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# Fast-tracking (bypassing the PACU) does not reduce nursing workload after ambulatory surgery†

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**Background.** Postoperative day-case patients are usually allowed to recover from anaesthesia in a postanaesthesia care unit (PACU) before transfer back to the day surgical unit (DSU). Bypassing the PACU can decrease recovery time after day surgery. Cost savings may result from a reduced nursing workload associated with the decreased recovery time. This study was designed to evaluate the effects of bypassing the PACU on patient recovery time and nursing workload and costs.

**Methods.** Two hundred and seven consenting outpatients undergoing day surgery procedures were enrolled. Anaesthesia was induced and maintained with a standardized technique and the electroencephalographic bispectral index was monitored and maintained at 40–60 during anaesthetic maintenance. At the end of surgery, patients were randomly assigned to either a routine or fast-tracking (FT) group. Patients in the FT group were transferred from the operating room to the DSU (i.e. bypassing the PACU) if they achieved the FT criteria. All other patients were transferred to the PACU and then to the DSU. Nursing workload was evaluated using a patient care hour chart based on the type and frequency of nursing interventions in the PACU and DSU. A cost associated with the nursing workload was calculated.

**Results.** The overall time from end of anaesthesia to discharge home was significantly decreased in the fast-tracking group. However, overall patient care hours and costs were similar in the two recovery groups.

**Conclusion.** Bypassing the PACU after these short outpatient procedures significantly decreases recovery time without compromising patient satisfaction. However, the overall nursing workload and the associated cost were not significantly affected.

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Bypassing phase I recovery (i.e. the postanaesthesia care unit or PACU) after day surgery has been termed 'fast-tracking'.[1] Early studies have shown that outpatients who are fast-tracked can be discharged home earlier without any increase in complications or side-effects.[2–7] However, this time saving may not result in true cost savings unless the fast-tracking process leads to savings in personnel costs or enhanced productivity.

Nursing workload is an important factor, which can be used to predict nursing costs.[8] In Ontario, the Ministry of Health has mandated that hospitals report nursing workload based on management information systems guidelines.[9] Approximately 70% of hospitals reporting the workload in Ontario use the validated GRASP® (GRASP System, Richmond Hill, Ontario, Canada) method to measure nursing workload. Nursing workload data are used to help in quantifying nursing care requirements into hours of care and for system planning decisions related to nursing.

A feature of the GRASP system that allows the nursing workload to be measured is the patient care hour chart (Appendix 1). Using this chart in the PACU and day surgery unit (DSU), the nursing workload can be estimated for each patient undergoing day surgery. We hypothesized that a reduced hospital stay that results from a fast-tracking recovery process can lead to a decreased nursing workload by using GRASP patient care hour data for patients undergoing

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day surgery. A randomized, prospective clinical study was therefore designed to compare the discharge time, differences in patient care hour, and its estimated costs between patients undergoing fast-tracking recovery and routine recovery processes.

## Methods

After obtaining University Health Network ethics committee approval, 207 consenting ASA I and II outpatients, age 18–65 yr who were scheduled for gynaecological laparoscopy, hysteroscopy or arthroscopy procedures were enrolled in this clinical study. Patients with significant cardiovascular, respiratory, renal/hepatic or metabolic disease, psychiatric illness, morbid obesity or history of substance abuse were excluded from the study.

All patients received naproxen 500 mg orally 30–60 min before induction of anaesthesia. Upon arrival in the operating room, routine monitors were applied to record heart rate, mean arterial pressure and oxygen saturation. In addition, the one-channel electroencephalographic bispectral index (BIS) monitor (A-2000 BIS monitor system XP, Aspect Medical System, Natick, MA, USA) was used for monitoring patients' intraoperative hypnotic levels.

Anaesthesia was induced with i.v. fentanyl 0.5–1.5 $\mu g\,kg^{-1}$ and propofol 1.0–2.5 mg $kg^{-1}$. A laryngeal mask airway was inserted to maintain a patent airway for spontaneously breathing patients undergoing hysteroscopy and arthroscopy. Patients undergoing laparoscopy received rocuronium 0.6 mg $kg^{-1}$ and mechanical ventilation via a tracheal tube. Granisetron 1 mg and droperidol 0.625 mg were administered i.v. to all patients immediately after induction for anti-emetic prophylaxis. Anaesthesia was maintained with desflurane 1–5% or sevoflurane 0.5–2% in combination with nitrous oxide 50–60% in oxygen. Supplementary fentanyl 50 $\mu g$ i.v. boluses were administered to treat persistent elevations in heart rate (>100 beats $min^{-1}$) or rises in mean arterial pressure (>30% of the pre-anaesthesia baseline). Patients' hypnotic levels were titrated with desflurane or sevoflurane to BIS values of 40–60. During anaesthesia, patients were kept hydrated with normal saline 20 ml $kg^{-1}$ $h^{-1}$. According to a computer-generated random number table, patients were randomly assigned to either the fast-tracking group or the routine recovery group before discontinuation of the general anaesthetic. The maintenance anaesthetics were discontinued upon completion of surgery. Neostigmine 2.5 mg and glycopyrrolate 0.4 mg were given i.v. to patients who had received rocuronium at this time.

Patients in the fast-tracking group were transferred directly to the DSU (bypassing PACU) if they achieved a fast-tracking score of $\geqslant$12 within 10 min of discontinuation of general anaesthesia (Appendix 2).[10] If they failed to achieve these criteria, they were considered unsuitable for the fast-track pathway and were transferred to the PACU. The data collected from these failed patients were still included in the fast-tracking group. Patients in the routine recovery groups were all transferred to the PACU whether or not they would achieve certain fast-tracking criteria. As is the standard practice in our institution, however, patients after general anaesthesia would not be transferred to the PACU until they awakened initially (i.e. open eyes on verbal command). Patients transferred to the PACU from either of the groups were discharged to the DSU when PACU discharge criteria were fulfilled.[11] In the DSU, the postanaesthetic discharge score (Appendix 3)[12] was used to assess patients' ability to be discharged home. Once patients had achieved a postanaesthetic discharge score of 9 or greater, they were discharged from the hospital.

Patients' recovery times were assessed from discontinuation of volatile inhalational agent to awakening (i.e. open eyes on verbal command), orientation (i.e. correctly indicates time, person and place) and discharge home. Postoperative pain and nausea were evaluated using an 11-point verbal rating scale (0=none, 10=worst) at 15-min intervals until patient discharge.

Postoperative nursing workload was determined from data recorded directly into a computer database by nursing staff in the PACU or DSU. The GRASP data were used to determine total direct patient care hours required at each location. Details of nursing care interventions and their associated standard times are given in Appendix 1. At our institution, Mistro® (GRASP System, Richmond Hill, Ontario, Canada) software is used; thus, documentation in the patient care hour chart is completely automated. Each intervention performed directly with patients can be recorded on the patient care hour chart and has a specific standard time attached. A consensus method was used to calculate the standard times and was arrived at with input from the DSU nursing staff. A total time, expressed as hours, was calculated for each patient. Nursing staff are fully trained in the use of the patient care hour chart.

The nursing costs associated with each patient were calculated according to nursing interventions recorded in the patient care hour chart. This information was based on costing data provided by the case costing group within our institution. These costs are expressed in Canadian dollars (C$). All patients were contacted 24 h after their surgery to enquire about their postdischarge side-effects, the need for therapeutic interventions, and their satisfaction with the recovery (rated as poor, fair, good or excellent).

### *Statistical analyses*

Before initiation of the study, a power analysis was performed based on the total patient care hours of patients undergoing outpatient gynaecological procedures in our institution. The mean total patient care hours was 2.5 with a standard deviation of 0.8. In order to detect a 20-min difference in patient care hour time between fast tracking and routine recovery, 92 study subjects were required in each group ($\alpha$=0.05 and $\beta$=0.2, two-sided test).

Data were analysed on an intention-to-treat basis; i.e. data from those patients randomized to fast-tracking but who failed to meet the fast-tracking criteria were still included in the fast-tracking group analysis.

The physical characteristics of the patient, recovery times and patient care hours were analysed using the unpaired *t* test. Postoperative pain and nausea scores were analysed using the Kruskal–Wallis test. Other non-parametric variables were analysed using the $\chi^2$ test (with Fisher's exact test). A *P* value <0.05 was considered statistically significant for all tests.

## Results

The two treatment groups were comparable with respect to age, weight, ASA physical status, surgical procedures, duration of surgery and anaesthesia, intraoperative drug dosages, and fluid volumes (Table 1). There were no differences between the two recovery groups regarding the intraoperative BIS values (Table 1) and times from the end of anaesthesia to awakening and orientation (Table 2). In the fast-tracking group overall, 81% of patients in the three surgical populations were successfully transferred from the operating room directly to the DSU. Patients undergoing arthroscopy proved most likely to avoid the PACU, with 97% meeting fast-track criteria. For gynaecological laparoscopy, this figure was only 72%.

Time from the end of anaesthesia to patient discharge home was significantly decreased in the fast-tracking group; the mean difference was 17 min (Table 2). This time saving was not consistent across the three surgical population subgroups examined. Patients undergoing hysteroscopy were discharged 43 min earlier in the fast-track group, while the time was 35 min earlier for those undergoing arthroscopy. The mean for the gynaecological laparoscopy group was just 2 min earlier.

There were very few significant differences in patient care hours or associated costs between fast-tracking and routine groups when compared directly (Table 3). A reduction in the time spent measuring vital signs was the only time saving which achieved statistical significance ($P<0.05$), but this did not translate into a statistically significant cost saving. For arthroscopic surgery, savings of C$ 50 and 24 patient care minutes ($P<0.05$) were made per procedure. For hysteroscopy, equivalent savings were C$ 10 and 6 min ($P>0.05$). For laparoscopic surgery, savings were C$ 6 and 6 min ($P>0.05$). Most of the savings made in the fast track groups were due to a reduction in time spent measuring vital signs.

There were no differences between the two groups with respect to postoperative nausea, pain scores or patient satisfaction with their recovery processes (Table 2). The incidence of nausea at home and the requirement for pain rescue medication were also similar between the two recovery groups.

## Discussion

The goal of a fast-track anaesthetic technique in day surgery is to provide optimal operating conditions and patient comfort with rapid recovery. This enables patients to bypass or spend less time in labour-intensive patient care areas and reduces patient stay before discharge home.[13] In this prospective clinical study, use of short-acting anaesthetic agents, the Laryngeal Mask Airway, BIS-titrated

**Table 1** Physical characteristics, durations of anaesthesia and surgery, intraoperative drug dosages, intraoperative fluid volume and bispectral index in the two recovery groups. Values are expressed as mean (range), mean (SD) or numbers. No differences between the two study groups

| | **Fast-tracking group** | | | | **Routine recovery group** | | | |
|---|---|---|---|---|---|---|---|---|
| | **Overall** | **Laparoscopy** | **Hysteroscopy** | **Arthroscopy** | **Overall** | **Laparoscopy** | **Hysteroscopy** | **Arthroscopy** |
| Number (*n*) | 110 | 36 | 44 | 30 | 97 | 28 | 42 | 27 |
| Sex (male/female) (*n*) | 20/90 | 0/36 | 0/44 | 20/10 | 18/79 | 0/28 | 0/42 | 18/9 |
| Age (yr) | 41 (18–65) | 36 (21–49) | 45 (29–64) | 40 (18–65) | 42 (20–63) | 38 (26–58) | 46 (27–63) | 40 (20–60) |
| Weight (kg) | 72 (17) | 66 (13) | 72 (17) | 79 (18) | 73 (18) | 68 (15) | 71 (16) | 82 (20) |
| ASA status (I/II) | 92/18 | 34/2 | 36/8 | 22/8 | 74/23 | 23/5 | 32/10 | 19/8 |
| Duration of anaesthesia (min) | 26 (10) | 26 (11) | 25 (12) | 27 (8) | 29 (12) | 28 (14) | 25 (11) | 33 (13) |
| Duration of surgery (min) | 19 (11) | 18 (11) | 20 (14) | 18 (6) | 21 (11) | 21 (13) | 19 (8) | 25 (13) |
| Intraoperative propofol (mg) | 217 (53) | 186 (37) | 214 (53) | 245 (54) | 214 (55) | 186 (32) | 198 (39) | 256 (64) |
| Intraoperative fentanyl (μg) | 89 (35) | 93 (34) | 75 (26) | 104 (41) | 97 (42) | 110 (38) | 74 (23) | 119 (51) |
| Intraoperative fluids (ml) | 652 (241) | 736 (232) | 668 (260) | 532 (169) | 636 (203) | 715 (215) | 655 (188) | 530 (169) |
| Intraoperative BIS (*u*) | 47 (8) | 47 (9) | 48 (8) | 44 (7) | 45 (9) | 46 (10) | 48 (8) | 42 (9) |
| BIS at end of anaesthesia (*u*) | 66 (13) | 64 (14) | 64 (14) | 70 (9) | 66 (14) | 65 (15) | 63 (15) | 70 (9) |

ASA=American Society of Anesthesiologists; BIS=bispectral index.

**Table 2** Recovery times, fast-tracking eligibility rate, actual PACU bypassing rate, postoperative nausea and vomiting, and patient satisfaction in the two recovery groups. Values are expressed as mean (SD), median and range or number and percentage. *$P<0.05$ compared with the routine recovery group

| | Fast-tracking group | | | | Routine recovery group | | | |
|---|---|---|---|---|---|---|---|---|
| | **Overall** | **Laparoscopy** | **Hysteroscopy** | **Arthroscopy** | **Overall** | **Laparoscopy** | **Hysteroscopy** | **Arthroscopy** |
| Time to awakening (min) | 4 (2) | 5 (3) | 4 (2) | 4 (2) | 4 (3) | 4 (2) | 4 (3) | 4 (3) |
| Time to orientation (min) | 6 (4) | 8 (5) | 5 (2) | 5 (3) | 6 (3) | 7 (4) | 5 (2) | 6 (3) |
| Time to leaving OR (min) | 7 (3) | 7 (3) | 5 (2) | 7 (3) | 6 (2) | 6 (3) | 5 (1) | 7 (3) |
| Fast-tracking score ⩾12 before leaving OR (*n*, %) | 89, 81 | 26, 72 | 34, 77 | 29, 97 | 75, 77 | 21, 75 | 33, 79 | 21, 78 |
| Patients bypassed PACU (*n*, %) | 89, 81 | 26, 72 | 34, 77 | 29, 97 | 0 | 0 | 0 | 0 |
| Time to discharge home (min) | 123 (54)* | 142 (49) | 106 (70)* | 98 (23)* | 140 (50) | 144 (35) | 149 (72) | 133 (42) |
| Average nausea score in hospital | 0 (0–3.1) | 0 (0–0.4) | 0 (0–3.1) | 0 | 0 (0–1) | 0 (0–1) | 0 (0–0.5) | 0 (0–0.5) |
| Average pain score in hospital | 0.9 (0–6.6) | 1 (0–6.6) | 1.0 (0–5.1) | 0.75(0–3.1) | 0.6 (0–3.7) | 0.6 (0–3.7) | 1.3 (0–3.3) | 0 (0–2.3) |
| Nausea rescue in hospital (*n*, %) | 10, 9 | 4, 11 | 6, 14 | 0 | 8, 8 | 3, 11 | 4, 10 | 1, 4 |
| Pain rescue in hospital (*n*, %) | 33, 30 | 15, 42 | 10, 23 | 8, 27 | 30, 31 | 13, 46 | 11, 26 | 6, 22 |
| Incidence of nausea at home at 24 h (*n*, %) | 4, 4 | 1, 3 | 2, 5 | 1, 3 | 5, 5 | 0 | 3, 7 | 2, 7 |
| Pain medication at home at 24 h (*n*, %) | 62, 56 | 19, 53 | 20, 46 | 23, 77 | 55, 57 | 17, 61 | 16, 38 | 22, 82 |
| Satisfaction with recovery (excellent/good/fair/poor) (*n*) | 44/61/5/0 | 14/19/3/0 | 18/26/0/0 | 12/16/2/0 | 40/55/2/0 | 11/16/1/0 | 18/24/0/0 | 11/15/1/0 |

OR=operating room; PACU=postanaesthesia care unit.

maintenance, pre-emptive pain relief, and multimodal antiemetic prophylaxis, achieved an overall 81% PACU bypass rate in patients undergoing short day procedures and contributed to a significantly decreased postoperative stay in the DSU. Importantly, this accelerated recovery process was not associated with any increased postoperative side-effects or patient discomfort.

In this study, the fast-track process reduced time from awakening to discharge by an average of 17 min. This result is skewed by the performance of the gynaecological laparoscopy subgroup, which did not show any significant time saving. For the hysteroscopy and arthroscopic surgery subgroups, time savings were 43 and 35 min respectively. Early discharge was not associated with any adverse outcome in terms of pain management or problems with nausea. Reductions in time to discharge of this magnitude can be considered clinically significant for both the patient and the DSU.

Although we had hypothesized that bypassing the PACU could lead to a decreased total nursing workload in the postoperative care units, this assumption was not confirmed by the results of this study. Neither reduced time to discharge nor bypassing the PACU appeared to reduce the nursing workload significantly. In this study, we focus on active nursing interventions and patient care hours that nurses spent with patients. Although the time to discharge was shorter in the fast-track group, the total numbers of nursing interventions and nursing hours were not different between the two recovery groups. This suggests that the extra postoperative monitoring received by PACU patients in the early phase of recovery represents only a tiny proportion of the overall nursing input. Other nursing inputs, such as i.v. therapy, medication treatments, hygiene, education, ambulation and emotional support make up most of the workload. It is perhaps not surprising that no cost savings were made using the fast-track approach. Another possible explanation could be that patients undergoing the routine recovery process in our study also had decreased postoperative nursing interventions as a result of receiving an effective fast-track anaesthetic technique.

It should be noted that in our hospital the PACU and DSU are separated by a distance of 200 feet and are staffed separately. It is possible that savings of nursing input and/or money might occur if the PACU and DSU were one and the same place. These savings could be a result of reduced paperwork, handover time, transport time and duplicated interventions.

Interestingly, when we looked at the subgroups of patients undergoing the three different types of procedure, we found that patients following arthroscopy had both significantly decreased patient care hours (24 min) and decreased costs associated with bypassing the PACU

**Table 3** Patient care hours and total nursing costs in PACU and DSU in the two recovery groups. Values are expressed as mean (SD). *$P<0.05$ compared with the routine recovery group

| | Fast-tracking group | | | | Routine recovery group | | | |
|---|---|---|---|---|---|---|---|---|
| | **Overall** | **Laparoscopy** | **Hysteroscopy** | **Arthroscopy** | **Overall** | **Laparoscopy** | **Hysteroscopy** | **Arthroscopy** |
| Patient care hours (h) | | | | | | | | |
| Assessment and planning | 0.5 (0.1) | 0.5 (0.1) | 0.5 (0.1) | 0.5 (0.1) | 0.5 (0.1) | 0.5 (0.1) | 0.5 (0.1) | 0.5 (0.1) |
| Teaching and emotional support | 0.2 (0.1) | 0.3 (0.1) | 0.2 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.2 (0.1) | 0.3 (0.1) | 0.3 (0.1) |
| I.V. therapy | 0.3 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.1 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.2 (0.1) |
| Nutrition | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) |
| Elimination | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) |
| Treatments | 0.1 (0.2) | 0.1 (0.2) | 0.1 (0.2) | 0.0 (0.1)* | 0.1 (0.1) | 0.1 (0.1) | 0.1 (0.1) | 0.1 (0.1) |
| Vital signs | 0.2 (0.1)* | 0.4 (0.9) | 0.2 (0.1)* | 0.2 (0.1)* | 0.3 (0.1) | 0.4 (0.2) | 0.3 (0.1) | 0.4 (0.1) |
| Hygiene | 0.01 (0.02) | 0.01 (0.01) | 0.01 (0.03) | 0.02 (0.02) | 0.01 (0.02) | 0.01 (0.02) | 0.01 (0.02) | 0.03 (0.03) |
| Activity | 0.3 (0.2) | 0.3 (0.1) | 0.2 (0.1) | 0.2 (0.04) | 0.3 (0.1) | 0.3 (0.1) | 0.3 (0.1) | 0.3 (0.1) |
| Medication | 0.2 (0.3) | 0.2 (0.5) | 0.2 (0.2) | 0.1 (0.1)* | 0.2 (0.2) | 0.2 (0.4) | 0.2 (0.1) | 0.2 (0.1) |
| Other direct nursing care | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Consultation | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.10 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) |
| Evaluation | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) | 0.1 (0.0) |
| Total | 2.1 (0.8) | 2.2 (1.1) | 2.2 (0.6) | 1.9 (0.4)* | 2.3 (0.7) | 2.3 (0.5) | 2.3 (0.4) | 2.3 (0.4) |
| Nursing costs (Canadian $) | | | | | | | | |
| Assessment and planning | 55 (10) | 55 (11) | 55 (10) | 56 (10) | 57 (9) | 56 (8) | 57 (8) | 61 (10) |
| Teaching and emotional support | 28 (10) | 29 (10) | 27 (7) | 31 (14) | 30 (14) | 27 (12) | 30 (14) | 34 (16) |
| I.V. therapy | 31 (13) | 36 (12) | 37 (7) | 15 (5) | 31 (12) | 34 (8) | 37 (78) | 18 (15) |
| Nutrition | 12 (2) | 12 (2) | 12 (2) | 11 (0.2) | 12 (1) | 11 (2) | 12 (1) | 12 (0.3) |
| Elimination | 12 (1) | 13 (2) | 12 (0.3) | 11 (0.2) | 12 (3) | 12 (4) | 12 (0.3) | 11 (2) |
| Treatments | 10 (8) | 14 (10) | 12 (9) | 4 (5)* | 13 (8) | 15 (8) | 14 (8) | 10 (8) |
| Vital signs | 34 (43) | 48 (106) | 30 (14)* | 25 (13)* | 41 (16) | 44 (23) | 38 (14) | 40 (10) |
| Hygiene | 1 (3) | 1 (3) | 1 (3) | 2 (3) | 2 (4) | 2 (5) | 1 (2) | 3 (3) |
| Activity | 30 (12) | 30 (12) | 30 (14) | 29 (9) | 32 (9) | 34 (9) | 31 (10) | 32 (6) |
| Medication | 20 (17) | 22 (20) | 26 (20) | 12 (9)* | 22 (17) | 24 (22) | 21 (16) | 22 (16) |
| Other direct nursing care | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Consultation | 12 (0.3) | 12 (0.3) | 12 (0.3) | 11 (0.2) | 12 (1) | 12 (0.3) | 12 (2) | 12 (0.3) |
| Evaluation | 6 (0.2) | 6 (0.2) | 6 (0.1) | 6 (0.1) | 6 (0.6) | 6 (1) | 6 (0.2) | 6 (0.1) |
| Total | 249 (103) | 267 (134) | 261 (101) | 212 (42)* | 269 (44) | 273 (54) | 271 (41) | 262 (40) |

PACU=postanaesthesia care unit; DSU=day surgery unit.

(CAD 50). In contrast, patients following gynaecological laparoscopy seemed to require a longer stay in the DSU after bypassing the PACU, which resulted in a total recovery time comparable to that of those not bypassing the PACU after the same procedure. Clearly, the type of day surgery has a significant influence on the outcomes of a fast-tracking process. Certain types of surgery may be more suited to fast-tracking than others. It seems that, from our study, fast-tracking those undergoing minor procedures requiring no muscle relaxants might be associated with reduced postoperative nursing workload. Further studies with a larger sample size in this population may be required to clarify this benefit.

The overall nursing costs for the three day procedures in our study were similar in the two recovery groups because there were few significant differences in nursing workload. Even though the overall recovery times in the DSU were reduced, these time savings may not result in significant cost savings unless the fast-tracking process leads to savings in personnel costs. In a previous study, Dexter and Tinker examined interventions that could decrease the costs of running a PACU.[14] They concluded that anaesthetists might not be able to decrease postoperative care cost to a great extent, and that the most expensive factor was staffing, which accounted for 98% of the costs. Significant cost savings can be achieved by decreasing PACU staffing levels, but clearly this must be matched with a significant decrease in nursing workload. However, it is difficult to reduce PACU staff as its staffing is very dependent on the number of patients present at peak times. Williams and colleagues showed that PACU-bypass patients were three times more likely to require at least one nursing intervention in the DSU when compared with patients not bypassing the PACU.[3] In this study, we were also not able to show a significant overall decrease in nursing workload following three common day procedures.

Dexter and colleagues examined the effect of PACU bypass rate on nursing staffing in postoperative care using a computer simulation.[15] The authors concluded that decreases in labour costs by faster emergence and bypassing PACU depend on how the operating room and PACU are scheduled, how nurses or technicians are paid, and how many patients per day pass through the unit. In the traditional hospital settings, postoperative personnel costs are fixed rather than variable. Changes in staffing of postoperative care units to take account of a fast-track recovery process

may be difficult when there is no decrease in nursing workload. Significant cost savings may be difficult to realize.

Fast-track pathways are associated with a reduction in monitoring of postoperative vital signs. The rationale for such a reduction is that patients' recovery is so rapid that prolonged monitoring is unnecessary. Although Apfelbaum and colleagues[2] did not find any increase in adverse events in the PACU, it is difficult to say with any certainty that the fast-track pathways are not associated with any increased risk to the patient. Our study demonstrated a statistically significant difference of 17 min in hospital stay between routine and fast-track groups. The question must be 'Is this difference clinically significant?', given that there is no significant financial saving or reduction of nursing workload.

Our results indicate that there is very little clinically significant benefit to patients in bypassing the PACU and very little financial benefit. This may be due to the fixed costs of nursing care. Also, day-case patients in the routine recovery group had a shortened duration of stay in the PACU, thus making the effect of bypassing the PACU less significant.

In summary, fast-tracking outpatients after gynaecological laparoscopy, hysteroscopy and arthroscopy procedures led to an overall shortened length of patient stay in the postoperative care units without increasing postoperative side-effects. However, the overall average nursing workload and cost per patient care were not significantly reduced. The value of bypassing the PACU needs to be further evaluated.

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**Appendix 1** Patient care hour chart

| Nursing care elements | Standard times (min) | |
|---|---|---|
| 1 *Assessment and planning* | | |
| Update PCH chart | 3 | Predetermined value |
| Admission assessment | 15 | Yes __ No __ |
| Admission assessment: complex | 33 | Yes __ No __ |
| Postoperative assessment | 6 | Yes __ No __ |
| Discharge assessment/note | 3 | Yes__ No __ |
| 2 *Teaching and emotional support* | | |
| Routine teaching and emotional support | 6 | Yes __ No__ |
| Complex/with interpreter | 36 | Yes __ No __ |
| Postprocedure discharge teaching: routine | 6 | Predetermined value |
| Additional postprocedure teaching | Real time | How many min __ |
| 3 *I.V. therapy* | | |
| I.V. start (including attempts) | 12 | How many times __ |
| I.V. maintenance | 6 | Yes __ No __ |
| Blood product administration | 18 | No. of units administered |
| 4 *Nutrition* | | |
| Feed self/family feed/NPO | 6 | Yes__ No __ |
| 5 *Elimination* | | |
| Urinal/bedpan/empty Foley | 3 | How many times __ |
| Assist patient to bathroom | 6 | Yes __ No __ |
| Fluid balance | 3 | Yes __ No __ |
| 6 *Treatments* | | |
| Dressing simple/pad and belt application | 3 | How many times __ |
| Continuous oxygen therapy | 6 | Yes __ No __ |
| Capillary blood glucose monitoring | 6 | How many times __ |
| 7 *Vital signs* | | |
| Vital signs (includes oximetry) | 3 | How many times __ |
| Complications requiring extra care | Real time | How many minutes __ |
| 8 *Hygiene* | | |
| Emesis care/Linen change | 3 | How many times __ |
| 9 *Activity* | | |
| Wheelchair transfer | 6 | Yes __ No __ |
| Put patient on surgilift/stretcher | 6 | Yes __ No __ |
| Assistance with dressing for discharge | 6 | Yes __ No __ |
| Postoperative ambulation: routine | 6 | Yes __ No __ |
| Postoperative ambulation: complex | 15 | Yes __ No __ |
| 10 *Medication* | | |
| Oral/topical/puffer medications | 6 | How many times __ |
| I.V./i.m. injections | 6 | How many times __ |
| I.V. medication titration with pump | 2 | How many times __ |
| 11 *Other direct nursing care* | | |
| Venipuncture | 6 | How many times __ |
| Specimen collection (not blood) | 3 | How many times __ |
| 12 Evaluation | 3 | Predetermined value |
| 13 Consultation | 6 | Predetermined value |

PCH=patient care hours.
From Anderson.[9]
NPO, nil by month.

**Appendix 2** Fast-tracking score

| | Score |
|---|---|
| I. Level of consciousness | |
| *Awake and oriented | 2 |
| *Arousable with minimal stimulation | 1 |
| *Responsive only to tactile stimulation | 0 |
| II. Physical activity | |
| *Able to move all extremities on command | 2 |
| *Some weakness in movement of extremities | 1 |
| *Unable to voluntarily move extremities | 0 |
| III. Haemodynamic stability | |
| *Blood pressure <15% below baseline MAP value | 2 |
| *Blood pressure within 15–30% of baseline MAP value | 1 |
| *Blood pressure >30% below baseline MAP value | 0 |
| IV Respiratory stability | |
| *Able to breathe deeply | 2 |
| *Tachypnoea with good cough | 1 |
| *Dyspnoeic with weak cough | 0 |
| V Oxygen saturation | |
| *Maintains value >90% on room air | 2 |
| *Requires supplementary oxygen (nasal prongs) | 1 |
| *Saturation <90% with supplementary oxygen | 0 |
| VI Postoperative pain assessment | |
| *None or mild discomfort | 2 |
| *Moderate to severe pain controlled with i.v. analgesics | 1 |
| *Persistent severe pain | 0 |
| VII Postoperative emetic symptoms | |
| *None or mild nausea with no active vomiting | 2 |
| *Transient vomiting or retching | 1 |
| *Persistent moderate-severe nausea and vomiting | 0 |
| **Total score** | **14** |

A minimum score of 12 (with no score less than 1 in any individual category) would be required for a patient to be fast-tracked (i.e. to bypass the postanaesthesia care unit) after general anaesthesia.
From White and Song.[10]

**Appendix 3** Postanaesthetic discharge score

| Category | Score |
|---|---|
| **Vital signs** | |
| *Vital signs must be stable and consistent with age and preoperative baseline* | |
| BP and pulse ⩽20% of preoperative baseline | 2 |
| BP and pulse >20% <40% of preoperative baseline | 1 |
| BP and pulse ⩾40% of preoperative baseline | 0 |
| **Activity level** | |
| *Patients must be able to ambulate at preoperative level* | |
| Steady gait, no dizziness, meets preoperative level | 2 |
| Requiring assistance | 1 |
| Unable to ambulate | 0 |
| **Pain** | |
| *Patients should have minimal or no pain prior to discharge* | |
| *The level of pain that the patient has should be acceptable to the patient* | |
| *Pain should be controllable by oral analgesics* | |
| *The location, type and intensity of pain should be consistent with anticipated postoperative discomfort* | |
| Acceptability | |
| Yes | 2 |
| No | 1 |
| **Nausea/vomiting** | |
| *The patient should have minimal nausea and vomiting prior to discharge* | |
| Minimal: successfully treated with PO medication | 2 |
| Moderate: successfully treated with i.m. medication | 1 |
| Severe: continues after repeated treatment | 0 |
| **Surgical bleeding** | |
| *Postoperative bleeding should be consistent with expected blood loss for the procedure* | |
| Minimal: does not require dressing change | 2 |
| Moderate: up to two dressing changes required | 1 |
| Severe: more than three dressing changes required | 0 |
| **Maximum score of** | **10** |

Patients with score of ⩾9 are considered fit for discharge home.
From Chung *et al.*[12]

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