor IDU	20.0%
Female	22.1%
Born in Canada	85.1%
High school education or lower	51.3%
Annual income:	
0 to 14999	43.9%
History of incarceration	33.2%
Currently homeless	3.6%
Mental illness diagnosis ever	64.6%

Table 2: Multivariable logistic regression, n=477

Variable	aOR (95% CI)
Age at interview	
Less than 40	Ref
40 to 49	2.11 (1.03, 4.31)
50 or more	2.45 (1.27, 4.72)
Type of HIV risk:	
MSM only	Ref
IDU only	0.24 (0.12, 0.47)
Both MSM and IDU	0.24 (0.09, 0.64)
Neither MSM nor IDU	0.49 (0.23, 1.02)
History of homelessness	
No	Ref
Currently homeless	0.21 (0.07, 0.62)
Prior homeless (last 12 months)	0.65 (0.30, 1.40)

Figure 1: Time to VLS by gender

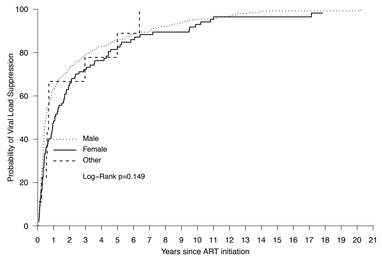

Figure 2: Time to VLS by Indigenous ancestry

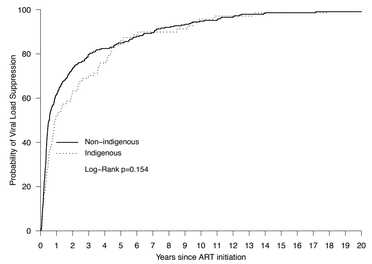

Table 3: Multivariable Cox proportional hazards model, n=421*

Variable	aHR (95% CI)
Type of HIV risk:	
MSM only	Ref
IDU only	0.84 (0.64, 1.08)
Both MSM and IDU	0.78 (0.51, 1.20)
Neither MSM nor IDU	0.66 (0.51, 0.86)
3rd ingredient in ARV regimen	
Protease Inhibitor	Ref
Nonnucleotide Reverse-Transcriptase Inhibitor	1.71 (1.35, 2.15)
Integrase Inhibitor	1.37 (0.94, 1.99)
Other/Unknown	0.48 (0.35, 0.66)
Age at ART initiation	
Per 10 year increase	1.30 (1.16, 1.44)

*This sub-analysis was limited to participants who had ≥ 1 year of follow-up since initiating ART and who were ART-naïve at time of initiation

Discussion & Conclusions

- There are high levels of VLS in the SHAPE cohort, and among participants who achieved VLS, median time to VLS was 0.57 years (Q1-Q3: 0.27, 2.29).
- The non-significant effects of known sociodemographic predictors of VLS (e.g., ethnicity and gender) may be due to sample size.
- While there are notable system level successes in BC's HIV response, high levels of VLS in this study may partially reflect challenges in recruiting individuals who are not currently engaged in care.
- Future studies should examine other prevalent risk factors for VLS and seek to identify optimal strategies for delivering services to vulnerable groups who are less likely to achieve VLS, or who are more likely to experience delays in achieving VLS, despite a context of universal ART coverage.
- In conclusion, our study corroborates previous research on predictors of VLS[1-6], and suggests that addressing health inequities related to age, injection drug use and housing stability may necessitate targeted supports.

References: 1) Cescon 2010, *HIV Med* 12:6 **2)** Knowlton 2006, *JAIDS* 41:4 **3)** Milloy 2012, *AIDS Patient Care STDS* 26:1 **4)** Mujugira 2016, *AIDS Res. Hum. Retrovir* 32:2 **5)** Muthulingam 2013, *JAIDS* 63:1 **6)** Tanner 2016, *BMC Infect Dis.* 16:590

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