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A Comparison of Cervical Cancer Screening Rates among Women with Traumatic Spinal Cord Injury and the General Population

Sara J.T. Guilcher, MSc(PT), M.Sc.,[1,2,3] Alice Newman, M.Sc.,[4] and Susan B. Jaglal, Ph.D.[1,2,3,4,5]

Abstract

Background: Previous qualitative and survey studies have suggested women with spinal cord injury (SCI) are screened less often for cervical cancer compared with the general population. We investigated whether cervical cancer screening rates differ between population-based women with and without traumatic SCI, matched for age and geography.

Methods: A double cohort design was used, comparing women with SCI to the general population (1:4) using administrative data for Ontario, Canada. Women with SCI, identified using the Discharge Abstract Database for the fiscal years 1995–1996 to 2001–2002, were female residents of Ontario between the ages of 25 and 66, admitted to an acute care facility with a traumatic SCI (ICD-9 CM code 806 or 952). Women in the general Ontario population were randomly matched by age and geography. Screening rates were calculated from fee codes related to Papanicolaou (Pap) smear tests for a 3-year period preinjury and postinjury.

Results: There were 339 women with SCI matched to 1506 women in the general Ontario population. Screening rates pre-SCI were 55% for women with SCI and 57% during this same time period for matched women in the general population; post-SCI rates were 58% for both the two groups. Factors predicting the likelihood of receiving a Pap test for SCI cases included younger age and higher socioeconomic status.

Conclusions: Utilization data suggest that there are no significant differences in screening rates for women with SCI compared with the general population. However, screening rates for women with SCI were significantly influenced by age as well as income.

Introduction

Cervical cancer screening is extremely important in the reduction of the incidence and mortality of cervical cancer. Routine screening has significantly decreased the incidence of cervical cancer up to 90%.[1] In Canada, the current national guidelines are for women between the ages of 18 (or at the onset of sexual activity) and 69 to receive an annual Papanicolaou (Pap) smear until two normal tests are received, then at least once every 3 years.[2] Self-report survey studies indicate that Ontario (Canada) has a screening rate of 80%, which is similar to the overall Canadian rate.[3,4] Studies using Ontario administrative data report slightly lower rates ranging between 60% and 70%.[3,5]

Previous research has suggested that women with disabilities, particularly those with physical limitations, such as spinal cord injury (SCI), are not receiving the same quality of preventive services as those in the general population.[6–16] Several barriers have been proposed, both structural-environmental and process related, that may influence the likelihood of women with SCI receiving cervical cancer screening.[7,15] Physical barriers, such as transportation to physician clinics and accessibility into offices, have been suggested to influence screening practices.[7,9,13,14,16–18] Specifically related to SCI, women have reported difficulties with the examination table and positioning during a pelvic examination.[12]

Access and availability of services may also pose challenges for this population. A recent study identified that women living in rural areas are screened less often than are women living in urban centers.[19] Additionally, time spent during physician visits may be devoted to more acute medical management of secondary complications (such as urinary tract infections [UTIs], autonomic dysreflexia, and pressure sores), which

[1]Department of Health Policy, Management and Evaluation, [2]Toronto Rehabilitation Institute, [3]Women's College Research Institute, [4]Institute for Clinical Evaluative Sciences, Sunnybrook Health Sciences Centre, and [5]Department of Physical Therapy, University of Toronto, Canada.

continue to be problematic with this population,[20–23] thereby foregoing time for preventive screening visits. Coyle et al.[23] reported that even though 60% of community living participants with self-reported physical limitations had three or more physician visits within a 6-month time frame, few women in their sample reported having had a Pap smear within 5 years after injury.

Physicians have also identified a lack of competency and self-efficacy in dealing with the specific issues related to women with SCI and providing pelvic examinations.[24–26] This lack of confidence may influence screening practices, as Nosek and Howland[7] found that although women with physical disabilities requested screening, the primary care providers failed to address these requests.

Indeed, these barriers are disconcerting, as women with physical disabilities might lack specific education related to their preventive screening needs and may not be able to advocate for the same quality of care as the general population.[14] Furthermore, women with SCI still require comprehensive gynecological services, as several studies indicate the majority of women (50%–83%) remain sexually active after the SCI,[6,27,28] and women were likely sexually active prior to the index injury event.

Regular cervical cancer screening, as per the Canadian guidelines, is a quality of care right to which every woman with SCI is entitled. To date, there are no published epidemiological studies that have investigated cervical screening rates among the SCI population. Thus, the objectives of the present study were (1) to compare the rates of cervical screening in women (between the ages of 18 and 69 years) with and without traumatic SCI in the province of Ontario, Canada, and (2) to identify factors associated with receiving cervical cancer screening.

Materials and Methods

Setting

Ontario is located in central Canada and is the most populous province, representing 40% of the Canadian population or 11 million inhabitants. Ontario has a universal publicly funded healthcare system.

Design

This study was a double cohort design,[29] comparing rates of cervical cancer screening among women with SCI and women without SCI in the general Ontario population. Each SCI subject was followed using record linkage 3 years prior to and 3 years after their index hospitalization for SCI to determine if they had cervical cancer screening during the preinjury and postinjury periods. Programming attempts were made to match 5 women in the general population by age and geography with 1 woman with SCI. Because of programming feasibility, we were unable to match for every woman with an SCI on a 1:5 ratio; however, 90% of women with SCI were matched to at least 4 women in the general population We do not see this as a limitation, as minimal statistical gain is achieved with matching to 4 relative to 5 women in the general population for every woman with SCI.[30]

Women in the general population were defined as women of the same age and living in the same area and who made a visit to a physician in the same year of injury as the matched woman with SCI. Similarly, these matched general population women were also followed 3 years prior and 3 years after their index physician visit to determine if they had cervical cancer screening. Screening was matched on time to control for practice changes that may have occurred over time.

Administrative data sources

Discharge Abstract Database (DAD). The Canadian Institute for Health Information (CIHI) hospital DAD is a national database that includes all acute care hospital stays and day surgery events in each fiscal year (every record corresponds to one hospital stay). The information is abstracted from hospital charts. The DAD contains standard clinical, demographic, and administrative information and a unique identifying number (IKN) to permit record linkage. Prior to 2002, the CIHI-DAD used the *International Classification of Diseases* Ninth Revision Clinical Modification (ICD-9 CM) for diagnostic coding. The DAD has been validated and shown to be of high quality.[31]

Ontario Health Insurance Plan (OHIP). The OHIP database contains all physician, community-based laboratory, and radiology facility fee-for service billing or claims made to the Ontario Ministry of Health and Long-Term Care. The main data elements are patient and physician unique identifying number, date of the service/claim, fee code for service provided, and fee paid. To obtain the age and sex of the patients in the OHIP database, records must be linked to the Registered Persons' Database (RPDB).

Registered Persons' Database (RPDB). The RPDB contains the IKN and demographic information (age, sex, postal code) for all residents in Ontario who are eligible for healthcare.

Study population: Inclusion criteria

Women with SCI. All women with acute care hospitalization for traumatic SCI in the fiscal years 1995–1996 to 2001–2002 were identified from the DAD. Women with SCI were identified as those having a traumatic SCI (ICD-9 CM codes 806, and 952) as the most responsible diagnosis. Several studies have investigated the validity of the ICD-9 CM codes 806.x and 952.x for traumatic SCI. The sensitivity ranges from 74% to 94%.[32–34] Women with SCI were included in the study if they were between the ages of 25 and 66 years at time of admission or discharge. This age range allows for the investigation of screening practice 3 years prior to the index event as well as 3 years after the index event. Notably, the lower inclusion of 25 years (rather than 21) was chosen to minimize bias in the prescreening index period. The Canadian guidelines recommend providing cervical cancer screening at 18 or at the onset of sexual activity. However, given that the majority (80%) of Canadian adults are not sexually active until their early to mid-20s,[35] we decided to set the lower range between 22 and 25 years for the prescreening period to allow for a more representative reflection of practice patterns. In addition to this age criterion, women with SCI were also included in the study if they were residents of Ontario and alive at the time of discharge.

Women in general population. Women in the general population were randomly identified from the RPDB, had at least one physician visit (OHIP fee claim billing) in the same year as the matched women with SCI (the index event for the general population), and were matched approximately 4:1 to women with SCI by age and geography (based on the 14 Local Health Integrated Networks [LHINs] that divide the province of Ontario). The LHIN geographical boundaries were created in 2006 by Ontario's Ministry of Health and Long-Term Care based on access to and availability of acute care hospitals.

Exclusion criteria

Women in both groups were excluded from the study if they had the following characteristics: invalid IKN, missing gender or age, previous diagnosis of cervical cancer (ICD-9 CM 180.0, 180.1, 180.8, 180.9), previous diagnosis of a hysterectomy (OHIP billings S810, S757, S758, S759), or previous SCI admission within 3 years prior to index SCI event (applied to women with SCI only).

Procedures

Privacy/ethics. This study was approved by the Research Ethics Board at the Institute for Clinical Evaluative Sciences (ICES), Sunnybrook Health Sciences Centre, which houses the data, and the University of Toronto (Toronto, Ontario).

Variables

Primary outcome variable. The outcome variable was whether cervical cancer screening (Pap test) was conducted within 3 years prior to as well as 3 years after the index SCI event for women with SCI and the index physician visit for matched general population women. Cervical cancer screening was identified if one of the following OHIP fee codes was used: E430 (tray fee code), G365 (periodic Pap), G394 (repeat Pap after an abnormal test), and corresponding L713 (laboratory technical), or L812 (laboratory professional) codes. To date, there is no published work on the validity of these Pap fee codes; however, there has been research suggesting that OHIP fee codes have good validity.[5] These codes have been used previously to determine cervical screening rates in Ontario.[5] The codes also have good face validity and capture either the clinician's clinical fee or the laboratory fee. Thus, if a clinician has coded incorrectly, the laboratory fee should capture the test.

Charlson Comorbidity Index (Deyo-Adaptation). The Charlson Index is the best-known index of comorbidity. It is a weighted measure (ranges from 0 to 31) of relative effects of a combination of 16 diseases/risk factors. This index is widely used in all aspects of outcome research and has been translated to an administrative data format.[36,37]

Rurality. The Rurality Index of Ontario (RIO) is made up of 10 components, including measures of population size, travel times to referral centers, population/general practitioner ratios, availability of ambulance and other services, weather conditions, hospital presence, and social indicators. The RIO is a scaled index between 0 and 100, such that communities with higher values are relatively more rural compared with communities with lower values.[38] Values equal to or above the cutoff point of 45 are considered rural.

Socioeconomic status (SES). Because individual household income level is not available in these administrative databases, income levels were imputed based on SES geographical indicators using Canadian Census data for 1991, 1996, and 2001, similar to other published studies.[39,40] SES was assessed based on the median income of the enumeration area associated with the individual's residential dissemination area as a proxy for individual SES. The Ontario population was divided into income quintiles, with 1 being the lowest and 5 being the highest. Because of privacy protocol at ICES, we are unable to determine the monetary range within each quintile.

Level of injury. Injury level was categorized as either cervical, thoracic, lumbar, or other (sacrum or coccyx).

Age. Age was categorized into two groups, 25–44 and 45–69 years, in order to provide stable estimates of associations, as the continuous distribution was not normal.[41]

Length of acute injury stay (LOS). This is a measure of number of days an SCI patient stayed in the hospital for the acute injury (admission to discharge).

Data analysis

Descriptive statistics were conducted to describe demographics and characteristics of women with SCI. Screening rates were compared for women with SCI and the general population during the 3 years prior to the index event, as well as 3 years after the index event. The purpose of pairing women with SCI with the general population during these two periods was to adjust for changes in screening practices over time. Chi-square analyses were performed to compare screening rates within women with SCI during the preindex period and postindex period, as well as between women in the general population during these two periods. Chi-square analyses were conducted to investigate whether the likelihood of receiving a Pap smear test was influenced by age (25–44 years and 45–69 years) and geographical location (rural vs. urban) for both women with SCI and the general population.

Multivariate logistic regression analyses were used separately for women with SCI and women in the general population to determine factors (such as SES, geographical location, age) associated with the likelihood of cervical cancer screening. We could not run models with both the women with SCI and the general population together because of multicollinearity (as they were matched by geographical unit), and we were interested in adjusting for SES (which is operationalized based on postal code). All analyses were performed using SAS for UNIX, version 9.1.3 (SAS Institute, Cary, NC). All statistical tests were performed at the 5% level of significance and were two-sided.

Results

The number of incident traumatic women with SCI identified from the fiscal years 1995–2001 were 357 (after exclusion criteria were applied). Of these, 339 women with SCI were matched with 1506 women in the general population on age and geography. Characteristics of women with SCI are shown in Table 1. The majority of women with SCI were injured in a motor vehicle collision (40.7%), had an injury at the level of the cervical spine (45.7%), lived in an urban area (78.5%), and

Table 1. Characteristics of Women with SCI for Fiscal Years 1995–2001

Characteristics of women with SCI	n *(%)* (n = *339)*
Age, years	
25–34	93 (27.4)
35–44	84 (24.8)
45–54	88 (26.0)
55–66	74 (21.8)
Mechanism of injury	
Fall	87 (25.7)
Motor vehicle collision	138 (40.7)
Other	114 (33.6)
Level of injury	
Cervical	155 (45.7)
Lumbar	72 (21.2)
Thoracic	59 (17.4)
Other (sacrum, coccyx)	53 (15.6)
Rural	73 (21.5)
Length of acute stay (days)	17.0 ± 24.1
Charlson score ≥1	40 (11.8)

were relatively healthy on acute care admission (88.2% had a Charlson Index score of 0).

Table 2 shows the percentage of Pap smear tests performed among women with SCI and women in the general population during the 3 years before and after the index event. Chi-square analyses showed no significant differences in screening rates for women with SCI during the preindex period compared with the postindex period (ns, $p > 0.05$). The Pap screening rate for women with SCI living in a rural setting was 59% and for women living in an urban environment was 55% (ns, $p > 0.05$). Similarly, the screening rate for women in the general population living in a rural area was 55% compared with 58% for women living in an urban setting (ns, $p > 0.05$). There were significant differences in the likelihood of cervical cancer screening between the younger women (age group 25–44) and the older women (age group 45–69) for both women with SCI (chi-square = 4.5, $p < 0.05$) and women in the general population (chi-square = 45.2, $p < 0.0001$), respectively. However, there were no significant difference in screening rates among women with SCI and the general population during these two time periods (ns, $p > 0.05$).

Factors that were associated with the likelihood of receiving a Pap smear for SCI women were younger age, 25–44 years (OR = 1.7, 95% CI 1.1-2.5), and higher SES (highest income quintile 5 compared with reference lowest quintile 1 (OR = 2.7, 95% CI 1.3-5.8) (Table 3). Table 3 also shows that for the general population, age group 25–44 also significantly predicted the likelihood of receiving a Pap smear (OR = 2.0, 95% CI 1.7-2.5); however, SES did not significantly influence cervical cancer screening ($p > 0.05$).

Discussion

The results of the present study indicate that women with traumatic SCI were screened for cervical cancer at the same rate as women in the general population of Ontario. Women with SCI who were older and of lower SES, however, were significantly less likely to receive cervical cancer screening. Similar age effects were found among women in the general population, in that older women were also less likely to receive screening compared with younger women, although the effect of SES on screening was not significant. This decline in screening with increasing age for both groups is consistent with previous Ontario data[3–5] and North American studies.[16,19] Similarly, women with lower income are less likely to be screened than women of higher income,[3–5,19] whereas no differences in cervical cancer screening were found in the present study between those living in rural compared with urban areas.

The few qualitative and survey design studies previously published have suggested that women with SCI are screened less often than the general population,[6–16] but this population-based study does not support these findings. There may be several reasons for these differences. First, there may be a participation bias in the previous studies. There may be certain characteristics that led women to participate in the studies (i.e., dissatisfaction with health services). For example, Persuad,[10] using a convenience sample of 28 women with SCI, conducted interviews to examine factors that impact preventive health practices. Based on these interviews, issues regarding access to cervical cancer screening were identified, such as physical barriers, physician competency, self-management, and self-advocacy. Unfortunately, the demographics of the sample were not identified, and it is difficult to ascertain the characteristics of participants. These women may have been reflecting a selection bias or women who are more marginalized (ethnic minority, lower SES, greater disability). Although there may be sample bias in previous studies, their results should not be negated but rather further explored.

Table 2. Percentage of Women with SCI and Women in General Population Receiving Pap Smear by Time Period, Age, and Geography

Characteristic	*Women with SCI* (n = *339)* n *(%)*	p *value*	*Women in general population* (n = *1506)* n *(%)*	p *value*
Time period		>0.05		>0.05
Before index	186 (55)		858 (57)	
After index	196 (58)		867 (58)	
Age		<0.05		<0.0001
25–44	112 (63)		498 (66)	
45–69	84 (52)		369 (49)	
Geography		>0.05		>0.05
Rural	43 (59)		130 (55)	
Urban	153 (58)		737 (58)	

Table 3. Factors Associated with Likelihood of Receiving a Pap Smear for Women with SCI and Women in General Population

Predictor variable	*Model for women with SCI odds ratio (95% CI)*	*Model for general population odds ratio (95% CI)*
Age 25–44	1.7 (1.1–2.5)*	2.0 (1.7–2.5)**
Age 45–69	1.0	1.0
SES quintile 1[a]	1.0	1.0
SES quintile 2	1.4 (0.8–2.8)	0.9 (0.7–1.3)
SES quintile 3	2.2 (1.1–4.6)*	0.8 (0.6–1.2)
SES quintile 4	3.6 (1.7–7.5)**	1.2 (0.9–1.7)
SES quintile 5	2.7 (1.3–5.8)**	1.2 (0.8–1.6)
Cervical injury	1.0	
Thoracic injury	1.0 (0.5–2.0)	
Lumbar injury	0.8 (0.4–1.4)	
Other injury	1.1 (0.6–2.2)	
LOS[b]	1.0 (1.0–1.0)	

*$p < 0.05$; **$p < 0.01$.
[a]Quintile 1 is the lowest and 5 is the highest.
[b]LOS, length of acute injury stay.

Second, the numerous secondary complications that are quite prevalent in this population were speculated to be a barrier in preventive services, with the assumption being that the time spent with clinicians might be focused on more acute medical issues. However, the opposite effect might have occurred, in that, frequent physician visits[20] may have reminded physicians to encourage preventive screening.

Third, differences in healthcare delivery structures may play an integral role in screening practice patterns. Canada's healthcare is a universal publicly funded system such that all Canadians in theory should have equal access to healthcare services. A privately funded system, such as in the United States, may pose more barriers for women with disabilities. In addition to access and availability, physicians may be more appropriately trained in Canada to provide comprehensive preventive services for women with disabilities. However, despite the fact that Canada has a universal healthcare system, we did find that there was a subgroup of women with SCI significantly less likely to be screened: those of lower income and older age.

These differences in the sample-based studies vs. our epidemiological study may relate to the influence of social determinants of women's health[42,43]; that is, "the conditions in which people live and work that affect their opportunities to lead healthy lives."[44(p2)] Social conditions attributed to play a role in disparities of health are (but not limited to) the following: income status, social status, social support, education, employment (physical and working environment), personal health practice, gender, and culture.[42]

The concept of intersectionality, that is, the synergistic effects of marginalizing factors (i.e., low income and disability), has been identified previously as an important consideration when addressing women's access to health services.[42] Previous studies may have been indirectly tapping into some of these social determinants. For example, the effects of social determinants of health were demonstrated by Diab and Johnston,[13] who investigated factors related to cervical cancer screening for women with disabilities using a telephone survey. When these researchers adjusted for age, income, and education, the significant effects of disability on cervical cancer screening disappeared. Liu and Clark[45] recently examined cervical cancer screening among women with disabilities and also found that after adjusting for social determinants, the differences in screening rates among women with and without disabilities were negligible.

Our study had a number of limitations. First, the OHIP fee codes are likely underestimating screening rates for both groups. Community-based laboratory pathology fee codes (captured by the OHIP fee codes) are not billed in the same manner as those conducted in the hospital system, and as a consequence, hospital-billed laboratory codes may have been missed.[5] Second, we do not have information on extent of injury severity (i.e., American Spinal Injury Association, [ASIA] scores) or data on functional outcomes in the acute care administrative database. We used level of injury and the Charlson Comorbidity Index as a proxy for physical limitations and comorbidities; however, there can be significant variation within cervical, thoracic, and lumbar injury. Unfortunately, this is a limitation with the acute care administrative data, and future research addressing level of injury and access to screening services is warranted.

Finally, and importantly, as the data used were administrative, we have no information on the effects of other psychosocial factors, such as health-related quality of life, individual level of income, marital status, ethnicity, quality of screening process (i.e., difficulties getting to and from clinics, comfort during procedures), or education or specific information on unmet care needs. There could be significant differences in reasons why women with SCI were not screened compared with women in the general population. These are important factors when trying to understand access to care for women.

Importantly, our findings suggest that, in general, physicians are performing cervical cancer screening at the same rate for women with and without SCI, although efforts need to be strengthened for women who are more marginalized. Specifically, screening efforts should be targeting women with an SCI who are of lower SES and who are older. These results are consistent with self-report survey findings from the Centers for Disease Control and Prevention (CDC), in that women with functional limitations who were older than 65 were less likely to receive cervical cancer screening.[11]

Previous work has identified the importance of patient and physician characteristics with respect to treatment and clinical management.[46,47] For example, patients with lower SES have been shown to be perceived as less attractive by physicians, which may influence the inequities observed in consultation times,[48] referral patterns, and overall medical management.[49] Additionally, women who are more marginalized are less likely to be assertive and be strong advocates for their medical management.[14,42] Thus, expanding on these social determinants of health, future studies should explore the relationship between marginalization factors and cervical cancer screening.

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Disclosure Statement

The authors have no conflicts of interest to report.

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Address correspondence to:
Susan B. Jaglal, Ph.D.
Associate Professor, Vice-Chair Research
Department of Physical Therapy
160-500 University Avenue
Toronto, ON M5G 1V7
Canada

E-mail: susan.jaglal@utoronto.ca