

The Mastectomy Clinical Pathway: What Has It Achieved?

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Abstract

Introduction: The mastectomy clinical pathway was developed to optimise the clinical care and cost management of breast cancer patients. The aim of this study was to prospectively assess the effect of the mastectomy pathway at the National University Hospital, Singapore over a 7-month period. **Materials and Methods:** A prospective study was carried out on all breast cancer patients admitted for elective mastectomy between March and October 2001. As surrogates of optimised cost and care management, the length of stay and hospital costs, as well as the incidence of complications and unscheduled readmissions, were analysed. Non-pathway mastectomy patients treated from March to October 2000 were used as controls. A total of 83 patients who underwent mastectomy formed the pathway group, while 69 non-pathway patients acted as controls. **Results:** Compared to controls, the mean length of hospital stay decreased significantly from 4.91 days to 4.10 days ($P = 0.018$) and the mean cost per case decreased significantly from \$5,050 to \$4,406 ($P = 0.014$) for those in the pathway group. There were no significant differences in the complications and unscheduled hospital readmission rates between the two groups ($P > 0.05$). **Conclusion:** The implementation of mastectomy clinical pathway has improved consistency in patient's treatment, the quality of patient outcome, and has reduced the costs of care and length of hospital stay. In addition, variance analysis of the mastectomy pathway has shown to be valuable for problem identification to improve patient care.

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Key words: Breast cancer, Cost of care, Length of hospital stay, Problem identification, Quality of care, Surgical treatment

Introduction

In an era of increasing healthcare cost and scarce resources, the tension between the cost and quality of healthcare demands not only effective but also cost-efficient healthcare systems.

The clinical pathway is a tool that has been used to respond to the increasing emphasis to contain cost, reduce practice pattern variability and improve quality. Also known as the critical pathway, it is developed to define "best" practices and then to outline timetables for adaptation of these tasks.¹ It has been reported that as a result of effective pathway implementation, shorter hospitalisation, increased efficiency of care delivery, decreased costs, increased patient satisfaction and enhanced quality of care can be achieved.²⁻⁶

Breast cancer is the leading cancer among women in Singapore today.⁷ For the 5-year period between 1993 and 1997, the Singapore Cancer Registry recorded that 3574 women had cancer of the breast, with a crude annual incidence rate of 47.6 per 100,000. Due to the large majority of patients with newly diagnosed breast cancer requiring surgical therapy, the savings realised by optimising in-hospital management after initial surgery can be substantial.^{8,9} In particular, breast cancer patients are considered especially suitable for shorter stays in hospital because they are generally in good health and recovery after surgery is usually rapid, despite the diagnosis of a life-threatening disease.^{10,11}

Postoperative management of patients after breast surgery is evolving. Large, randomised studies suggest

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that early discharge with a drain in place results in no more complications compared to a longer stay in the hospital.¹²⁻¹⁴ Moreover, patients reported greater satisfaction, with no major differences in psychological morbidity.^{10,15} In addition, the reduction of the length of hospital stay has resulted in increased efficiency in resource utilisation and reduction in costs without affecting patient care.^{8,9,16,17}

Although positive examples of such evidence-based improvements in healthcare abound elsewhere, differences in cultural perspectives and patient expectations may limit their application in Singapore.

The aims of this study were to analyse the impact of the pathway on length of stay and costs per case, and to evaluate if this would lead to a compromise in clinical care, the incidence of complications and unscheduled readmissions.

Patients and Methods

Pathway Development and Implementation

The development of the pathway was carried out by a multidisciplinary team consisting of breast and reconstructive surgeons, a specialist breast care nurse, nursing officers, physiotherapists and a case manager.

A comprehensive and critical literature review of recommended standards of care from published trials and clinical guidelines^{10-14,18,19} was conducted by the multidisciplinary team prior to the development of the pathway. Having defined existing practices and appropriateness of care based on “best practice”, a mastectomy pathway was designed; the principal focus of which was to standardise the pre- and postoperative phases of care delivery. Early postoperative discharge was integrated into the pathway to reduce practice variation, promote quality and decrease length of stay. This was defined as discharge by the 4th postoperative day (POD).

The pathway was initiated when the patient was listed for surgery in the outpatient clinic. A central tenet of the pathway was patient education. The pathway defined which members of the breast team were to be involved in each point of contact with the patient and her relatives, and the topics to be covered. Patient education started at the time of initial consultation with the surgeons at consent for operation. This usually consisted of information regarding the immediate postoperative period, and the possibility of early discharge if preparations can be made by care givers. The breast care sister was involved from the start of this process and maintained contact with the patient and her relatives until the time of admission. In particular, pathway patients were encouraged to ambulate early after awakening from anaesthesia and were informed that discharge would be as soon as they began eating, were ambulatory, capable of appropriate drain and wound care, and had adequate

pain control with no special nursing care requirements. Patients were informed that physiotherapy for arm mobilisation was started on the 1st POD and progressively made more vigorous on the 2nd POD until the patient had near normal arm movement at discharge. All cases would be reviewed by the breast care sister and the primary surgeon to ensure these requirements were met before discharge. Prior to surgery, the second contact was made which consisted of reviewing the preoperative investigations with the patient and again reinforcing the possibility of early discharge. The breast care sister also provided practical instructions in drain and wound care.

All aspects of care were addressed in the pathway, including preoperative laboratory studies and investigations, postoperative pain medication, intravenous fluid replacement, drain and wound management, arm exercise, patient education, psychosocial support services, discharge planning, discharge instructions and follow-up care. Incorporation of pathway content into customised documentation avoided duplication on the part of the medical and nursing staff, and improved compliance. This consisted of a time-based standardised set of ordered changes, which started at the preoperative consultation until the 4th POD (Fig. 1). In addition, a specific variance collection form was designed for analysis of unexpected events that lead to deviation from the mastectomy pathway.^{20,21}

The case manager conducted training sessions for staff on the use of the pathway before rolling-out in January 2001. Two months allowance served as a pilot period for staff education and refinement of the pathway. Full implementation of the mastectomy clinical pathway was on March 2001.

Pathway Evaluation

A prospective study was carried out on all breast cancer patients admitted for elective surgery and put on the mastectomy clinical pathway between March and October 2001. Exclusion criteria were: 1) patients with bilateral mastectomy; 2) patients who were admitted for other unrelated clinical conditions, but underwent mastectomy in the same episode of hospitalisation; and 3) mastectomy with any form of immediate breast reconstructions. Controls consisted of a historical cohort of non-pathway mastectomy patients treated from March to October 2000.

The major outcomes of interest were length of stay, total hospital charges, postoperative complications occurring within 30 days of surgery and unscheduled readmissions within 15 days. In addition, variances from the pathway were also analysed to identify areas where repeated failures in achieving pathway standards occurred, and measures taken to correct such shortcomings.

National University Hospital
Clinical Pathway for Mastectomy (with or without Axillary Clearance)

F1 - 21

Treatment And Progress Notes	UNIT	WARD	BED	Pre-OP Assessment (Clinic & Ward)	Pt's Label

Doctor's Orders		Nurse's Note			
Clinic Investigation	Treatment	Activity / Education	AM	PM	ND
Symptomatic Diagnostic Inx (to trace): ☐ FNAC ☐ Core-cut Biopsy ☐ Ex Biopsy ☐ Mammography ☐ Ultrasonography ☐ MRI Screen Detected: ☐ DDI appt for Hook wire Guided Biopsy Pre-op Inx: • Renal panel • FBC ☐ GXM 2 Units PCT ☐ ECG ☐ CXR ☐ Others:	Referrals: • Refer Breast Care Nurse ☐ Refer MSW ☐ Refer _____ Consult: ☐ Physician ☐ Anaesthetist ☐ _____ • Check operation consent • Check PAT results • Check X-ray films available • Check histology report available • Operation site marked • NBM night before operation ☐ Obtain mastectomy vest ☐ No injection, blood pressure & blood taking over affected arm (for patient with Axillary Clearance)	• Referrals signed and faxed • Ensure all investigation results & X-rays available and noted by doctor • Identify patient discharge needs and destination • Consent is up • Operation Theatre chit faxed • NBM instructed ☐ Mastectomy vest measured & ordered Educate patient on: • Nature of operation • Pre-op preparation • Anaesthesia • IV Drip / tube / drain • Wound • Pain Management • Fluids and Diet • Ambulation			
Dr's signature: _____	Dr's signature: _____	AM: _____ Signatures: PM: _____ ND: _____			

Legend: • = must complete the action ☐ = ✓ according pt's condition

Fig. 1. Preoperative assessment of mastectomy clinical pathway.

Statistical significance was assessed to determine whether any significant differences existed between the pathway patients and the non-pathway patients on characteristics that may affect outcomes. A comparison of the prevalence of concomitant chronic disease and patient class were analysed by using chi-square test. Difference in patient age was assessed by independent *t*-test. To identify changes in the dependent variables of interest, two-sided *t*-tests were used to compare length of stay and hospital charges. Differences in complication rates and unscheduled readmission rates were analysed by utilising Pearson's chi-square test and Fisher's exact test, respectively. For all statistical tests, *P* values less than or equal to 0.05 were considered statistically significant.

Results

A total of 83 patients who underwent mastectomy from March to October 2001 were included in the pathway group and 69 patients who underwent mastectomy from March through October 2000 constituted the historical controls. There was no statistically significant difference in the average age between both groups, nor were there any

differences in the prevalence of concomitant chronic disease or patient class that may have altered the length of postoperative stay ($P > 0.050$). The average age of patients before pathway implementation was 53.59 years (SD, 12.83 years), and 50.45 years (SD, 11.10 years) after pathway implementation (Table I).

After the implementation of clinical pathway, the average length of stay decreased significantly from 4.91 days to 4.10 days ($P = 0.018$). The average cost per case decreased significantly from \$5,050 to \$4,406 ($P = 0.014$) (Table II).

Table III represents the complication rates and unscheduled readmissions before and after implementation of pathway. Unscheduled readmissions were defined as readmission for the same or a related condition that was not scheduled at the time of the previous discharge.²² There were 3 readmissions in the pathway group: 2 patients were readmitted because of an infected seroma and 1 patient had post-mastectomy fever and was readmitted for investigation. Two readmissions were observed in the non-pathway group because of post-mastectomy fever. There were no

TABLE I: SUMMARY INDICES OF STUDY AND COMPARISON GROUPS

Variable	Before pathway (%)	After pathway (%)	Level of significance
No. of patients	69	83	
Mean age (y)	53.59	50.45	$P = 0.112$
Patient class			
A	19 (27.5)	12 (14.5)	
B1	11 (15.9)	9 (10.8)	
B2	29 (42.0)	42 (50.6)	$P = 0.148$
B2+	8 (11.6)	18 (21.7)	
C	2 (2.9)	2 (2.4)	
Co-morbidities			
Hypertension	11 (15.9)	21 (25.3)	$P = 0.159$
Diabetes mellitus	6 (8.7)	7 (8.4)	$P = 0.954$

significant differences in the complication rates and unscheduled readmission rates between the two groups ($P = 0.805$) (Table III).

A prospective variance analysis was performed of all mastectomy pathway patients. The most common variance in the mastectomy pathway was prolonged hospital stay. Ten patients (12%) were unable to be discharged by the 4th POD. Five of these patients were medically fit for discharge but requested for extension of stay due to not having a care giver at home and lack of psychosocial support. Two patients had complications due to urinary tract infection and large post-mastectomy seroma. Two patients had co-morbidities which required treatment and were discharged on the 5th POD. One patient, a resident of a nursing home with concurrent medical conditions, was not discharged from the hospital until drains were removed, in keeping with existing regulations in the nursing home regarding care of postoperative patients.

Based on the early analysis of variances and patient outcome data, two revisions were made to the pathway during the period of assessment. Firstly, physiotherapy for arm mobilisation started on the 1st POD instead of the 2nd POD as this was found to be well-tolerated. Secondly, patient education, especially regarding early discharge and care for surgical drains, would be initiated at consent for operation, and not at time of admission as initially designed.

TABLE III: COMPLICATIONS AND UNSCHEDULED READMISSIONS BEFORE AND AFTER PATHWAY IMPLEMENTATION

	Before pathway No. (%)	After pathway No. (%)
Seroma formation	20 (28.99)	24 (28.92)
Haematoma	6 (8.70)	2 (2.41)
Necrosis	0	2 (2.41)
Wound infection	3 (4.35)	2 (2.41)
Unscheduled readmission	2 (2.90)	3 (3.61)

This alteration was taken when variance analysis revealed that relatives and care givers required more time to make home preparations in order to receive the patient following early discharge.

Discussion

In the initial treatment of breast cancer, in-patient hospital care comprises the major expenditure. One of the important strategies in reducing the expenses of cancer care is to shift surgical treatment to a short hospital stay or outpatient procedures without compromising quality of care.⁹

The development and implementation of pathways in healthcare have been credited with achieving optimal standards of care while reducing total hospital costs and average length of stay. Pathways offer an efficient method to maximise timely resource utilisation to achieve targeted outcomes in a cost-effective manner.

In this study, data analysis showed that after implementation of the mastectomy pathway, length of stay and total hospital charges are effectively reduced. Furthermore, implementation of the pathway had significant effects on length of stay without increasing complication and unscheduled readmission rates during the postoperative period, surrogates for a compromise in post-surgical care. This suggests that despite the implementation of an aggressive policy of early discharge in the pathway, quality of care was not jeopardised.

The implementation of the mastectomy pathway required less of a complete revision of surgical care but rather a re-focussing of the multidisciplinary breast team on areas of patient care that were not fully exploited. The two

TABLE II: LENGTH OF STAY AND HOSPITAL CHARGES BEFORE AND AFTER PATHWAY IMPLEMENTATION

	Before pathway (2000)			After pathway (2001)			P value
	Range	Median	Mean	Range	Median	Mean	
LOS (days)	2 to 12	4.00	4.91	1 to 10	3.00	4.10	0.018
Cost (\$)	2,373 to 10,134	4,481	5,050	2,164 to 8,769	4,115	4,406	0.014

LOS: length of stay

fundamental measures that led to the improved outcome were enhanced patient education and better nursing support.

Patient education was the central tenet in the incorporation of early discharge in the mastectomy pathway. Teaching patients to care for their drains not only led to a reduction in the length of stay and potential cost savings, but also allowed breast cancer patients to recuperate at home.²³ The points of contact and areas of discussion with the patient by various members of the breast team were stipulated in the mastectomy pathway. By placing patient education as an essential part in the care of mastectomy patients, patients were more likely to be adequately informed as they received more information and involvement in their care. While it is not conclusive that patients in the pathway had tangible impact of improved psychological adjustment to treatment as a result of patient education, studies have suggested that counselling women before and after surgery can substantially reduce the psychiatric morbidity associated with mastectomy and breast cancer.²⁴⁻²⁶

The second tenet of the mastectomy pathway is the continual access to medical or nursing support. It is essential that patients have a point of reference that they can refer to for advice and management after discharge. During the study period, patients were given access to the staff on the ward at all times; and during working hours, to the breast care nurse as well.

Discharge was delayed in 10 patients (12%). Our study indicates that a significant minority of patients will require a more prolonged stay even though they were deemed fit enough for early discharge. Reasons included inadequate social support at home, feeling safer in hospital, needing the rest and unsuitable home circumstances. The majority of the post-mastectomy patients however, could be discharged home with drain in place and could be followed on an outpatient basis by the surgeon and a breast care nurse.

Apart from the cost efficiency gains, the pathway allowed for a streamlining of the care processes in mastectomy patients. Before the implementation of pathway, there were variations in practice of preoperative counselling, breast care nursing involvement, laboratory investigations and postoperative care for patients undergoing operations for breast cancer. With the implementation of pathway, all aspects of care including preoperative laboratory studies and investigations, postoperative pain medication, intravenous fluid replacement, drain and wound management, arm exercise, patient education, psychosocial support services, discharge planning, discharge instructions and follow-up care were standardised for the mastectomy patients. There were also improvements in coordination of care and documentation. As the pathway explicitly charts the expected clinical course of treatment, it helps to ensure

that all the various activities are completed in an efficient and timely manner.

The use of variance analysis as an intrinsic part of the pathway process allowed the identification of areas of improvement in our care of mastectomy patients where new solutions will have to be found. The pathway process is therefore a dynamic one where shortcomings are identified and solutions created in an ongoing manner. This was seen in our initial experience upon implementation of the pathway, where it was noted that earlier patient education on early discharge was required to give more time for care givers to make arrangements. The initial pathway design had been to leave this to the in-hospital session. The observation by the physiotherapist that arm mobilisation was well tolerated on the 1st POD despite an axillary dissection also helped to further shorten the postoperative in-hospital period. Both these adjustments required good communication and willingness to modify practice on the part of surgeons, breast care nurses and physiotherapists.

The variance analysis also targeted problems which have yet to be solved. During the study period, patients who were not capable for early discharge despite physical recovery were identified. A possible solution to be tested in the future modification of the pathway process may include a greater involvement of care givers in the immediate postoperative care of the patients with the breast care nurse prior to discharge. Variance analysis also identified the lack of psychosocial support as a significant obstacle in early discharge. The introduction of various volunteer organisations that can provide this support is being explored. The evaluation and revision of the pathway will be conducted annually in the light of clinical evidence as an essential part of continuous quality improvement.

This study has several limitations. A randomised controlled design could not be used due to operational, administrative and ethical issues. The number of patients in this study may be too small to detect small but significant differences in outcome such as complication rates and unscheduled readmission rates. As there were no estimates on patient satisfaction in the historical controls, this was not assessed in this study.

While this study has shown no compromise in the quality of care following the implementation of an aggressive discharge pathway protocol, the larger question that remains unanswered is whether patients perceive a better satisfaction following early discharge. While this has been seen in studies elsewhere,^{6,10,13,15,17} the situation in the local setting is still unresolved.

Conclusion

Implementation of mastectomy clinical pathway at the National University Hospital, Singapore has improved

consistency in patient's treatment, quality of patient outcome, and has reduced the costs of care and length of hospital stay. In addition, variance analysis of the mastectomy pathway has shown to be valuable for problem identification to improve patient care.

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