

Breast reconstruction in Nova Scotia: Rate, trends and influencing factors

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BACKGROUND: During their lifetime, approximately 10% of Canadian women will develop breast cancer. An increased awareness of breast reconstruction in patients undergoing mastectomy appears to have increased the demand for breast reconstructive surgery.

OBJECTIVES: To study the rate of breast reconstructive surgeries performed in the province of Nova Scotia to determine whether the breast reconstructive services now offered are adequate to meet the needs of the population of this area.

METHODS: The number of breast reconstruction procedures and mastectomies completed in the province of Nova Scotia during the time period of 1992 to 2001 was reviewed. The data were obtained from Maritime Medical Care Incorporated, the provincial medical plan. Information available on patients coded as undergoing breast surgeries was reviewed (n=10,056). The data on the trends and demographics of the Nova Scotia population were obtained from Statistics Canada. The data on incidence, prevalence and trends of breast cancer were obtained from the Canadian Cancer Society and the National Cancer Institute of Canada.

RESULTS AND CONCLUSIONS: There is strong evidence of an increasing trend in the number of reconstructive surgeries among the women who underwent mastectomy. The number of breast reconstruction procedures increased 15 fold during the study period. This is mainly attributed to the increased awareness of women undergoing mastectomy and improved education by surgeons, family physicians and breast cancer support groups. Health sector employees must evaluate these trends to determine if the breast reconstructive services currently offered in this region are adequate. Reconstructive surgery was negatively associated with increasing age. Place of residency (urban versus rural) seems to play a role in women's decisions to proceed with breast reconstruction.

Key Words: *Breast cancer; Breast reconstruction; Mastectomy*

Mastectomy is an essential but disfiguring operation in cancer treatment (1). It is associated with significant psychological trauma for the patient (2,3). Over the past decade there has been a significant increase in the number of women who are making the decision to proceed with breast reconstruction after a mastectomy. The American Society of Plastic Surgeons reported a 166% increase in breast reconstruction procedures performed in the USA in 2000 as compared with 1992 (4,5). It is interesting to observe that the increasing rate

La reconstruction mammaire en Nouvelle-Écosse : taux, tendances et facteurs déterminants

CONTEXTE : Environ 10 % des femmes au Canada seront touchées par le cancer du sein au cours de leur vie. Une conscientisation accrue à l'égard de la plastie du sein chez les femmes qui subissent une mastectomie semble avoir augmenté la demande de reconstructions mammaires.

OBJECTIF : Étudier le taux de reconstructions mammaires pratiquées en Nouvelle-Écosse pour savoir si les services de plastie actuellement offerts répondent aux besoins de la population concernée.

MÉTHODE : Nous avons passé en revue le nombre de reconstructions mammaires et de mastectomies pratiquées en Nouvelle-Écosse entre 1992 et 2001. Les données ont été tirées du Maritime Medical Care Incorporated, le régime provincial de soins de santé. Nous avons ensuite examiné les renseignements concernant les patients associés aux codes de chirurgie du sein (n=10 056). Les données sur les tendances et l'évolution démographique en Nouvelle-Écosse ont été obtenues de Statistique Canada et celles sur l'incidence, la prévalence et les tendances du cancer du sein, de la Société canadienne du cancer et de l'Institut national du cancer du Canada.

RÉSULTATS ET CONCLUSIONS : Les chiffres font nettement état d'une tendance à la hausse du nombre de reconstructions mammaires chez les femmes ayant subi une mastectomie. En effet, le nombre de plasties a augmenté de 15 fois durant la période à l'étude. Cela est en grande partie attribuable à la conscientisation accrue des femmes qui subissent une mastectomie et à une meilleure éducation par les chirurgiens, les omnipraticiens et les groupes de soutien aux femmes atteintes du cancer du sein. Les employés du secteur de la santé doivent évaluer les tendances observées pour savoir si les services de reconstruction mammaire actuellement offerts dans la région suffisent à la demande. Par ailleurs, la plastie est mal perçue à mesure qu'augmente l'âge des femmes. De plus, le milieu où vivent les femmes (urbain versus rural) semble jouer un rôle dans la décision de subir ou non une reconstruction mammaire.

of breast conserving procedures and the decreasing number of mastectomies (6,9) does not appear to be diminishing the demand for breast reconstruction (4,5).

The authors hypothesize that the number of breast reconstructive surgeries in Nova Scotia has significantly increased. The objectives of this study were to determine the rate and trends in breast reconstructive surgery in Nova Scotia and to further evaluate factors related to these trends. The present data will assist health sector employees to anticipate the

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changing trends and determine whether the breast reconstructive services now offered are adequate to meet the needs of this population.

MATERIAL AND METHODS

Data were collected from the provincial medical insurance organization, Maritime Medical Care Incorporated (MSI). Patients who underwent breast surgery between 1992 and 2001 were reviewed. The coding of breast reconstructive surgery cases was incomplete. All cases of breast reconstruction submitted to MSI from 1992 to 2001 were tabulated but could not be further subdivided according to type of procedures. For example there is no separate code for immediate versus delayed reconstruction or transverse rectus abdominis myocutaneous (TRAM) flaps versus latissimus dorsi flaps. Because MSI is the payer for the government insured medical services, it is assumed that the data obtained is accurate and comprehensively documents the number of procedures actually performed.

Breast reconstructions were performed throughout the province of Nova Scotia, but the majority of procedures were performed at the Queen Elisabeth II Health Sciences Centre in Halifax. During 1996 and 1997, the old MSI payment system was phased out and the new payment system was adopted. Before 1996, the old system did not differentiate between the various facilities. In the new payment system data, facility codes are assigned to individual hospitals.

The patient's residency was assigned as urban or rural, based on the address of the patient at the time of the procedure. In the MSI system, the cities of Halifax, Dartmouth and Sydney comprise the urban group. 'Unknown' residency represents patients with incomplete address information and patients from other provinces.

The data obtained from MSI was compared with data from Cancer Care Nova Scotia to determine if there is any difference between these two systems in terms of number of breast surgery procedures performed in Nova Scotia during the study period, and to check for the accuracy of MSI data.

To anticipate demographic and epidemiological changes within the Nova Scotia population, the data from Canadian Statistics were used. Since the 1991 census, the population of Sydney has been amalgamated with the population of Cape Breton Regional Municipality and cannot be identified as 'Sydney' alone. Statistics Canada reported the population of Nova Scotia as being 67.5% rural and 32.5% urban (10).

Data on the incidence, prevalence and trends of breast cancer in Nova Scotia were obtained from *Canadian Cancer Statistics 2001* published by the Canadian Cancer Society and the National Cancer Institute of Canada in collaboration with Health Canada, Statistics Canada, provincial and territorial Cancer Register and university-based researchers (11).

A group of patients undergoing breast reconstruction by one of the plastic surgeons at Queen Elisabeth II Health Sciences Centre in Halifax between March 1997 and March 2002, was asked to fill out a questionnaire before the breast reconstruction surgery. They were asked questions like "What type of reconstruction do you think you would prefer?", "Why are you considering a breast reconstruction?", "When did you become aware that breast reconstruction is available?", "Have you already tried to get more information on breast reconstruction?", "What is your source of information?", "Did you find it easy to find information?" and "Are you satisfied with the information you found?" Twenty-eight patients completed the questionnaire.

As mentioned above, there is no separate code for immediate versus delayed reconstructive breast surgery in the MSI database.

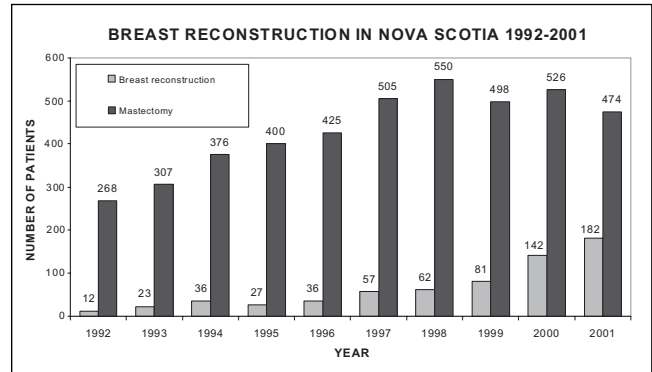


Figure 1 The number of breast reconstruction procedures were compared with simple, modified radical and radical mastectomies for each year of the study period. There is strong evidence of an increasing trend in the number of reconstructive surgeries among the women who underwent mastectomy (Cochran-Armitage Trend Test, $P < 0.0001$)

For that reason the authors could not study the trends of breast reconstruction surgery in Nova Scotia during the study period. To have an understanding of the current trend, 46 breast reconstruction procedures performed by one of the plastic surgeons at Queen Elisabeth II, Health Sciences Centre in Halifax over the past six years were studied.

STATISTICAL ANALYSIS

The authors used the Cochran-Armitage Trend Test, parametric for large samples and exact-nonparametric for small samples, to determine if significant differences in the rate of breast reconstruction exist between various years of the study. This test was also used to determine the trend of breast reconstruction surgeries, mastectomies and reduction mammoplasties as compared with the total number of breast procedures performed during the study period in Nova Scotia. The χ^2 test was used to determine if place of residency had an effect on the rate of breast reconstruction procedures. The Cochran Armitage Trend Test was also used to determine if there was a trend on immediate and delayed breast reconstruction procedures.

RESULTS

Figure 1 compares the number of simple, radical and modified radical mastectomies with breast reconstructive surgery for each year of the study period. To facilitate the comparison, the number of breast conserving procedures (lumpectomies and quadrantectomies) were excluded, because only a small number of these patients require reconstructive surgery.

There is strong evidence of an increasing trend in the number of reconstructive surgeries among the women who underwent mastectomy (Cochran Armitage Trend Test: two sided $P < 0.0001$, Statistic $Z = 13.4460$). The total number of reconstructive surgeries increased from 12 in 1992 to 182 in 2001 (an increase of 15-fold).

Figure 2 shows the four most common breast surgery procedures performed in Nova Scotia from 1992 to 2001. The number of breast reconstruction procedures had increased when expressed as a percentage of the total procedures ($P < 0.0001$, Statistic $Z = 15.05290$). The number of mastectomies had also increased when expressed as a percentage of the total procedures ($P < 0.0001$, Statistic $Z = 3.9173$), whereas the number of breast conserving procedures had not significantly changed

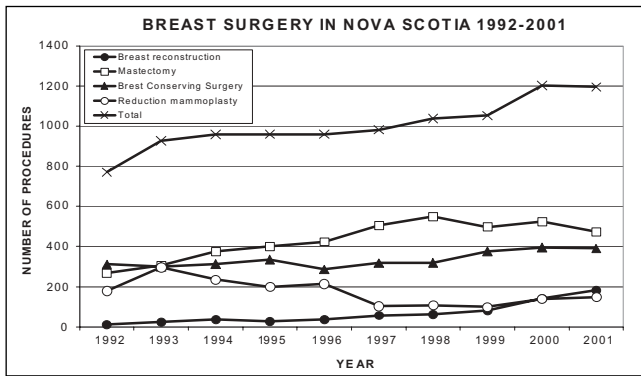


Figure 2) Three most common types of breast surgery procedures performed in Nova Scotia from 1992 to 2001. "Mastectomy" included simple, modified radical and radical mastectomies. The number of breast reconstruction procedures had increased when expressed as a percentage of total procedures ($P < 0.0001$). The number of mastectomies had also increased expressed as a percentage of the total procedures ($P < 0.0001$), whereas the number of reduction mammoplasties had decreased ($P < 0.0001$)

($P = 0.20$). Reduction mammoplasties had decreased ($P < 0.0001$, Statistic $Z = 13.6683$).

The total number of breast surgery procedures, including all mastectomies, reconstructions and reduction mammoplasties, increased from 771 procedures/year in 1992 to 1196 procedures/year in 2001 (an increase of 1.6-fold).

Figure 3 shows the age distribution of all breast surgery procedures. The number of breast conserving procedures, simple, radical or modified radical mastectomies peak in age group 50 to 59 years. Breast reconstruction procedures peak in the age group of 40 to 49 years. Reduction mammoplasties peak in the age group of 20 to 29 years.

Table 1 shows the population distribution for the province of Nova Scotia in 1996. Because the population of Nova Scotia had not changed significantly throughout the study period, it was assumed that the population distribution (urban versus rural) had not changed significantly as well.

Figure 4 shows the distribution of patients' places of residence for the province of Nova Scotia and three breast surgery procedures: breast reconstructions, mastectomies and reduction mammoplasties performed during the 10 year study period. In the MSI system, the urban area consists of the population of Halifax, Dartmouth and Sydney. On the other hand, Statistics Canada had amalgamated the population of Sydney into the Cape Breton area. Thus, the urban population in the Statistics Canada system was larger than in the MSI system. To determine if the place of residency plays a role in the decision to proceed with breast reconstructive surgery, the χ^2 test for independence was performed to assess whether reconstruction is independent of the place of residency. The distribution of breast reconstruction surgeries and mammoplasties was analyzed. The χ^2 test statistic was 6.04 ($P < 0.0140$), indicating that women in urban areas were undergoing more breast reconstructive surgeries than those in rural areas. The place of residency seems to play a role in patients' decisions to proceed with breast reconstruction surgery.

Twenty-eight patients, who underwent breast reconstructive surgery at Queen Elisabeth II Health Sciences Centre in

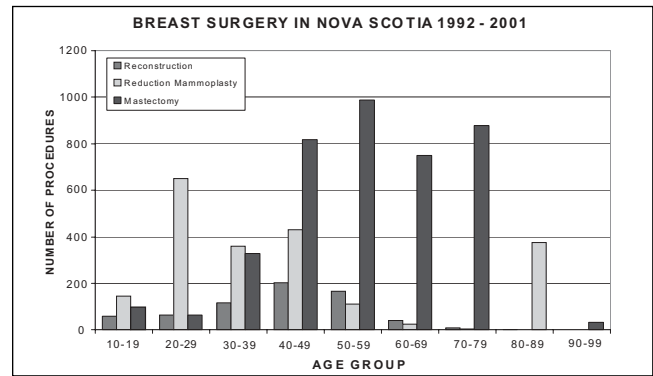


Figure 3) Age distribution (years) of breast surgery procedures in Nova Scotia. The mastectomy group includes simple, modified radical and radical mastectomies. The number of mastectomies peaks in the 50-59 age group, breast reconstruction procedures in the 40-49 age group and reduction mammoplasties in the 20-29 age group

TABLE 1
Nova Scotia population during the study period

Year	Population
1991	899, 900
1996	909, 282
1997	934, 500
1998	936, 100
1999	939, 700
2000	941, 200
2001	942,700
*2005	*947, 900

*Population projection for the year 2005. Data are obtained from Catalogue # 91/520, Table A3, P 147, as of July 1, 2005 (9)

Halifax between March 1997 and March 2002, filled out a questionnaire before breast reconstruction surgery. When asked when they became aware that breast reconstruction was available, 85% of the patients who had responded to this question in the questionnaire stated 'before mastectomy' and 15% indicated 'after mastectomy'. Fifty per cent of the patients had already tried to find additional information about breast reconstruction, 33% did not try to get more information and 27% of the patients did not answer this question. The most common sources of information were the internet (10 patients), family and friends (10 patients) and the surgeon (10 patients). The Canadian Cancer Society was used as a source of information in seven cases. Other sources of information included family physicians, support groups, books, breast cancer survivors and hospital staff. When asked what type of reconstruction they would prefer, most women (54%) did not know what was best for them, 25% preferred the TRAM flap, 11% preferred the breast saline implant and 7% preferred tissue expansion and saline implant. Before reconstruction surgery, most patients (85%) needed more information on the risks, complications and recovery after the surgical procedure.

The main reason for considering breast reconstruction cited by most patients (64%) was to have a body that 'looks normal'. Forty-three per cent sought reconstruction 'so they would not have to worry about their prostheses.

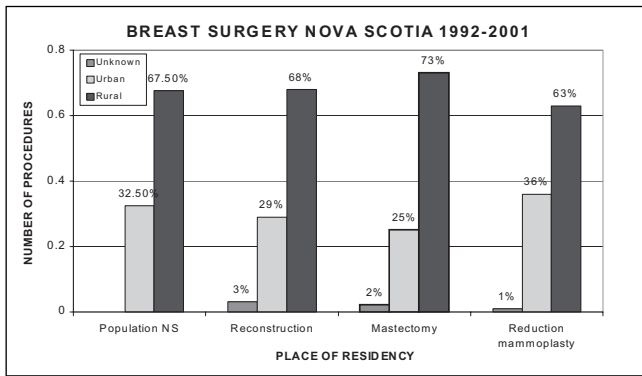


Figure 4) The distribution of patients' places of residency for the province of Nova Scotia and the three most common breast surgery procedures: breast reconstructions, mastectomies (including simple, radical and modified radical mastectomies) and reduction mammoplasties performed during the study period. The χ^2 test statistic was 6.0395 ($P < 0.0140$), indicating that the place of residency plays a role in patients' decisions to proceed with breast reconstruction surgery

Previous studies have indicated a trend towards immediate breast reconstruction procedures. Based on the MSI database, the authors were unable to determine the timing of mastectomy versus breast reconstruction. There was no code for immediate versus delayed procedures. It was decided to study breast reconstruction procedures performed by one of the plastic surgeons at the Queen Elisabeth II Health Sciences Centre in Halifax during the last six years of the study period (Figure 5). It was found that there was a statistically significant increase in the number of immediate breast reconstruction procedures performed (Cochran Armitage Trend Test (Exact Test) for trends, one sided $P < 0.0106$).

Finally, the data obtained from MSI were compared with the data of Cancer Care Nova Scotia to see if there was any difference between these two systems in terms of the number of breast procedures performed. Despite many limitations of the two data systems, they yielded similar data.

DISCUSSION

The rates of reconstruction surgery among breast cancer patients in the present study were similar to those reported by the American College of Plastic Surgeons and other studies (4,5,9,12). The increasing trend of breast reconstruction procedures as evidenced by the statistics of the American Society of Plastic Surgeons (4,5) continues despite the increasing use of breast conserving techniques (6-9). The number of breast reconstruction surgeries in Nova Scotia increased 15-fold during the study period, although the rate of mastectomies hadn't changed significantly since 1992. There is evidence of an increasing trend in the number of women who are undergoing mastectomy that are interested in breast reconstruction. We believe that the increased awareness of women undergoing mastectomy that breast reconstruction is available is the main contributing factor. Many general surgeons in Nova Scotia discuss possible breast reconstructions with women with breast cancer, who are facing mastectomy. If the patient decides that they would like to discuss reconstructive surgery, an appointment is made with a plastic surgeon, who provides the patient with information regarding the available breast reconstruction procedures.

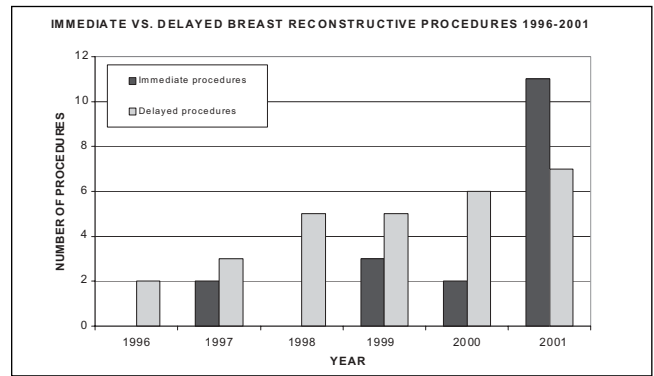


Figure 5) Immediate breast reconstructive procedures performed by one plastic surgeon during the last six years of the study period were compared with delayed procedures by the same surgeon. There was a statistically significant increase in the rate of immediate breast reconstruction during the study period (Cochran-Armitage Trend Test, Exact Test, one sided $P < 0.01$)

Most patients (85%) who had completed a questionnaire at the time of the initial consultation became aware of breast reconstructive procedures before the mastectomy. The internet, family and friends, and the plastic surgeon were the most common sources of information. The Canadian Cancer Society, the family physician and support groups played an important role in providing breast cancer patients with information on breast reconstructive surgery. Even though health care professionals provided oral and written information on breast reconstruction, the patients still need more information (50%). Despite several sources of information, 54% of the women in our study did not know what type of procedure was best for them. Although they decided to pursue breast reconstruction, 85% of the women were still concerned about the risks, complications and recovery after surgery. Other concerns expressed included the final results and the impact of reconstruction on detecting cancer in the remaining breast. Better information on these aspects of breast reconstruction may encourage more women to proceed with breast reconstruction and, thus, further increase the number of reconstructive surgeries in Nova Scotia in the future.

During the past two decades, improved techniques of breast reconstruction have increased patients' satisfaction with the cosmetic results of surgery (4,13-17). Contant et al (14) evaluated satisfaction with the surgery in 103 women who were treated with mastectomy followed by immediate breast reconstruction with submuscular silicone prostheses. Seventy per cent of these women were satisfied with the reconstruction and 95% of the patients would recommend the procedure to others. Similarly, Andrade et al (18) studied 206 women who underwent breast reconstruction; the vast majority (88.8%) indicated that they were satisfied with the results of the treatment. Breast reconstruction is now thought to be an important component of the restoration and rehabilitation process in the treatment of breast cancer. Women are able to take part in various activities such as swimming and other sports without fear of embarrassment (2-4,17). The women's social lives improves significantly, and they regain their confidence.

The present study demonstrated a negative association between place of residency (urban versus rural) and the deci-

sion of women to pursue breast reconstruction, suggesting that women in urban areas have more breast reconstruction surgeries than those in rural environments. Place of residence may play a role in a woman's decision to proceed with breast reconstruction surgery. This may be due to either a difference in the availability of breast reconstruction in rural areas or to the extent of perioperative education at the time of the mastectomy. Better education of women in rural areas regarding breast reconstruction surgery may lead to a further increase in number of breast reconstructions performed in Nova Scotia in years to come.

The strong association between reconstruction and young age may reflect differences in patients' attitudes about breast loss, appearance, differences in surgeons' recommendations and/or the prevalence of comorbidity, that may affect the decision about reconstructive surgery. The present study, as well as other studies (13,19,20), showed that the age of the patient affects the decision to proceed with breast reconstruction, and that those women who seek breast reconstruction tend to be younger than women undergoing mastectomy in general. However, recent technical innovations have decreased mortality and made reconstruction an increasingly acceptable option for elderly women (13).

In the present study, the motivation for breast reconstruction included the perceived need to restore feeling of wholeness, to avoid disfigurement and to avoid the use of an external prosthesis. These results are similar to those previously reported in the literature (21-23). The current trend in breast reconstruction surgery is towards immediate procedures (24). The present study showed that in the province of Nova Scotia, there is also a trend towards immediate surgery. Immediate reconstruction appears to be advantageous over delayed procedures on the basis of improved cost effectiveness, faster recovery and reduced inconvenience for the patient. A request for immediate reconstruction is now considered indicative of positive adjustment to the diagnosis and is therefore thought to offer greater psychological benefits (23,25). In our study, the main reason for choosing immediate reconstruction was to avoid a second operation. The main reason for not proceeding with immediate breast reconstruction was the fear of cancer recurrence.

Morrow et al (24) studied factors influencing the use of postmastectomy breast reconstruction using the American National Cancer Data Base. The authors concluded that breast reconstruction is an underused option in breast cancer management. Handel et al (13) studied 245 women who had undergone a mastectomy. Only 45% of them had breast reconstruction after mastectomy, although 80% of the women had been given written materials about reconstruction, 58% reported having viewed a videotape on the subject and 39% had visited other patients who had undergone reconstruction.

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Bostwick (26) reported that the availability of breast reconstruction was limited by the availability of a breast management team, including an oncological surgeon and a plastic surgeon. Increasing the availability of such teams may further increase the availability of breast reconstruction in the province of Nova Scotia.

The National Cancer Institute of Canada estimated that approximately 670 new cases of breast cancer would be diagnosed in Nova Scotia in 2001 (11). The actual breast cancer incidence among Canadian women levelled off in 1993 and hasn't changed significantly since then. It is expected that the high incidence rate of breast cancer will continue. The Nova Scotia population projection for 2005 estimates a small but constant increase in the population of this province (10). Considering all these factors, we believe that the number of breast reconstruction surgeries will continue to increase in the coming years.

The main limitation of the present study is the data collected from Maritime Medical Care Incorporated (MSI). These data are collected for the purpose of payment and not for research (secondary use of the database). The degree of detail that could be obtained from this system is directly dependant on the quality of information contained in the claims submitted by physicians for payment. For example, there is no separate code for immediate versus delayed reconstructions or TRAM flaps versus latissimus dorsi flaps. There are differences between the surgeons regarding the interpretation of the coding system. Data from Health Information Services in Halifax, including the Discharge Abstract Database, suffer from the same problems. Originally, they were not collected for research purposes but rather to understand the volume of activities in the hospital. However, because MSI is a payment system, these data are believed to be highly accurate in terms of number of procedures performed.

CONCLUSION

In the Nova Scotia region, like other regions of North America and Europe, there is a significant increase in the number of women who are making the decision to proceed with breast reconstruction after a mastectomy, either as a delayed or immediate procedure. Health sector employees must be aware of the increased demand for breast reconstruction surgery and determine if the breast reconstructive services that are currently offered in our province are adequate to meet the increasing needs of this population for breast reconstructive procedures.

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