Recovery at the post anaesthetic care unit after breast cancer surgery

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ABSTRACT

INTRODUCTION: Extant literature shows that women having undergone breast cancer surgery have substantial problems at the post-anaesthesia care unit (PACU). Based on nursing reports and elements of the discharge scoring system recommended by The Danish Society of Anaesthesiology and Intensive Care Medicine, the present prospective, observational study aims to determine why these patients stayed at PACU.

METHODS: The study included 116 consecutive patients having undergone surgery for breast cancer. Postoperative nausea and vomiting (PONV), pain, sedation, respiration, oxygen saturation (SpO_2), blood pressure and heart rate were scored at the PACU, and nurses were asked why discharge was delayed in case patients were not discharged at the time the discharge criteria were met. The outcome measurers were the proportion of patients ready for discharge upon arrival at the PACU, patient time spent until discharge criteria were met, time to actual discharge, and the contribution of each discharge criterion in postponing discharge from the unit, as well as nurse-reported factors for the delay.

RESULTS: 31% of the patients were ready for discharge upon arrival at the PACU. The mean time until the discharge criteria were met was 40 min (standard deviation (SD) = 46 min). The actual time spent at the PACU was 110 min (SD = 75 min). A total of 36 patients had low SpO_2 (< 90%) upon arrival to the PACU. In 36 cases, discharge was delayed by the workload at the PACU and/or waiting for patient transport to the ward.

CONCLUSION: Low SpO_2 (< 90%), the workload at the PACU and time spent waiting for transport to the ward were the primary reasons why patients stayed at the PACU after breast cancer surgery.

In Denmark, 4,000 women undergo breast cancer surgery annually. Extant literature shows that women are facing severe early recovery problems at the post-anaesthesia care unit (PACU). Thus, surgery for breast cancer is associated with postoperative nausea and vomiting (PONV) in up to 80% of patients, and moderate pain occurs in about 50% of patients receiving uni- or bi-modal analgesic intervention during the first 24 postoperative hours [1]. Other studies have identified problems with evaluation of oxygen saturation [2].

A retrospective study exploring why patients stay at recovery units after elective colonic surgery concluded that PACU practices varied considerably, and the study called for prospective studies applying modern surgical techniques and specific scoring systems for observations and discharge from PACUs [3].

In 2004, The Danish Society of Anaesthesiology and Intensive Care Medicine (DASAIM) introduced a new set of recommendations including a criteria-based scoring system for the discharge of patients from PACUs to surgical wards. The system was fully implemented at our department during the autumn of 2006.

The present study explores potential problems at the PACU using the DASAIM scoring system. This involved an evaluation of PONV and pain at rest, as well as sedation, respiratory rate (RR), oxygen saturation (SpO_2), systolic blood pressure (SBP) and heart rate (HR).

We have previously reported data on pain, PONV and sedation at the PACU and the ward [4]. Based on the various elements of the DASAIM discharge scoring system and nursing reports, the present article aims to evaluate why patients who had undergone breast cancer surgery stayed at the PACU.

MATERIAL AND METHODS

The present prospective, consecutive, observational study includes all patients admitted for primary surgical treatment of unilateral breast cancer at our department during a 3-month period from 27 November 2006 to 26 February 2007. The patients had either mastectomy or breast conserving surgery (BCS) combined with sentinel lymph node dissection (SLND), or axillary lymph node dissection (ALND) in case of lymph node metastasis. As part of the SLND procedure, patients had 0.5-1.0 ml 2.5% Patent Blue solution injected intradermally into the breast.

The prophylactic treatment of PONV, pain and the method of anaesthesia have been described previously [4]. All patients were to be referred from the operating theatre to the PACU before going to the ward in order to evaluate dischargeability.

To evaluate the reasons why patients stayed at the PACU, we used a modified version of the DASAIM discharge criteria scoring system for discharge of patients

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TABLE 1

Modified version of the discharge criteria scoring system recommended by the Danish Society of Anaesthesiology and Intensive Care Intensive Medicine. Patients were considered dischargeable from the post-anaesthesia care unit when the score sum of all criteria was four or less and the patients had no single score above one.

Modality	Score	Criteria
Sedation	0	The patient is fully awake
(Nurse evaluation)	1	The patient is asleep, aroused by verbal stimulation
	2	The patient is asleep, aroused by physical stimulation
	3	The patient asleep, can not be aroused
RR	0	Regular rate > 10
(nurse count)	1	Snoring, 10 > RR > 30
	2	RR < 10 or RR > 30/min.
	3	Periods of apnoea or obstructive pattern
Oxygen saturation, no supplementary oxygen for 10 min	0	$SpO_2 \geq 94\%$
	1	$90\% \leq SpO_2 < 94\%$
	2	$85\% \leq SpO_2 < 90\%$
	3	$SpO_2 < 85\%$
Systolic blood pressure	0	SBP ≥ 100 mmHg
(automatic NIBP)	1	90 ≤ SBP < 100 mmHg
	2	80 mmHg ≤ SBP < 90 mmHg or SBP > 220 mmHg
	3	SBP < 80 mmHg
Heart rate	0	50 < HR ≤ 100
(automatically derived from ECG)	1	100 < HR ≤ 120
	2	40 < HR ≤ 50 or 120 < HR ≤ 130
	3	HR < 40 or HR > 130
Pain at rest	0	No pain
(patient evaulation)	1	Light pain
	2	Moderate pain
	3	Severe pain
Nausea	0	No nausea and not vomiting
(patient evaluation and	1	Light nausea or vomiting whitout previous nausea
nurse observation)	2	Moderate nausea and/or vomiting
	3	Severe nausea and/or reoccurring vomiting

RR = respiratory rate; SpO_2 = oxygen saturation; SBP = systolic blood pressure; HR = heart rate; NIBP = non invasive blood pressure; ECG = electrocardiography.

from the PACU to the surgical ward, **Table 1**. As from arrival at the PACU, sedation, RR, SpO_2, SBP, HR, pain at rest and PONV were recorded every 15 minutes. Each parameter was scored 0, 1, 2 or 3, respectively, corresponding to the following degrees of severity: none, light, moderate or severe, see Table 1.

Patients were considered dischargeable by the PACU nurses when the score sum was four or less, with no single score exceeding one. Patients who did not fulfil these two criteria but were otherwise dischargeable had to be discharged by the anaesthesiologist on duty. Additionally, the nurses were asked to explain why discharge was delayed if patients were not discharged at the time the criteria were met.

The work was performed in accordance with the Helsinki Declaration and with the acceptance of the local Ethics Committee as a quality assurance study. The collection and handling of data was approved by the Danish Data Protection Agency.

Results are presented as mean and standard deviations (SD) or as amounts and percentages, as appropriate. The significance level for the p-value was set to 0.05% (Kruskal-Wallis one-way analysis of variance (asymmetric p-value) and Fisher's exact test for 2 × 2 contingency tables (2-tailed p-value)).

RESULTS

A total of 116 consecutive patients aged 33 to 86 years were included in the study (**Table 2**).

In all, 29 women underwent mastectomy with the SLND procedure, 19 underwent mastectomy with ALND. 55 women had BCS with the SLND procedure and 13 had BCS with ALND. A total of 95 patients were administered Patent Blue.

All patients were transferred from the operation theatre to the PACU as prescribed by the protocol, except one who by mistake was transferred directly to the ward. Upon arrival at the PACU, 36 patients (31%) fulfilled the criteria for discharge. The mean time from the patients regained spontaneous respiration to the first scoring at the PACU was 16 min (SD = 14 min). The mean time until the discharge criteria were met was 40

TABLE 2

Demographic data describing the 116 consecutive patients who underwent breast cancer surgery.

	Number (percentage)	Mean (standard deviation)
Age, years		62.0 (11.7)
Weight, kg		68.2 (12.0)
Height, cm		165.5 (6.29)
Body mass index, kg/m²		24.9 (4.2)
Opioid users	6 (5.1)	
Smokers	25 (21.6)	
Motion sickness/previous PONV	40 (34.5)	
Preoperative pain in ipsilateral arm	13 (11.2)	
Preoperative pain in the breast	26 (22.4)	
ASA-score 1-2	100 (84.2)	
ASA-score 3-4	16 (13.8)	
Surgical procedures		
Mastectomy with axillary dissection	19 (16.4)	
Mastectomy with sentinel node	13 (11.2)	
Breast conserving surgery with axillary dissection	29 (25.0)	
Breast conserving surgery with sentinel node	55 (47.4)	

PONV = Postoperative nausea and vomiting; ASA = Classification from the American Society of Anesthesiologists.

min (SD = 46 min). A total of 94 patients fulfilled the discharge criteria upon arrival or while staying at the PACU. In 22 patients (19%), discharge had to be approved by the anaesthesiologist on duty, mainly due to low SpO_2. The overall mean time spent at the PACU was 110 min (SD = 75 min).

Figure 1 displays the number of patients scoring higher than one on any of the discharge criteria for the first 105 min after arrival at the PACU.

Low SpO_2 (scores two and three, corresponding to SpO_2 < 90% without supplementary oxygen) remained the most frequent cause for not fulfilling discharge criteria upon arrival to the PACU (36 patients; 31%) and until 75 min after arrival (14 patients; 12%). In the same period, scores two and three for RR fell from 18 to nine patients (16% to 8%).

Seven out of 16 patients belonging to the American Society of Anesthesiologists (ASA) group 3-4 scored more than one on SpO_2 upon arrival to the PACU, which was not significantly different from patients belonging to ASA group 1-2, 28 patients of 100 (p = 0.24). Nor did we find any significant differences in SpO_2 between the patients who received Patent Blue and those who did not (p = 0.61). Pain peaked after 30 min, with 12 patients (10%) scoring > 1, decreasing to only one patient after 90 min.

Upon arrival to the PACU, 17 patients (15%) scored > 1 on sedation. One hour later this number was reduced to three patients.

One patient scored > 1 on heart rate upon arrival to the PACU. No patients scored > 1 on PONV or sys tolic blood pressure upon arrival. At the PACU, only very few patients developed scores > 1 (see Figure 1). Thus, PONV, systolic blood pressure and heart rate had no overall influence on delay of discharge from the PACU.

In 36 cases (31%), the nurses at the PACU stated that discharge was delayed by logistic factors like the workload at the PACU and/or waiting for patient transport to the ward.

DISCUSSION

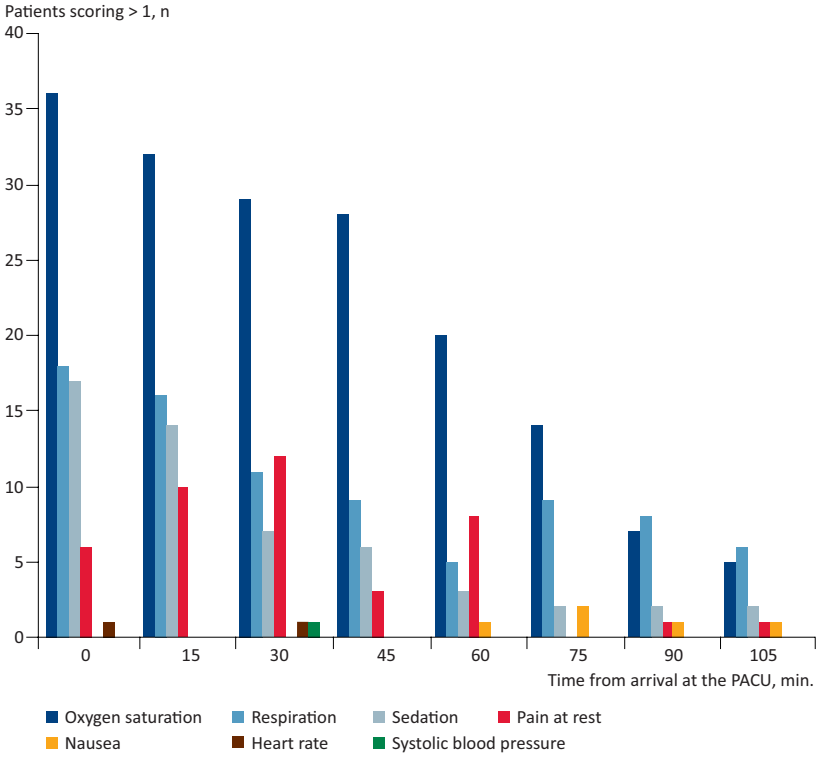
Our results show that with a multimodal regimen, described elsewhere [1], low oxygenation and logistic problems were the two major causes for staying at the PACU.

Due to the sentinel node procedure, 95 patients (82%) had Patent Blue injected. Patent Blue is known to cause falsely low peripheral SpO_2 values [2]. However, there were no significant differences regarding SpO_2 at the PACU between the patients who received Patent Blue and those who did not. Nor could the observed low SpO_2 levels be explained by the relatively high proportion of ASA group 3-4 patients (13%). Yet the number of ASA group 3-4 patients and the number of patients who did not receive Patent Blue were too small to rule out possible effects on SpO_2 measurement. Finally, the intraoperative use of long-acting opioids, well known to suppress respiratory drive, may pose a third explanation for the fact that SpO_2 was the most common reason for keeping the patients at the PACU. However, only half of the patients with low SpO_2 levels had a low respiratory rate (< 10) upon arrival to the PACU. As fentanyl is the standard analgesic for breast cancer surgery at our department, we did not use remifentanil in this study. The

Scoring situation at the post-anaesthesia care unit.

FIGURE 1

Recovery profile of the 116 consecutive patients operated on for breast cancer. The numbers of patients scoring higher than 1 on any of the DASAIM discharge criteria during the first 105 minutes after arrival at the post-anaesthesia care unit (PACU).



use of the short acting opioid remifentanil might have resolved this question, but there is no available evidence that remifentanil should improve the outcome at the PACU for PONV, pain control or speeding up discharge in general after breast cancer surgery [5].

The procedures used in this study may all be considered surface surgery, and they have hardly interfered as such with post-operative respiratory function. In combination with other surgical interventions such as laparoscopic cholecystectomy, positive pressure ventilation is, however, known to cause microatelectases and reduced respiratory function [6-8]. Correspondingly, a study of recovery after laparoscopic cholecystectomy showed that one third of the patients had a supplemental oxygen demand for one hour or more, but it questioned whether oxygen saturation was a relevant discharge criterion [9]. In a similar study of abdominal hysterectomy, the same authors found that half of the patients required supplemental oxygen for one hour or more to sustain an SpO_2 > 92% [10]. In our study, 20% of the patients needed supplementary oxygen for one hour or more. However, the consequence of modest desaturation in patients operated for breast cancer is questionable. A pragmatic solution could be to discharge patients from the PACU regardless of such mild pulmonary dysfunction, provided that the patients have binasal oxygen supply on the ward for a few hours.

Though 31% of the patients were dischargeable already upon the arrival to the PACU, the actual time to discharge was two and a half fold longer than the average time to fulfilment of the discharge criteria. This was mostly due to hospital logistics. At our PACU, the pa-

Scoring at the post-anaesthesia care unit with use of the discharge scoring system recommended by The Danish Society of Anaesthesiology and Intensive Care Medicine.

tients having had surgery for breast cancer is the group needing the least amount of care at the PACU, and thus the group that waits when PACU nurses are busy. Additionally, patients brought to the PACU are to be monitored for a minimum of 30 min before discharge. Hence, the postoperative course of these patients would be much helped by critically reviewing procedures at the PACU and by discharging patients meeting these discharge criteria already at the operating theatre directly to the ward.

In conclusion, a modest decrease in SpO_2 (<90%), the workload at the PACU and time spent waiting for transport to the ward were the primary reasons why patients stayed at the PACU after breast cancer surgery.

Discharging patients fulfilling the DASAIM discharge criteria at the operating theatre directly to the ward, reviewing logistics at the PACU, and discharging patients presenting with only a modest decrease in SpO_2 with binasal oxygen supply to the ward have the potential of reducing the time spent at the PACU and the number of women operated for breast cancer who needs care at the PACU. This would, in turn, facilitate the development of breast cancer surgery towards an outpatient clinic practice enhancing fast recovery and rehabilitation.

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