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ORIGINAL ARTICLE

A Study on the Performance of Breast One-Stop Clinic in Queen Elizabeth Hospital

WSE Fok, WL Poon, KM Chu, CY Lee, CW Lee, KS Tse, WC Wai, LF Chiu

Department of Radiology and Imaging, Queen Elizabeth Hospital, 30 Gascoigne Road, Hong Kong

ABSTRACT

Objectives: *To evaluate the breast One-Stop Clinic (OSC) performance in Queen Elizabeth Hospital from December 2011 to November 2012.*

Methods: *Patient attendances and clinical data were retrieved from the hospital computer database. Data of patients attending the OSC (the OSC group) were compared with those of a control group attending the regular surgical breast clinic (the non-OSC group). Binary logistic regression was performed to determine the association between a short symptom-to-operation time (within 6 weeks) and the type of clinic attended (OSC or non-OSC), adjusting for patient's age, symptomatology, and history of contralateral breast cancer. Statistical significance was set at 5%.*

Results: *A total of 850 patient attendances were reviewed. Cancer detection rates for the OSC and non-OSC groups were 42.7% and 12.1%, respectively. The proportions of patients with a short symptom-to-operation time in the OSC and non-OSC groups were 12.4% and 3.4%, respectively. The OSC group was 22 times more likely to have a short symptom-to-operation time than the non-OSC group ($p < 0.05$), independent of age, symptomatology, and history of contralateral breast cancer.*

Conclusion: *The OSC is an effective clinical pathway to identify symptomatic patients for timely operation.*

Key Words: *Biopsy, needle; Breast neoplasms; Mammography; Ultrasonography*

中文摘要

伊利沙伯醫院內一站式乳房診所的一項研究

霍泳珊、潘偉麟、朱嘉敏、李俊賢、李昭穎、謝健燊、衞頴莊、趙朗峰

目的：評估2011年12月至2012年11月期間伊利沙伯醫院內一站式乳房診所（OSC）的表現。

方法：從醫院電腦數據庫中抽取就診人次和其臨床數據。比較到一站式診所（OSC組）和定期到乳房外科診所（非OSC組，即對照組）就診的病人數據。在調整患者年齡、症狀和對側乳腺癌的病史後，使用二元邏輯回歸判斷「症狀至手術」短時間間隔（即6個星期內）與診所類別（即OSC或非OSC）的關係。統計顯著性水平設定為5%。

結果：共回顧850例就診病人。癌症檢出率分別為：OSC組42.7%，非OSC組12.1%。從症狀出現至手

Correspondence: *Dr WSE Fok, Department of Radiology and Imaging, Queen Elizabeth Hospital, 30 Gascoigne Road, Hong Kong. Tel: (852) 2958 2881; Email: elainefokws@gmail.com*

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術時間為6個星期內的，OSC組有12.4%，非OSC組有3.4%；OSC組比非OSC組的比率高出22倍（$p < 0.05$），這與年齡、症狀和對側乳腺癌的病史無關。

結論：一站式診所是確診具症狀的乳腺癌患者並能及時進行手術的有效臨床途徑。

INTRODUCTION

Breast cancer has been the leading malignancy in Hong Kong women since the 1990s, and its incidence has been escalating.[1] Unfortunately, the provision of breast services within the public sector is variable, and patients often undergo multiple consultations before being given the final diagnosis and treatment options. Long waiting time for imaging and biopsy after the initial clinical assessment poses other sources of delay in the management of breast cancer.

In the UK, the introduction of the One-Stop Clinic (OSC) in the 1990s has streamlined the triple assessment process (combination of clinical examination, imaging, and cytopathological analysis) in patients with suspected breast cancer by reducing the number of pre-diagnostic visits (Figure 1). Previous studies have shown that "one-stop" symptomatic breast clinics were able to relieve patient anxiety[2] and optimise the use of resources.[3]

In Hong Kong, OSC was first introduced in 2008, wherein patients were assessed by surgeons in the morning and referred to radiologists for breast imaging and biopsy in the same afternoon.[4] It was shown to be important for patient care, with a reduced median time interval between the first surgical consultation and operation when compared with a historical cohort.[4]

In December 2011, Queen Elizabeth Hospital also established an OSC that operated in a similar fashion within the hospital premises. The clinic aims to streamline investigation procedures for patients with breast cancer to facilitate timely surgical treatment.

While it is impossible to measure the true effectiveness of OSC by means of patient survival, we chose symptom-to-operation time as a surrogate marker. The symptom-to-operation time for each patient may, however, be influenced by the surgeon's degree of clinical suspicion for cancer and consideration of factors such as age, symptomatology, and history of contralateral breast cancer. This study aimed to determine the effectiveness of OSC with consideration of such clinical factors.

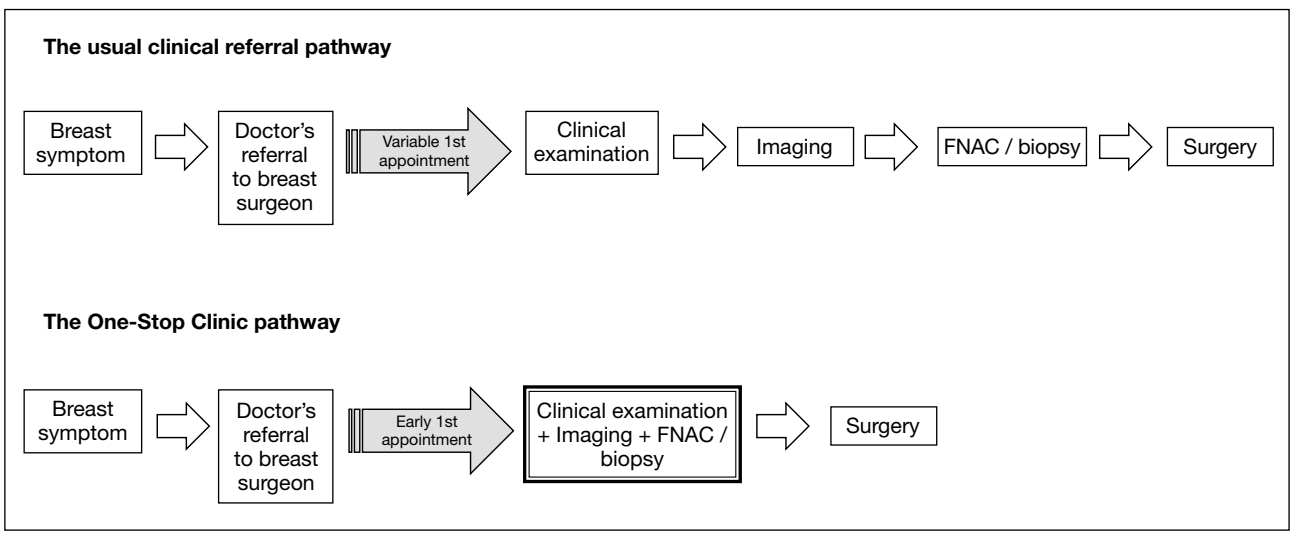

Figure 1. The usual clinical referral pathway of patients with suspected breast cancer (above) and the One-Stop Clinic pathway (below). Patients in One-Stop Clinic pathway will have shorter symptom-to-operation time due to shorter appointment waiting time and reduced number of clinical visits.
Abbreviation: FNAC = fine-needle aspiration cytology.

METHODS

This was a retrospective case-control study designed to evaluate the performance of the breast OSC at the Queen Elizabeth Hospital in Hong Kong from December 2011 to November 2012. The study was approved by the institutional ethics board, and patient consent was waived because of the retrospective nature.

New patient referrals to OSC were accepted if any one of the following criteria was satisfied: breast mass detected at the age of 40 years or above; suspicious findings at breast imaging; bloody nipple discharge; and suspicious nipple abnormality (deformity or ulceration). A clerical staff member was responsible for initial case selection according to the given criteria. A specialist breast surgeon was responsible for double-checking the selected cases and providing the clinical consultation. A maximum quota of six cases per week was set for OSC, which was scheduled on consecutive Thursdays for logistic purposes. All patients attending OSC were examined by the specialist breast surgeon in the morning and referred to the radiologist in the same afternoon for breast imaging with or without biopsy (Figure 2). All patients received mammography, comprising standard mediolateral oblique and craniocaudal views, and supplementary views as required by the radiologist, and high-resolution ultrasound with colour Doppler. All suspicious masses detected by breast imaging underwent ultrasound-guided fine-needle aspiration cytology or automated core biopsy by the radiologist in the same session. If a suspicious lesion was visible by mammography but could not be detected by ultrasound, early stereotactic biopsy would be arranged. Patients with a high clinical suspicion of cancer were scheduled for a follow-up consultation 1 week after the initial consultation, while patients with a lower clinical suspicion were followed up after 2 to 4 weeks. The results of all breast imaging examinations and biopsies were available at the follow-up consultation.

All patient attendances at the OSC within the review period were retrieved by the Radiological Information System and further clinical information was extracted through the electronic Patient Record interface. Demographic data of patients attending OSC (OSC/case group) were compared with those of another group of patients who attended the regular surgical breast clinic and were referred for biopsy sessions (non-OSC/control group) within the same period. If patients in this group were found to have high clinical suspicion of cancer after surgeon's assessment, an ultra-early imaging and biopsy session would be arranged within 2 weeks on a separate day. Patients referred from specialties other than surgery (to control for variables related to the referral source) and patients attending these biopsy sessions for mammotome excision or hookwire localisation (who already had a histological diagnosis of breast cancer) were excluded from the control group.

All patients who were diagnosed with breast cancer and surgically treated were selected for further statistical analysis. Parameters including age, presenting symptoms, history of contralateral breast cancer, type of clinic attended (OSC or non-OSC), and the duration from symptom onset to operation were recorded. Those with incomplete data on clinical notes on electronic Patient Record were excluded (Figure 3).

A short symptom-to-operation time was defined as 6 weeks or less. Student's *t*-test was used for numerical variables for univariate analysis. Binary logistic regression was performed to determine the association between a short symptom-to-operation time and the type of clinic attended (OSC or non-OSC), with age, symptomatology, and history of contralateral breast cancer as covariates. The level of statistical significance was set at 5%. All statistical calculations were performed using the Statistical Package for the Social

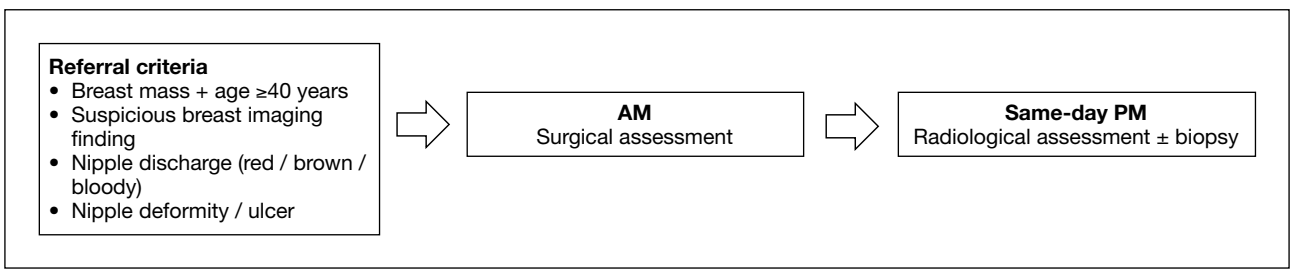

Figure 2. Workflow of One-Stop Clinic setting in Queen Elizabeth Hospital.

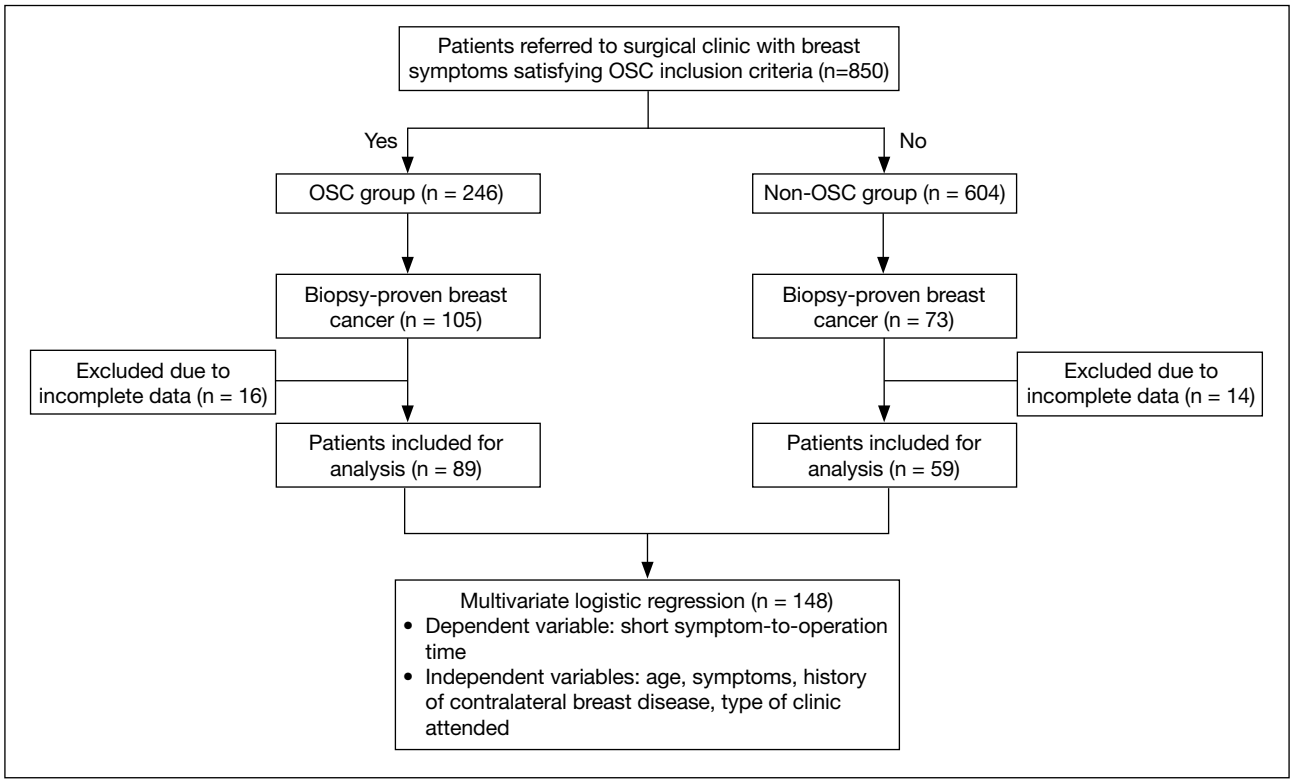

Figure 3. Study design.
Abbreviation: OSC = One-Stop Clinic.

Sciences (Windows version 16.0; SPSS Inc, Chicago [IL], US) software.

RESULTS

A total of 850 patient attendances were reviewed, including 246 patients from the OSC group and 604 patients from the non-OSC group. The mean age at presentation for the OSC group was 50 (range, 28-83) years while that for non-OSC group was 42 (range, 16-89) years. There was a statistically significant difference in age between the two groups ($p < 0.05$). No statistically significant difference was observed between the two groups in terms of family history ($p = 0.086$), smoking history ($p = 0.441$), and history of private consultation ($p = 0.846$). The patient demographic profiles are shown in Table 1.

The clinical presentation, location, and clinical diagnosis of attending patients in both groups are shown in Table 2. Breast lump was the major indication for referral in both groups. There was a higher percentage of clinically diagnosed or suspected breast cancer in the OSC group as compared with the non-OSC group. Laterality of the symptomatic breast was not significantly different

Table 1. Patient demographics in the One-Stop Clinic (OSC) and non-OSC groups.

Demographics	No. (%) of patients	
	OSC group	Non-OSC group
Gender		
Female	242 (98)	581 (96)
Male	4 (2)	23 (4)
Age-group (years)		
10-19	0 (0)	7 (1)
20-29	5 (2)	42 (7)
30-39	11 (4)	115 (19)
40-49	78 (32)	184 (30)
50-59	82 (33)	141 (23)
60-69	32 (13)	65 (11)
70-79	20 (8)	32 (5)
≥80	18 (7)	18 (3)
Family history of breast cancer		
Yes	22 (9)	62 (10)
History of previous breast cancer		
Yes	6 (2)	47 (8)
Symptom duration*		
<6 weeks	115 (48)	181 (32)
6-12 weeks	39 (16)	88 (15)
12-26 weeks	20 (8)	80 (14)
26-52 weeks	17 (7)	64 (11)
1-2 year(s)	16 (7)	77 (14)
>2 years	31 (13)	78 (14)

* 8 cases from OSC group and 36 cases from non-OSC group were excluded due to missing data.

between the two groups. All suspicious lesions detected on breast imaging in the review period underwent biopsy under ultrasound guidance.

Table 2. Clinical presentation, tumour location, and clinical diagnosis of attending patients.

	No. (%) of patients	
	OSC group (n=246)	Non-OSC group (n=604)
Clinical presentation		
Lump	196 (80)	422 (70)
Discharge	21 (9)	19 (3)
Pain	7 (3)	39 (6)
Abnormal imaging	22 (9)	124 (21)
Location		
Right breast	123 (50)	255 (42)
Left breast	115 (47)	257 (43)
Both breasts	7 (3)	68 (11)
Right axilla	0 (0)	11 (2)
Left axilla	1 (0.4)	12 (2)
Both axillae	0 (0)	1 (0)
Clinical diagnosis		
Breast cancer	45 (18)	16 (3)
Suspected breast cancer	45 (18)	40 (7)
Probably benign breast lesion	41 (17)	126 (21)
Indeterminate breast lesion	115 (47)	422 (70)

Abbreviation: OSC = One-Stop Clinic.

Table 3. Cancer detection rate in the OSC and non-OSC groups.

	OSC group (n=246)	Non-OSC group (n=604)
No. of confirmed cancer cases	105	73
Positive cancer detection rate	42.7%	12.1%

Abbreviation: OSC = One-Stop Clinic.

The cancer detection rates for the OSC and non-OSC groups were 42.7% and 12.1%, respectively (Table 3). A total of 178 patients were diagnosed with breast cancer and operated on. Overall, 148 patients were selected for further analysis while 30 cases were excluded due to incomplete data. The proportions of patients with short symptom-to-operation time (within 6 weeks) for the OSC and non-OSC groups were 12.4% and 3.4%, respectively (Table 4).

Following multivariate analysis, patients who attended the OSC were shown to be 22 times more likely to have a short symptom-to-operation time (within 6 weeks) than those who attended the regular surgical breast clinic ($p < 0.05$), independent of their age, symptomatology, and history of contralateral breast cancer (Table 5).

Table 6 shows the stage and clinical outcome of patients in both groups who were diagnosed with breast cancer. There was a higher percentage of patients with advanced stage cancer (stage III or above) in the OSC group as compared with the non-OSC group. Binary logistic regression was used to assess the likelihood of identifying advanced stage breast cancer in OSC but statistical significance was not reached ($p = 0.14$).

DISCUSSION

Under the current practice in public hospitals, patients are prioritised for assessment according to the level of clinical suspicion for breast cancer. However, as there is significant overlap of clinical presentations between patients with breast cancer and those with benign

Table 4. Percentage of patients with short symptom-to-operation time.

	OSC group	Non-OSC group
Total No. of cases	89	59
No. of cases with short symptom-to-operation time (<6 weeks)	11 (12.4%)	2 (3.4%)
Reasons for non-eligibility for curative surgery with unavailable operation date (n=30)		
Locally advanced tumour with plan for neoadjuvant therapy before operation	3	1
Inoperable tumour	7	5
Patients defaulted follow-up / refused operation	6	4
Death before operation	0	1
Atypical biopsy result: lymphoma	0	3

Abbreviation: OSC = One-Stop Clinic.

Table 5. Multivariate analysis of factors associated with a short symptom-to-operation time.

	B value	Exp (B) / adjusted odds ratio	p Value
Type of clinic (OSC vs. non-OSC)	3.098	22.158	0.042

Abbreviation: OSC = One-Stop Clinic.

Table 6. Outcomes of patients in the OSC and non-OSC groups.

Outcome	No. (%) of patients	
	OSC group	Non-OSC group
Breast cancer staging	(n = 105)	(n = 65)*
0	7 (7)	12 (18)
I	34 (32)	20 (31)
II	37 (35)	22 (34)
III	22 (21)	7 (11)
IV	5 (5)	4 (6)
Subsequent follow-up	(n = 246)	(n = 604)
Breast cancer follow-up	96 (39)	78 (13)
Palliative / neoadjuvant treatment	14 (6)	13 (2)
Routine follow-up	76 (31)	375 (62)
Discharge / follow-up by breast nurse	46 (19)	123 (20)
Others	14 (6)	15 (2)

Abbreviation: OSC = One-Stop Clinic.

* 8 cases from non-OSC group were excluded from staging due to missing data.

conditions, imaging and histology are frequently needed for establishing the diagnosis and planning subsequent treatment.

In the pathway of breast cancer treatment, there are multiple time events between self-detected symptom to operation:

(1) Time from symptom onset to specialty referral — which depends on individual patient's decision;
(2) Time from referral letter to first specialty consultation — which depends on the referral letter and subsequent prioritisation;
(3) Time from first consultation to diagnosis — which depends on the time to imaging and biopsy service; and
(4) Time from diagnosis to operation / treatment — which depends on resources of the operating theatre.

When compared with historical cohort, patients entering our OSC had significantly fewer number of consultations before surgery, and a shorter duration from first attendance to surgery.[5] With provision of OSC, patients with high risk (satisfying the selection criteria) can have earlier first specialty consultation and same-day imaging assessment, facilitating cancer diagnosis and subsequent treatment.

The OSC model currently employed in local public hospitals, as applies to both United Christian Hospital and Queen Elizabeth Hospital, can be more accurately described as a fast-track breast imaging and biopsy service for suspected breast cancer patients. It is inherently different from the concept of a 'true' one-stop breast clinic used in the UK which enables surgical consultation, breast imaging and biopsy, cytopathological evaluation by fine-needle aspiration, and disclosure of diagnosis and treatment all in the same visit.[4] Such an arrangement requires significantly closer collaboration among surgeons, radiologists, pathologists and breast care nursing specialists, and requires a stronger commitment of resources at greater financial and manpower costs. Furthermore, feasibility of such a 'true' OSC is limited in our local setting where the standard of diagnosis is tissue histology, which requires more time for tissue preparation and interpretation compared with cytology. Our current OSC setup entails limited additional resources and is a reasonable compromise.

The non-OSC group of patients (surgically referred patients for imaging and biopsy) is a representative sample of patients undergoing the regular clinical pathway in local public hospitals. As this patient group was also assessed by the same team of breast surgeons as the OSC group during the review period, we believe it is a reasonable control group despite demographic differences resulting from the use of selection criteria for entry to OSC.

The significance of our study results is two-fold. First, in terms of cancer detection rate, our OSC is able to identify a significantly higher percentage of patients with breast cancer compared with the control group (42.7% vs. 12.1%), and compares favourably with other clinics of similar nature in published literature (with a cancer detection rate in the range of 10%-36%).[4,6,7] This implies that the selection criteria of (1) breast mass detected at an age of 40 years or above, (2) suspicious findings at breast imaging, (3) bloody nipple discharge, and (4) suspicious nipple abnormality (deformity or ulceration), are effective in selecting the high-risk group for early management in the OSC.

Second, our study demonstrated that patients attending the OSC are 22 times more likely to have a short symptom-to-operation time compared with the control group, independent of the patient's age, symptomatology, and history of contralateral breast cancer. In the available literature, the efficacy of breast OSCs is often measured in terms of waiting time[8] or

reduction in patient's anxiety level assessed by means of questionnaires.[4,8,9] Although we are unable to measure the true effectiveness of the OSC pathway by means of improved patient survival,[10] we believe that a shorter time to definitive surgical treatment is a close surrogate marker for such, and our study provides additional supportive evidence for efficiency of the OSC.

In this study, we found that a significant number of cancer patients are not eligible for curative surgery and these cases were subsequently excluded from further analysis. If we could obtain data for symptom onset-to-treatment (including surgery or chemotherapy) time instead of symptom-to-operation time, we could have included these patients. Unfortunately we were unable to obtain these data due to the retrospective nature of data collection.

Furthermore, due to the retrospective nature of this study, we were unable to measure differences in psychosocial outcomes between the OSC and non-OSC groups, such as estimates of anxiety level by means of questionnaires, which are also important indicators of effectiveness for OSCs.[10]

The lower, yet significant, cancer detection rate (12.1%) in the non-OSC group means that a significant percentage of cancer patients are not selected. By further evaluation and revision of the inclusion criteria, we may be able to include more high-risk patients to the faster, more effective OSC pathway. This is a potential area of improvement in our OSC pathway.

CONCLUSION

Our OSC provides an effective clinical pathway to identify symptomatic patients for timely diagnosis and surgical treatment by producing a significant reduction in symptom-to-operation times. This reduction is independent of clinical factors such as patient's age, symptomatology, and history of contralateral breast cancer.

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