Human papillomavirus (HPV) is the primary cause of cervical, anal, and other genital cancers, which are preventable through screening and early treatment. Cervical cancer is a major public health problem, with profound individual impacts in terms of life expectancy and quality of life, as well as societal impacts in terms of economic burden1-4. In Canada, an estimated 1,550 women will be diagnosed with cervical cancer in 2017, and 400 will die from it. In Ontario, Canada’s most populous and diverse province, 630 women are diagnosed annually with cervical cancer, and 150 die from it5. The mean overall health care cost per patient during the first five years after being diagnosed with cervical cancer is projected to be about $68,7454 in Ontario. This does not include the cost associated with loss of economic productivity and family life disruption related to emotional and psychological stress.

Cervical cancer deaths and associated health care and social costs can be avoided through appropriate screening. Currently, screening is performed via the Pap test (cytological examination of the peeled cells from the cervix), which requires a visit to a doctor’s office. This approach has shown effectiveness for early identification and removal of precancerous abnormalities6 and has been considered as the primary reason for the observed reduction in cervical cancer incidence and mortality in high-income countries like Canada2,3,6-8. The most current cervical cancer screening guidelines recommend that women be screened by Papanicolaou (Pap) tests at least once every three years starting at 21 years of age if sexually active and discontinuing at age 702. For HIV-positive women, recommendation includes receiving screening at the initial assessment and at six months, with an annual follow-up for women with normal results. Despite these clear screening guidelines and a universal health care system, screening participation has remained lower than desired over the past two decades in Ontario, holding steady at 60% to 65% since 20033.

Under/never utilization of cancer screening has been reported to be more predominant among certain vulnerable women, such as immigrants and women of low income, those belonging to visible minority groups, women living with HIV (WLHV) and those with disability9-23. Low levels of screening among these hard-to-reach women have been related to individual-level barriers such as cultural barriers (e.g., modesty, language), lack of knowledge about cervical cancer risk factors and preventive measures, not knowing where to go for the test, and transportation difficulties; physician-level barriers, such as lack of a family physician, lack of physician recommendation, or having a male provider; and system-level barriers, such as inconvenient clinic hours and indirect costs associated with screening (e.g., for childcare, taking time off work)10-15,17-27. Two Canadian retrospective population-based studies in Ontario showed that cancer screening was low among WLHV. Close to half of the HIV-positive women had not received cervical screening, even though more than 80% of these women were connected to health care26. The lowest testing rates were among women receiving exclusively HIV specialist care (33.7%) and women with low engagement with health care (18.95%)26,27.

The persistence of these disparities over decades suggests that innovative methods are urgently needed to overcome these barriers and promote screening uptake among hard-to-reach women.

Since empirical evidence clearly shows HPV is the cause of all cases of cervical cancer and HIV and HPV co-infections promote vulnerability to cervical cancer, HPV DNA testing is viewed as a promising primary screening approach for cervical cancer. Several international and Canadian studies have compared the effectiveness of this method of screening with that of cervical cytology and found greater sensitivity and slightly lower specificity in detecting high-grade precancerous lesions28-33. These results are consistent with other randomized controlled studies conducted in Europe29,31-33, as well as recent meta-analyses of both randomized and non-randomized trials34-35, which showed a much better performance than cytology-based screening for detection of high-grade cervical cancer among women aged 30 years and more. Human papillomavirus infection has been found to be more prevalent and transient among younger women (i.e., under 30 years old) than older women36. Human papillomavirus DNA testing has been found to allow for longer screening intervals (i.e., every 5 years). Studies found lower risk of high-grade pre-cancerous lesions following a negative HPV result compared with a negative cytology result and suggested that screening women every five years with HPV DNA testing is as safe as screening with cytology every three years37,38. Furthermore, HPV DNA testing is an automated and objective procedure to detect HPV and less...
prone to human error in collection and interpretation of the specimen.\textsuperscript{8,34}

Self-sampling for \textit{hpv} is an innovative technique that empowers women by allowing them to collect their own specimen in private, at a time and place of their choosing and when and where they are comfortable. It has the potential to overcome many of the identified barriers in accessing Pap tests for under-served women. Although much of the existing literature on \textit{hpv} self-sampling comes from Europe\textsuperscript{40-52}, a few Canadian studies are available\textsuperscript{53-62} with an even smaller number involving trialing of self-sampling\textsuperscript{4,60-62}. The literature provides solid evidence of the validity of \textit{hpv} self-sampling compared with clinician-collected cervical samples\textsuperscript{8,43-45}, as well as of women’s high acceptance of self-sampling and their positive attitudes towards it.

It is interesting that despite the ample evidence about the effectiveness, feasibility, and acceptability of \textit{hpv} self-sampling, both in Canada and internationally, this approach has not yet been incorporated into any of the Canadian screening guidelines. Offering this approach as a screening alternative for under-screened groups could lead to increased participation, and a resultant reduction in cancer screening inequalities, and could transform the cervical cancer screening paradigm in Canada.

We held a one-day symposium as a medium for knowledge exchange and discussion around barriers and facilitators for the adoption of \textit{hpv}, particularly self-sampling, as a primary screening option into provincial screening programs (see Figures 1 to 3). We invited national and international leaders in primary care with a focus on cancer screening, as well as service providers and policy/decision makers. Approximately 60 people from across the country attended the symposium in person or by webinar. The idea of developing a special issue on \textit{hpv} self-sampling to provide a concrete and comprehensive overview of this method of screening was originated from discussions at this symposium. This special issue includes a number of research, review and commentary papers that present and transfer key knowledge on the utility of \textit{hpv} self-sampling as a primary method of cancer screening among underserved and at-risk populations.

The two scoping reviews by Wong and colleagues and Poon and colleagues on the knowledge of \textit{hiv-hpv} co-infections and \textit{hpv}-related cancer screening among people living with \textit{hiv} (\textit{plhiv}) show, in addition to lack of Canadian research on these topics, low and suboptimal rates of screening of \textit{hpv} and related cancers among \textit{plhiv}. The factors identified include low awareness of increased cancer risks with \textit{hiv-hpv} co-infection; lack of knowledge about \textit{hpv}-related cancer prevention and screening strategies; and inadequate \textit{plhiv}-service provider communication about these topics. These reviews demonstrate that although research attention has turned to \textit{hiv} Pre-Exposure Prophylaxis (PrEP) and treatment as prevention, which are important prevention strategies, they do not address syndemic challenges such as \textit{hiv-hpv} co-infection and \textit{hpv}-related cancer disparities among \textit{plhiv}. These reviews affirm that \textit{hpv} self-sampling is an acceptable and promising screening option for \textit{plhiv}.

The paper by Wood and colleagues uses qualitative methods involving interviews with Canadian and international key informants on barriers and facilitators for inclusion of \textit{hpv} self-sampling in screening guidelines.
FIGURE 2  HPV self-sampling Symposium, Toronto, Ontario, 14 October 2016.

FIGURE 3  HPV self-sampling Symposium, Toronto, Ontario, 14 October 2016.
The study showed that, although there was consensus on important action points such as a need for provincial programs to shift to HPV primary screening, there was disagreement on whether self-sampling evidence was appropriate for implementation. There was little consensus between respondents on whether the state of evidence was satisfactory to integrate a self-sampling option into policy, or whether more Canadian research was needed. The findings from this research suggest that political priorities and system barriers may be important challenges to implementing tailored screening, like self-sampling, to reach marginalized women.

The papers by Saville and colleagues and McLachlan and colleagues use quantitative methods to examine acceptability of HPV self-collection and factors that promote uptake among never-screened/under-screened women who refused conventional cervical screening in the context of alternative pathways of the Australian Renewed National Cervical Screening Program (ncsp). These studies showed high acceptability of HPV self-collection and found similar rates of squamous abnormality and oncogenic HPV positivity for the women who undertook the self-collection pathway compared with those reported in the literature. Furthermore, clear explanations on HPV self-collection procedure and development of a trusting relationship with primary care providers are critical to the successful completion of the self-collection pathway.

The paper by Pedersen and colleagues provides a commentary about the challenges and considerations for implementing HPV self-sampling for under-screened women in high-income settings. The paper provides a general overview of the "paradigm shift towards HPV screening globally" and then gives a comprehensive overview of the implications to the health care system and important issues to be considered for its implementation, such as human resources, record keeping, recall, invitation, follow-up, and education.

Finally, the commentary by Franco clearly demonstrates the need for HPV testing to become the paradigm in cervical cancer screening, and this cannot be done without the move towards self-sampling, which allows screening coverage for the most vulnerable segments of the population.

The body of work contained in this special issue serves to provide a comprehensive picture of available evidence to influence the place that HPV primary screening, particularly HPV self-collection could have in the Canadian health care environment.

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