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Exploring the role of the oncology nurse in cervical cancer screening programs during times of transition

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ABSTRACT

Cervical cancer remains the fourth most prevalent cancer among women worldwide, with approximately 660,000 new diagnoses and 350,000 deaths recorded in 2022. Countries with well-established preventative measures have experienced significant reductions in cervical cancer rates through vaccination and regular screening. In Canada, recent efforts have emphasized the adoption of primary HPV-DNA testing as a primary screening tool in cervical cancer screening programs, replacing the cytology (pap) testing. The COVID-19 pandemic had disrupted these initiatives, posing challenges to screening and vaccination programs. Despite these setbacks, ongoing recovery strategies are underway to mitigate the pandemic's adverse effects. Several challenges regarding this shift also have been identified by countries that have transitioned their respective screening programs to primary HPV-DNA testing. Understanding these unique challenges will be essential for developing strategies to address barriers, such as implementing new technologies, training healthcare providers, and ensuring equitable access to screening. This review seeks to (1) examine the evolution of HPV testing and the transition from cervical cytology (Pap smear) to HPV testing as the primary screening method; (2) assess the long-term impacts of the COVID-19 pandemic on screening, prevention, and HPV vaccination within the Canadian healthcare system; and (3) explore the pivotal role of oncology nurses in advancing education, advocacy, and leadership in cancer prevention.

INTRODUCTION

Cervical cancer is a significant global health challenge, ranking as the fourth most common cancer among women worldwide (World Health Organization [WHO], 2024). In 2022, 660,000 new cases of cervical cancer were identified globally with nearly 350,000 deaths (WHO, 2024). Countries with an emphasis on preventative care have seen declines in cervical cancer rates due to effective screening techniques, such as cytology (Pap) testing and primary human papillomavirus (HPV) testing (WHO, 2024). In 2018, the WHO launched a global call for action to eliminate cervical cancer worldwide (WHO, 2018). This led many countries to develop strategic action plans to eliminate cervical cancer, such as the Canadian Partnership Against Cancer's action plan to eliminate cervical cancer in Canada by 2040 (Canadian Partnership Against Cancer [CPAC], 2023). These strategic plans focused on integrating HPV testing into current cervical screening programs and increasing HPV vaccination uptake. Despite advances in HPV vaccines and screening programs, disparities remain globally predominantly in low- and middle-income countries (LMICs) due to limited access to preventive care (Bray et al., 2018). It is well-established that screening for HPV is crucial for early detection and prevention of cervical cancer, significantly reducing mortality, by identifying precancerous changes before they develop into invasive cancers (WHO, 2024).

The COVID-19 pandemic has undeniably caused significant disruptions in primary prevention and cervical screening programs worldwide. As a result of the pandemic, there were significant decreases in cancer screenings, cancellations of school-based screening programs for human papillomavirus (HPV) vaccinations, and interruptions to colposcopy and cancer treatments (Meggetto et al., 2021). The impact of this disruption is currently unknown. However, there is renewed vigor to offset the impacts of these restrictions in the post-COVID-19 recovery era, as many countries transition to primary HPV testing in their cervical screening guidelines and programs and have set targets for HPV vaccination uptake.

Several challenges have been identified by countries that have transitioned their respective screening programs to primary HPV-DNA testing (Delpero & Selk, 2022). Understanding these challenges is essential for developing strategies to address barriers, such as implementing new technologies, training healthcare providers, and ensuring equitable access to screening. This knowledge will guide the creation of more effective and inclusive cervical cancer screening programs, especially in regions where resources are limited.

Nurses, especially oncology nurses, will play a critical role, as educators and advocates of evidence-informed healthcare. Nurses are instrumental in facilitating the acceptance and understanding of updated cervical screening guidelines and vaccine practices among patients and their families (Cappiello & Boardman, 2018; Constable et al., 2022; Dike et al., 2023). The aim of this review paper is to discuss 1) HPV testing and the recommended transition from cervical cytology (Pap test) to high-risk human papillomavirus (hrHPV)-DNA testing (HPV testing) as a primary screening test in cervical screening programs; 2) the implications of the COVID-19 pandemic on HPV screening and prevention; 3) the HPV vaccine; and,

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finally, 4) the role of oncology nurses in education, advocacy, and leadership in addressing the current cancer prevention healthcare needs in this challenging and changing environment.

BACKGROUND

HPV has been identified as the main causal agent of cervical cancer (International Agency for Research on Cancer Working Group on the Evaluation of Cancer-Preventative Strategies [IARC Working Group Strategies], 2005). HPV is a member of the *Papillomaviridae* family, which is one of the most common sexually transmitted diseases worldwide (IARC Working Group Strategies, 2005). While more than 200 types of human papillomaviruses (HPVs) have been identified, only about 40 of them are associated with the genital tract (National Cancer Institute [NCI], 2019). These include subtypes of HPV that are based on their association with cancer; "low-risk" or "high-risk" (IARC Working Group Strategies, 2005). Approximately 75% of sexually active adults will contract HPV at some point (Government of Canada, 2024). The majority of these individuals (75%–90%) will eventually clear this infection naturally on their own (Kombe Kombe et al., 2021). Those individuals who do not clear the infection and continue to have a persistent HPV ("high-risk") infection (which is a molecular precursor to cervical cancer) are the true high-risk group for cervical cancer (de Martel et al., 2017; Radley et al., 2016; WHO, 2024).

While new HPV infections occur most commonly in adolescents and young adults (Meites et al., 2019), cervical cancer is most often diagnosed in individuals with a cervix between the ages of 35–44 years (International Agency for Research on Cancer Working Group on the Evaluation of Cancer-Preventative Interventions [IARC Working Group Interventions], 2022; American Cancer Society, 2023). The diagnosis is often preceded by pre-invasive changes caused by persistent high-risk HPV (IARC Working Group Interventions, 2022; WHO, 2024). The disease trajectory of HPV and the subsequent development of cervical cancer offers a unique opportunity for prevention prior to a cancer diagnosis by identifying HPV through routine screening and primary prevention (HPV vaccination). There is potential to reduce the overall burden of cervical cancer (de Martel et al., 2017).

SCREENING

Within Canada, each province or territory is responsible for the delivery and administration of healthcare services, including screening for cancer. In Canada alone, more than 14 guidelines address cervical cancer screening (Delpero & Selk 2022). Therefore, navigating the recommendations for cervical screening can be overwhelming for primary care providers (Gates et al., 2021). Additionally, while recommendations currently vary across jurisdictions, it is anticipated that national and international screening guidelines will recommend primary HPV testing for high-risk types in cervical screening programs' place of or in conjunction with cytology (pap testing) (WHO, 2021). Primary HPV testing offers greater sensitivity for detecting precancerous changes in the cervix compared to traditional Pap testing (Wright et al., 2021).

Similar to the Pap test, HPV testing involves collecting a sample of cervical cells using a swab or brush during a pelvic examination (Feldman et al., 2024). However, HPV tests are analyzed using automated methods, typically polymerase chain reaction (PCR), to detect high-risk HPV DNA. This objective testing approach removes the subjective visual assessment of the cells under the microscope required in cytology (Alliance for Cervical Cancer Prevention, 2002). By directly identifying HPV types associated with cervical cancer, HPV testing allows for a more accurate evaluation of cancer risk and generally enables longer screening intervals, typically every five years (Arbyn et al., 2021). In contrast, Pap testing involves collecting cervical cells, which are then examined microscopically by a cytopathologist for any abnormal changes that could indicate precancerous conditions or cancer (Koliopoulous, 2017a). This method focuses on detecting cell abnormalities rather than directly identifying the presence of HPV. Additionally, Pap tests can be subject to human error and typically require more frequent screening—generally every three years—to ensure timely detection of any issues (Arbyn, 2010). The transition to primary HPV screening will, therefore, have implications on both infrastructure and healthcare resources (Bains et al., 2019) while having the potential to reduce quality assurance errors (Grimes et al., 2021).

Sensitivity and specificity

In the case of HPV, a positive screening result can have both psychosocial consequences, such as increased anxiety, as well as system-level implications, such as increased interventions and additional confirmatory tests (McBride et al., 2019). The ***sensitivity*** of a test lies in its ability to identify those with a condition or a disease correctly, often referred to as a "true positive" result (Trevethan, 2017). Regarding primary HPV testing, this means that of 1,000 individuals who undergo cervical screening, 20 will been shown to have a precancerous lesion (cervical epithelial neoplasia) with primary HPV testing correctly identifying 18 of these individuals with precancerous changes (Koliopoulous et al., 2017b). In the same scenario, the cytology (Pap) test will identify 15 of these individuals with precancerous changes (Koliopoulous et al., 2017b). In comparison to HPV testing, Pap testing is less sensitive in detecting the necessary precursor to cervical cancer (Ogilvie et al., 2018). It is crucial that future messaging to the general question emphasizes that Pap testing is less likely to correctly identify women with precancerous changes than primary HPV testing (Ogilvie et al., 2018).

The ability to detect "correct negative" cases is also an important characteristic of medical screening, referred to as the ***specificity*** of a test. In the case of the HPV test, specificity measures the percentage of healthy people who are correctly identified as not having the condition (Trevethen, 2017). This means that when a primary HPV test comes back negative, it is very unlikely that a person will develop a precancerous change, such as cervical intraepithelial neoplasia (CIN) 3 (a severe type of abnormal cellular change), or cancer in the near future. Evidence supports that it can take longer than 10 years to develop cervical cancer after contracting the HPV virus

(Kim et al., 2018; Popadiuk et al., 2016; US Preventive Services Task Force, 2018; Koliopoulous et al., 2017a), suggesting that the frequency of CIN 3 or cancer following a negative primary HPV test within 10 years is small. While it is **not** expected that Canadian guidelines will extend the testing interval to 10 years, primary HPV testing can safely be extended for up to five-year testing intervals for those with a cervix between the ages of 30–65 years (National Cancer Institute, 2024; Dijkstra et al., 2016; Ronco et al., 2014). To date, the Netherlands, Finland, Sweden, Italy, and regions in Turkey have transitioned in this direction (Maver & Poljak, 2020). By increasing testing intervals, there is the potential to lessen the burden on individuals, as well as costs to the health care systems.

Moving to primary HPV testing in cervical screening programs will allow for a more cost-effective approach to cervical screening programs and contribute to a safe decrease in testing procedures throughout the interval of an individual's screening eligibility (Gottschlich, 2021). As primary HPV testing can directly detect the presence of the HPV virus—rather than just the changes it may cause—and boasts high sensitivity and specificity, we can anticipate that cervical screening guidelines will shift toward primary HPV testing. This transition may not allow only for longer intervals between screenings, but also enable the age at which screening begins to be safely increased. Lastly, we must recognize that HPV screening and follow-up can have psychosocial implications, such as anxiety, fear of cancer, and denial, creating barriers for women. With proper education, these barriers can be reduced, as it is important to have women screened given increased screening can help lower HPV rates over time (Chadwick et al., 2022; Brisson et al., 2020).

Considerations for implementation of primary HPV testing

Various screening barriers within their cervical screening programs have been reported by countries, including the United Kingdom, the Netherlands, Australia, and Finland, that have already transitioned to primary HPV testing (Aitken et al., 2021; Brotherton et al., 2023; Bavor et al., 2023; Hall et al., 2019; Nemec et al., 2022; Veijalainen et al., 2021). One of these barriers has been healthcare-provider (Silver et al., 2015) and patient skepticism over newly extended screening intervals and the use of a new testing format (Nemec et al., 2022; Silver et al., 2015). In 2012, a randomized controlled trial was conducted in British Columbia to assess women's intentions to be screened for cervical cancer with HPV testing, instead of a cervical cytology screen test (Pap test), and to be screened every four years instead of every three years (Ogilvie et al., 2016). The results of this study indicated that more than 80% of participants were willing to participate in primary HPV screening; however, intention to be screened through this method decreased (84.2% to 54.2%) when the screening interval between tests was extended (Ogilvie et al., 2016). These findings suggest cause for concern as provinces and territories shift to longer screening intervals. Individuals may not be willing to engage in these new preventative practices unless they can be informed and support properly through these changes.

These concerns by the public have been echoed elsewhere. For example, Australia was one of the first countries to transition from cytology-based Pap testing to primary HPV testing, and similar concerns relating to acceptance of this change to cervical screening-age individuals were found (Smith, Hammond et al., 2019). The changes to the screening program were met with alarm and mistrust by the Australian public; nearly 70,000 signatures were collected over concerns that this new test was implemented to save healthcare dollars without adequately detecting high-grade HPV-type related cancers (Smith, Hammond et al., 2019). A similar incidence of public mistrust and confusion over cervical cancer information and guidelines was observed when a popular news magazine published a cover story questioning the ethics of the vaccine following its 2006 implementation in Ontario in school-based programs (CTV, 2007). This, and similar incidences of public distrust were seen across Canada, evidenced in patterns of negative online comments regarding social factors and the safety and efficacy of the vaccine (Feinberg et al., 2015). The concerns emphasize a need to ensure healthcare professionals, and the general population, understand current evidenced-informed HPV-related information that demonstrates the efficacy and safety of screening intervals of the new testing guidelines (Smith, Hammond et al., 2019). For instance, while guidelines (and thus screening intervals) may vary across Canadian jurisdictions, those eligible for screening can expect longer intervals between routine screening with the introduction of primary HPV testing into cervical screening guidelines. It will be critical to support and educate healthcare professionals, facilitating their adherence to program-specific guidelines and assisting them in addressing client mistrust regarding these newly extended intervals (Smith, Hammond et al., 2019).

Suk et al., examined guidelines for HPV screening from The U.S. Preventive Services Task Force (USPSTF) and acknowledged that a primary reasons for those not receiving up-to-date screening was a lack of awareness around screening protocols among the eligible population (2022). Many individuals may not realize that screening is necessary, may be unfamiliar with the transition from traditional Pap tests to primary HPV testing—including the longer testing intervals—and may not have received reminders from their healthcare providers about the availability of testing (Suk et al., 2022). Healthcare provider mistrust in primary HPV testing also can hinder effective cervical cancer screening and prevention. Concerns about the reliability and implications of HPV tests, such as their accuracy compared to pap smears and the risk of overdiagnosis, contribute to this mistrust (Jayasinghe et al., 2016). This skepticism may affect the adoption of new screening guidelines and limit patient access to timely screening. These gaps in knowledge further highlight the importance of encouraging healthcare providers to explain new cervical screening guidelines to clients at screening appointments and also to reach out to those who have not undergone testing (Suk et al., 2022). The role of nursing, particularly oncology nursing, in education, raising awareness, and knowledge translation is critical. Without a solid understanding of this process, achieving full acceptance and uptake will be challenging (Delporo & Selk, 2022).

HPV self-sampling to address individuals' screening barriers

In addition to the potential benefits of primary HPV testing, the use of primary HPV self-sampling has emerged as a strategy to increase utilization of cervical cancer screening programs. HPV self-sampling refers to a process where samples for HPV testing can be self-collected by individuals (using a lavage, brush, swab, or vaginal patch) in a comfortable setting (i.e., home, labs, primary healthcare offices) and mailed for processing (Yeh et al., 2019). Self-sampling has shown to be an accurate alternative when compared to clinician-collected samples (Inturrisi et al., 2021; Snijjers et al., 2013). Importantly, as reported by screening programs, the use of self-sampling has been shown to increase screening uptake by 20%–30% among non-attenders when participants were offered the option to self-collect, increasing screening coverage in this particular population (Polman et al., 2019; Yeh et al., 2019). Primary HPV self-sampling may especially benefit those living in rural, inaccessible, or remote settings by accommodating challenges, such as access to primary care providers and increased participation in national cervical cancer screening programs, by reducing geographical barriers (Suk et al., 2019; Yeh et al., 2019). Finally, self-sampling allows for consideration of cultural factors and accommodates diverse populations within cervical screening programs. This approach is particularly supportive for individuals who may not identify as women, such as gender-expansive and 2SLGBTQIA+ individuals with a cervix (Polman et al., 2019). By offering a safe space to make screening more accessible and inclusive, self-sampling helps to ensure that all eligible individuals can participate in cervical cancer prevention efforts.

THE IMPLICATIONS OF COVID-19 ON HPV

The international community had been making progress in integrating primary HPV testing into cervical screening guidelines. However, these efforts were significantly disrupted by the COVID-19 pandemic, which led to the reallocation of healthcare resources (Walker et al., 2022). For example, the Canadian Partnership Against Cancer has supported the use of primary HPV testing in cervical screening programs for clients beginning at 25 years of age (2021). Yet, these recommendations have only been implemented in the provinces of British Columbia and Prince Edward Island within Canada (CPAC, 2024; Gates et al., 2021; Proctor et al., 2023). In contrast, countries such United Kingdom, the Netherlands, Australia, and Finland have already implemented primary HPV testing (Aitken et al., 2021; Brotherton et al, 2023; Bavor et al., 2023; Hall et al., 2019; Nemec et al., 2022; Veijalainen et al., 2021). The UK introduced primary HPV testing nationwide in 2019, leading to significant improvements in early detection and screening efficiency (Gates et al., 2021). Similarly, Australia has adopted primary HPV testing in several states since 2017, with plans to expand it nationwide, contributing to a reduction in cervical cancer rates and enhanced screening coverage (Hall, 2019). These advancements highlight the progressive adoption of HPV testing in diverse regions, emphasising its effectiveness and the growing global trend toward more reliable cervical cancer screening methods.

During the pandemic, routine cancer screening services were impacted in many countries to preserve healthcare capacity (National Cancer Institute's PROSPR Consortium, 2021). It is estimated that approximately 50% fewer high-grade screening cytology results were identified in the first six months of the pandemic in Ontario than would otherwise be expected in a similar period (Meggetto et al., 2021). It is well known that timely detection, follow-up of abnormal screening, and treatment where indicated are crucial elements of reducing the risk of progression to invasive cervical cancer (Meggetto et al., 2021). Although it is not yet possible to measure the direct impact of COVID-19-related service disruptions on cervical cancer, this delay in screening holds future implications for oncology nurses and cervical cancer (Walker et al., 2022). There is a need for careful ongoing assessments of related disturbances on cervical pre-cancer and cancer outcomes in Canada and this will require planning to arrange necessary future services. Finally, given the impact of the COVID-19 pandemic on cervical cancer screening and in light of the recommendations to transition from cytology-based Pap testing to primary HPV testing, there is a need to examine the individual willingness of uptake in new screening guidelines of those at risk of HPV and clinician acceptance to engage in preventative screening behaviours and associated follow-up.

HPV VACCINE

The Government of Canada (2024) recommends that all individuals between the ages of 9–26 years receive the HPV vaccination, independent of sex. As part of the current immunization strategy and aligned with the WHO call to eliminate cervical cancer (WHO, 2024), the Government of Canada has announced a target of 90% HPV vaccine coverage among adolescents by 2025 (Government of Canada, 2022). There are currently two HPV vaccines authorized for use in Canada: Cervarix® and Gardasil-9®, (See Table 1; Government of Canada, 2024). The previous quadrivalent (Gardasil-4) was discontinued for use in Canada in 2019 (Government of Canada, 2024).

In 2007, the Canadian National Advisory Committee on Immunization (NACI) implemented a publicly funded HPV vaccination program for eligible females aged nine years and older through school-based immunization programs (NACI, 2015). At that time, NACI recommended a three-dose HPV

Table 1

HPV Vaccines Authorized for Use in Canada

Vaccine	Manufacturer	Authorized for Use in Canada	HPV Types Included
Cervarix® (Bivalent, HPV 2)	GlaxoSmithKline Inc.	2010	HPV Types 16 and 18
Gardasil® 9 (9vHPV)	Merck Canada Inc.®	2015	HPV 6, 11, 16, 18, 31, 33, 45, 52, 58

Note. Government of Canada, 2024; Canadian National Advisory Committe on Immunization, 2015).

vaccination schedule for females between nine and 26 years (bivalent or quadrivalent vaccine). However, the Government of Canada (2024) now recommends individuals aged 9 to 20 receive a one-dose schedule of 9vHPV for immunization (regardless of sex or gender), unless immunocompromised. This change followed other countries, such as Australia, move to a one-dose HPV vaccination schedule (Reyburn & Russell, 2023). This transition was supported by the International Agency for Research Against Cancer (2023), which concluded through single-dose efficacy trials that a single dose was "as effective as two or three doses in preventing persistent HPV16 and HPV18 infections" (p. 3).

When comparing the HPV vaccine types, overall they have been reported to be effective. For instance, Arbyn et al. (2018) found the bivalent and quadrivalent HPV vaccines to be 87%–100% effective at preventing HPV16/18-related six-month-persistent cervical infections and precancerous lesion (2018). In line with the Government of Canada reporting nearly 100% efficacy of the nonvalent vaccine against HPV 18/16, 95%–99% efficacy for genital warts, and greater than 96% efficacy against high-risk disease (2024). A 2019 systematic review by Yusupov and colleagues (2019) further suggests the more recently approved nonavalent vaccine to not only similarly reduce HPV16/18 risk, but to additionally protect against additional HPV variants, providing a further reduction in cancer risk relative to the bivalent or quadrivalent vaccines.

Building on the substantial reduction in HPV16/18 prevalence observed in Canada post-HPV vaccine implementation, the HPV vaccine's safety profile further solidifies its public health significance. While minor side effects are relatively common, such as pain, redness, or swelling at the injection site, severe adverse reactions, such as anaphylaxis, are exceptionally rare (Government of Canada, 2024). In addition, comprehensive surveillance has consistently found no causal link between the HPV vaccine and severe adverse outcomes (Government of Canada, 2024). Ongoing global monitoring by organizations like the WHO continues to validate the vaccine's safety (WHO, 2021). Given the minimal risks, the extensive public health benefits of widespread HPV vaccination are compelling and well-supported. It is projected that with continued vaccination of future cohorts of adolescents there will be associated decreases in the annual cervical cancer incidence rate and mortality (Smith, Baines et al., 2019). Further, the inclusion of males in HPV vaccination programs has been an important step in the prevention of not only cervical cancer, but also other HPV-related cancers. Ultimately, a decrease in cervical cancer incidence associated with increased HPV vaccine uptake is projected not only to improve population health, but also to increase the efficiency of the health system by reducing the need for colposcopies, clinical treatments for warts, precancerous lesions, and cervical cancers (Smith, Baines et al., 2019a).

HPV vaccine and males

Males who have an HPV infection and who engage in sexual activity with women can represent a significant source of transmission for these women and can experience HPV-related diseases themselves (Bruni et al., 2023). Therefore, having males (age 9–27 years) included in HPV vaccination programs across all regions of Canada can contribute to both a reduction in the spread of HPV, and HPV-related cancers and diseases (Bruni et al., 2023). Approval of the HPV vaccine for use in males (February 2010) is an important step to ensuring equity in protecting males from HPV-associated cancers and diseases (Public Health Agency of Canada, 2012; Bruni et al., 2023). Since this time, the gap in HPV vaccination between boys and girls in Canada has narrowed dramatically, due in large part to a national school-based immunization program; at present, current estimates suggest that between 57.1% to 91.3% of girls, and 57.5% to 91.3% of boys have complete HPV vaccinations (Canadian Partnership Against Cancer, 2021). In 2019, 15% of girls worldwide, but only 4% of boys had been vaccinated for HPV (Bruni et al., 2021), suggesting that greater attention must be given to closing this gap globally, and to understanding what has made the HPV vaccination programs in Canada successful thus far.

A number of factors are thought to contribute to the update of the HPV vaccine, including the importance of convenience and sociocultural norms to male vaccine recipients (Feinberg et al., 2015). In the past, it had been shown that individuals with a lack of knowledge regarding HPV were unlikely to receive a vaccination, and have greater shame associated with subsequent infection (Thomas, 2016). More recently, a systematic review by Shin and colleagues (2022) demonstrated that health provider recommendations were the most critical factor tied to HPV vaccine uptake in males internationally, whether related to recommendations made directly to males or those made to the parents of adolescents. Mode of information delivery may also be important, as in-person client education for males and females was not effective without added digital reminders (Chandeying & Thongseiratch, 2023). These digital reminders were found to have the greatest impact on male vaccine uptake when targeting only males, which may be explored further (Chandeying & Thongseiratch, 2023).

The future of the HPV vaccine

At present, as a result of the COVID-19 pandemic, there have been disruptions in school-based vaccination programs, which have particularly impacted the distribution of the HPV vaccine. A study conducted in the United States of America (USA) found that in April 2020, HPV vaccination rates declined to a quarter of the rate that was seen in April 2018 and 2019 (Daniels et al., 2021). The implications of the missed cohorts from 2019 and 2020 are currently unknown. However, 45% of family physicians and pediatricians acknowledged that the pandemic negatively impacted healthcare services and childhood immunization rates (Piché-Renaud, 2021). This decline in HPV vaccination is projected to slow the global improvement that is being made to decrease the incidence of cervical cancer (Daniels et al., 2021).

Within a Canadian context, various solutions have been proposed to strengthen cervical cancer prevention strategies. Suggested solutions include opening additional clinics for immunization services, re-organization in the flow of patients during appointments, and opportunistic immunization at other healthcare appointments (Piché-Renaud et al., 2021). The

implementation of a universal centralized electronic immunization record may help identify immunization gaps and support the organization of catch-up clinics (Wilson et al., 2017). It will be important to monitor the uptake of the HPV vaccine in a post-pandemic world, as anti-vaccination information has been increasingly seen throughout media platforms concerning the COVID-19 pandemic (Garett & Young, 2021). In addition, it will be critical for public health units and governmental bodies to invest in educational campaigns for parents, which should focus on vaccine effectiveness, address misinformation, and educate on the safety of receiving vaccinations (Piché-Renaud et al., 2021). Nurses and other healthcare providers are needed to support and advocate for "catch-up" vaccination clinics to target missed cohorts and educate parents and families on adopting primary HPV prevention through vaccination.

THE ONCOLOGY NURSE ROLE

Success in the uptake of new cervical cancer screening guidelines and the roll-out of catch-up vaccination programs will depend on both the public's and health providers' acceptance of evidence-informed practice, and the effectiveness of primary HPV testing and vaccination (Delpero & Selk, 2022). The role of the oncology nurse in education, leadership, and advocacy is critical to promoting the transition to new protocols in the prevention of HPV and cervical cancer. To support the HPV vaccination and the shift from pap testing to primary HPV testing with extended screening intervals, oncology nurses must provide clear, evidence-based education to individuals and communities (Johnson et al., 2019).

The Canadian Association of Oncology Nurses (CANO) emphasizes that oncology nurses should foster independent functioning, offer emotional support, and promote culturally tailored awareness campaigns (CANO, 2001). By providing ongoing support throughout the continuum of diagnosis, treatment, and survivorship, oncology nurses help integrate cervical cancer care into broader cancer management frameworks (Feinberg et al., 2015; Thomas, 2016). For instance, when the USPSTF changed its recommendations from pap testing every three years to primary HPV testing every five years, this was thought to have confused both clients and providers (Suk et al., 2022). There was also confusion among surveyed Canadian providers surrounding HPV self-sampling with most (51.7%) rating their knowledge of HPV self-sampling as poor to very poor (Zelli et al., 2022). Thus, a shift to new screening modalities in Canada will require additional resources to educate providers and clients accordingly (Delpero & Selk, 2022).

Ensuring oncology nurses have a strong understanding of current evidence and recommendations of new guidelines and protocols for primary HPV testing, self-sampling, and vaccination can promote knowledge dissemination; ultimately increasing adoption among clients and providers. This is critical, given the historical reports of negative interpretations concerning the HPV vaccine safety and efficacy; distrust of pharmaceutical companies and the government; and the belief that school-aged children are too young for the HPV vaccine (Feinberg et al., 2015). Provider recommendation has been acknowledged as a primary indication for patients' decision to receive vaccination for HPV (Thomas, 2016). Therefore, oncology nurses will play a pivotal role in informing the public and healthcare providers that HPV vaccination is safe and effective (Thomas, 2016).

Nursing practice in primary care

In many healthcare settings, nurses are often the first point of contact for patients, making their role in the acceptance of primary HPV screening and vaccination equally important. Unlike oncology nurses, who may specialize in cancer care, nurses in primary care frequently interact with a broader population, including individuals who may not be aware of the latest screening guidelines (Lin et al., 2022). As the cancer continuum increasingly overlaps with primary care, it is essential for nurses to be able to communicate the importance of regular screenings and vaccinations in a culturally sensitive and accessible manner in order to help increase participation rates in these preventative programs (Suk et al., 2022). As well, nurses can help mitigate confusion surrounding new screening recommendations, such as the shift from Pap tests to primary HPV testing, by providing consistent and accurate information during routine care visits (Zelli et al., 2022). Their involvement is critical in ensuring that patients receive timely and appropriate preventive care, especially in regions where specialty training is lacking and general nurses are the primary providers of cervical cancer screening. For example, education provided by nurses may not only improve vaccine uptake, but may also reduce unnecessary testing by providers who may continue to reference outdated guidelines while reducing the frequency of these requests from concerned patients (Lin et al., 2022).

Other healthcare practitioners' role in promoting HPV screening and vaccination

Beyond nurses, other healthcare practitioners, including primary care physicians, midwives, and public health workers, also play a significant role in the acceptance of primary HPV screening and vaccination. Their endorsement of these practices is often a decisive factor in whether patients choose to participate in screening and vaccination programs (Thomas, 2016). Studies have shown that there can be a gap in knowledge and confidence among these providers regarding the latest guidelines, particularly in relation to self-sampling and extended screening intervals (Zelli et al., 2022). To address this, ongoing education and training are essential, ensuring that all healthcare providers are equipped with the most current information and are able to communicate the benefits of primary HPV testing and vaccination effectively to their patients (Delpero & Selk, 2022). By fostering a collaborative approach to education and advocacy, healthcare practitioners across disciplines can work together to enhance the uptake of these preventive measures, ultimately reducing the incidence of cervical cancer.

CONCLUSION

To prevent cervical cancer globally, oncology nurses and healthcare providers are presented with a unique role in educating eligible individuals and healthcare providers on the

transition from cytological (Pap) testing to primary HPV testing and the need for HPV vaccination uptake strategies. With wide-scale changes and major advances in cervical cancer screening, primary HPV testing will be valuable in identifying those at the highest risk for HPV. Further, HPV self-testing can support increased accessibility to screening for harder to reach communities. Additionally, in a post-pandemic world, HPV immunization, with the inclusion of males in vaccination programs, and the implementation of HPV "catch-up" vaccination clinics will be important components of cancer prevention and the elimination of the most prevalent oncogenic strains of HPV. By addressing gaps in cervical cancer prevention highlighted by the COVID-19 pandemic, oncology nurses should continue to promote the acceptance of screening, the use of optimal testing measures, and the vaccination of missed cohorts and future generations.

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