Mini-audits facilitate quality assurance in outpatient units

[Des mini-audits contribuent à l'assurance qualité en consultation externe]

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Purpose: It has been shown that large-scale epidemiological studies are an unsatisfactory method of measuring quality of care in anesthesia. We performed a mini-audit of the outpatient surgery unit at Vancouver General Hospital to determine whether such methodology would be helpful in assessing and monitoring quality of care and in identifying areas where improvements could be made.

Methods: After institutional approval, we conducted a prospective quality assurance audit in a cohort of 462 consecutive outpatients. A measurement tool was developed using information from previous literature. Data recorded included demographics, type of surgery and anesthesia, duration of stay in the postanesthetic care unit (PACU) and any adverse events in the PACU. The effect of ethnicity on the above was also examined.

Results: The demographics and practice profiles of our unit were comparable to other units. The mean duration of stay in the PACU was 91 ± 55.3 min and is twice as long as other units. The incidence of hypotension, hypothermia and excessive pain in the PACU were higher compared to other centres. The incidence of other adverse events was comparable to that reported by other centres. O_2 supplementation was required more frequently in Caucasians (23% vs 9%; $P < 0.05$) and postoperative bleeding occurred more frequently in Asiatics (46% vs 27%; $P < 0.05$).

Conclusion: A mini-audit was found to be helpful in assessing and monitoring quality of care and in identifying areas where improvements could be made.

Objectif : On a déjà démontré que les études épidémiologiques à grande échelle ne constituent pas une méthode satisfaisante de mesure de la qualité des soins en anesthésie. Nous avons réalisé un mini-audit de l'unité de chirurgie ambulatoire au Vancouver General Hospital afin de déterminer si cette méthodologie pouvait être utile pour évaluer et surveiller la qualité des soins et pour identifier des domaines susceptibles d'amélioration.

Méthode : Après avoir obtenu l'accord de l'hôpital, nous avons réalisé un audit prospectif sur l'assurance qualité auprès d'une cohorte de 462 patients ambulatoires successifs. Un instrument de

mesure a été mis au point en utilisant des renseignements provenant de documentation déjà publiée sur le sujet. Les données comprenaient des informations personnelles, le type de chirurgie et d'anesthésie, la durée du séjour en salle de réveil (SDR) et les événements défavorables qui ont pu y survenir. On a aussi vérifié l'effet de l'origine ethnique sur ces données.

Résultats : Les données démographiques et les profils de pratique de notre unité ont été comparables à d'autres unités. La durée moyenne du séjour en SDR a été de $91 \pm 55,3$ min, ce qui est deux fois plus long que dans les autres unités. L'incidence d'hypotension, d'hypothermie et de douleur intense à la SDR a été plus élevée, en comparaison avec d'autres centres. L'incidence d'autres événements indésirables a été comparable à celle qui a été rapportée ailleurs. L'administration d'un supplément d' O_2 a été nécessaire plus souvent chez les patients de race blanche (23 % vs 9 %; $P < 0,05$) et les saignements postopératoires plus fréquents chez les Asiaticques (46 % vs 27 %; $P < 0,05$).

Conclusion : Un mini-audit est jugé utile à l'évaluation et à la surveillance de la qualité des soins et à l'identification de domaines à améliorer.

IN the last decade, we have seen a large and ever increasing proportion of surgical procedures performed in an ambulatory care setting. Ambulatory anesthesia is faced with many challenges and we are constantly striving to maintain and improve quality of care. Expensive large scale epidemiological studies have shown that measuring quality of care in anesthesia by comparing major outcomes is unsatisfactory since the contribution of anesthesia to perioperative outcomes is uncertain and that variations may be explained by institutional differences which are beyond the control of anesthesiologists.¹ It has been suggested that the next focus for quality improvement in anesthesia should be tracking of

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minor events that are of particular concern to the patient and are important for resource planning by the institution.¹ Large-scale outcome-tracking databases are an expensive proposition for many outpatient facilities and yield little information that is of concern to patients or institutions, and the results are largely dependent on the documentation culture of the institution.² Mini-audits are an acceptable and inexpensive method of acquiring data that may be useful in small facilities.³ However, there is little experience and agreement on the type of information that should be collected with such mini-audits.

The objective of this study was to develop and implement a mini-audit for the rapid assessment and monitoring of quality in the postanesthetic care unit (PACU) of a busy outpatient unit. A secondary objective was to determine whether such an audit could be useful in evaluating the impact of ethnicity on the PACU complications because it was our clinical impression that ethnicity appeared to be an important factor in the development of adverse events.

Methods

The Surgical Day Unit (SDU) in Vancouver General Hospital provides ambulatory surgical care to over 10,000 patients per year. Surgical specialties represented here include general surgery, dental, otorhinolaryngology, urology, gynecology, plastics, orthopedics and ophthalmology. Our schedule for the four operating rooms from Monday to Friday is 07:45 hr to 17:00 hr. Postoperatively, these patients recover in a 12-bed PACU prior to their discharge home.

Patients attending this unit are admitted routinely to the preoperative area 90 min prior to the scheduled operation. *IV* access is secured and an infusion of 0.9% saline is commenced. All patients receive 975 mg acetaminophen *po* and depending on the type of surgery, diclofenac *po/pr* may be given also. Patients walk to the appropriate operating room and anesthesia is induced with propofol *iv* or sevoflurane by inhalation. Anesthesia is maintained with O₂/N₂O and either sevoflurane/isoflurane or a propofol infusion. If required, intraoperative opiates are used including fentanyl, alfentanil, sufentanil, morphine and meperidine. At the discretion of the attending anesthesiologist, routine antiemetic treatment (metoclopramide 10 mg, dolansetron 20–50 mg or perphenazine 1–2 mg) is administered either preoperatively or on emergence from anesthesia. Regional anesthetic techniques are employed based on patient's preference and medical condition as well as anesthesiologist's preference. The most common regional techniques employed are spinal anesthesia, *iv*

regional anesthesia, popliteal block, ankle block, and axillary block. Monitored anesthesia techniques consist of local anesthetic infiltration and sedation with adjuvants such as midazolam, opioids and propofol.

Patients are then transferred to the PACU where a minimum of three sets of physiological measurements (heart rate, respiratory rate, O₂ saturation, non-invasive blood pressure and sedation scores) are taken at 15-min intervals. If indicated, aural temperature and capillary glucose are recorded. On fulfilling the unit's discharge criteria, patients are discharged from the centre. The criteria for discharge from the PACU are: 1) alert and oriented; 2) stable vital signs; 3) complete recovery of neuraxial block; 4) control of pain with oral analgesia; 5) control of postoperative nausea and vomiting (PONV); and 6) absence of surgical bleeding.

We studied prospectively the postoperative course of patients attending the SDU of Vancouver General Hospital. The design of the study was 'occurrence screening' over a two-week period in November 1998, during which all 462 patients admitted consecutively to the PACU were evaluated. Institutional Ethics Committee approval was obtained but since this was an observational study with no deviation from standard care, written consent was not required.

Several meetings were held to determine which items were to be included and to develop guidelines for inclusion of variables. The data collection tool had to be paper based, short (single sheet, double sided) and have enough space to allow hand written commentary. Strict definition of variables was used to ensure strict adherence and uniformity. All definitions, unless specified, were consistent with previous studies.^{1,3} Data were collected by one anesthesiologist in the PACU to minimize inter observer variability. After development of a prototype form, it was tested for two days in the PACU before adoption. Preoperative information recorded consisted of date, time, hospital ID, age, weight, sex, ASA class, ethnicity, type of operation and anesthesia. The PACU information recorded consisted of total time in the PACU, respiratory rate (normal, <10, >10·min⁻¹), SpO₂ on room air (<94%, >94%), O₂ requirement for SpO₂<94% on room air (none, nasal prongs, O₂ mask), intubated on transfer to the PACU (yes, no), intubated in the PACU (yes, no), occurrence of respiratory complications,³ blood pressure (normal, low,³ high,³) heart rate [normal, low (<50 beats·min⁻¹), high (>120 beats·min⁻¹)], occurrence of cardiovascular complications as defined in previous studies,³ temperature [normal, low,³ high (>38°C skin, or 38.5°C aural)], neurological status,³ nausea/vomiting,³ pain control (comfortable, required treatment, number of nursing

visits for pain treatment), bleeding in the PACU (none, <200 mL, >200 mL), renal/metabolic abnormalities,³ any other complications and whether a return to the operating room occurred.

Data were analyzed with SPSS (version 4.0). Descriptive statistics of the demographic data were calculated and a comparison was made between the Asiatic and Caucasian populations. Student’s t test was used for continuous variables and the Chi square test for categorical variables. A *P* value <0.05 was considered statistically significant.

Results

Forty-one percent of patients were admitted to the PACU between 08:05–12:00 hr and the remainder from 12:00–17:43 hr. There were more females than males and the Caucasian population was in majority. The majority of patients were classified as ASA I (Table I). Most procedures were performed under general anesthesia. Details of methods of anesthesia and types of surgery are shown in Table II. The mean length of stay ($\pm$ SD) in the PACU was 91 $\pm$ 55 min.

Bradypnea (RR <10) occurred in 2.4% of patients and 0.4% were tachypneic (RR >30) during their stay in the PACU. In only two patients (0.4%) was O₂ saturation <94% on room air on admission. Supplemental O₂ (facemask or nasal prongs) was required in 19.7% of patients during their PACU stay. A laryngeal mask airway (LMA) or endotracheal tube (ETT) was in place in 2.6% and 1.7% respectively of patients entering the PACU. Two patients developed bronchospasm, which subsided with appropriate treatment. There were no episodes of aspiration, pulmonary edema, respiratory arrest or laryngeal spasm. No patient required reintubation postoperatively.

Hypertension occurred in 8.7% of patients and hypotension in 21.4% while in the PACU. Bradycardia occurred in 29.9% while 0.4% of patients developed tachycardia. No patient developed evidence of myocardial ischemia, infarction or arrest. Dysrhythmias occurred in only 0.2 % of patients.

Aural temperature was measured in 36.1% of patients. This was within normal range in 92% of these patients, the remaining patients having a temperature of <36°C. No patient developed hyperthermia. A majority (99.8%) of patients were conscious/drowsy on admission to the PACU while one patient (0.2%) was unconscious for <15 min.

PONV was present in 6.5% of patients and 3.7% of all patients received antiemetic medication in the PACU. Thirty-seven percent of patients described their pain as unbearable while 63% were comfortable. Analgesia was required in 54.5% of patients. One post-

TABLE I Demographic data

Age (yr)	41 $\pm$ 17
Mean $\pm$ SD	
Weight (kg)	69 $\pm$ 16
Mean $\pm$ SD	
Gender	(%)
Male	31.4
Female	68.6
ASA status	(%)
I	60.5
II	33.4
III	5.4
IV	0.7
Ethnicity	(%)
Asiatic	24
Caucasian	76

TABLE II Types of surgery/methods of anesthesia

Types of Surgery	(%)
Lower limb	5
Upper limb	5
Head and neck	13.9
Gynecology	38.2
Urogenital	25.8
Abdominal	2.4
Dental	7.8
Breast	0.4
Others	1.7
Methods of anesthesia	(%)
General anesthesia	84.6
Spinal	2.4
Regional block	3.9
Local infiltration	9.1

operative nursing visit for pain was required in 27.9%, while 8, 6.9, 4.3 and 3.9% of patients required two, three, four and five visits respectively (Figure).

Postoperative bleeding (200 mL) occurred in 32% and was managed conservatively with *iv* crystalloid infusion. No patient required return to the operating room. Residual neuromuscular paralysis was diagnosed (clinically and with a nerve stimulator) in 0.2% of patients. There were no other complications identified in this cohort.

Subgroup analysis showed that 24% of patients were of Asiatic origin and 76% were Caucasian. There was no difference between the groups with respect to age and weight. Ninety percent of Asiatics received general anesthesia compared to 83% of Caucasians.

FIGURE Nursing visit requirements for pain in the PACU.

The mean length of stay in the PACU was 101 ± 61 min for Asiatics and 90 ± 55 min for Caucasians. There was a higher requirement for O_2 supplementation in Caucasians patients (23%) compared to Asiatics (9%, $P < 0.05$). There was a higher frequency of bleeding amongst Asiatic patients (46%) compared to Caucasian patients (27%, $P < 0.05$). Bleeding was 200 mL in all patients in the study.

Discussion

This report describes our methodology and results for a mini-audit to measure and monitor quality of care in the PACU of the outpatient surgery unit at Vancouver General Hospital.

Demographic data indicate the type of practice profile of the unit and are helpful in inter-institutional comparisons and for monitoring change in practice over time. The age, ASA class, and surgery type in our unit are comparable to other Canadian outpatient units.⁴ Anesthetic practice has not changed over the last decade and most outpatients continue to receive general anesthesia.⁴ This is in keeping with the heavy demands of a busy unit and the need to maintain efficiency. More patients arrive in the PACU between 12:00–17:43 hr than before 12:00 hr. Since the unit closes at 19:00 hr, the shortest amount of recovery time available was approximately 2.2 hr. Since there were no admissions to hospital, it is reasonable to assume that there is enough time for recovery and discharge of patients in the unit provided that the last operation is finished by 17:43 hr at the latest.

Duration of stay in the PACU is an interesting measure of anesthetic quality – a short stay suggestive of a rapid, uneventful recovery without complications. The mean duration of the PACU stay for our unit was 91 ± 55 min. This compares with the PACU times of 104

± 31 min in units not using fast-track eligibility criteria⁵ (ability to achieve the PACU discharge criteria) and 40 ± 13 min reported by other units using fast-track criteria to abbreviate the duration of the PACU stay.^{6,7} This suggests that implementation of fast-track eligibility criteria in our day unit would result in improved efficiency of the PACU. An audit such as this, by providing objective information, will help in facilitating a change in behaviour in our unit.

Respiratory problems identified were: bradypnea (2.4%), $SpO_2 < 94\%$ (0.4%), and bronchospasm (0.4%). These compare favourably with a 4.3% respiratory complication rate reported in 6914 outpatients⁴ and a 0.8% incidence of bronchospasm and 0.9% incidence of hypoxia reported in 96,107 hospital patients (mixed outpatient and inpatient database).² Supplemental oxygenation use was 19% and is probably a reflection of patients' physical status, type of anesthetic, sea level location of Vancouver and surgery. The number of patients arriving to the PACU with an LMA (2.6%) or ETT (1.7%) is low and reflects variability in anesthetic practice and patient type.

Cardiovascular problems identified were: hypotension (21%), hypertension (8.7%), bradycardia (30%), tachycardia (0.4%) and dysrhythmias (0.2%). In previous studies,⁴ the incidence of hypotension in the PACU in outpatients was 0.2% and of hypertension was 0.1%. In hospital patients,² the incidences of hypotension, hypertension, bradycardia and dysrhythmia were 7%, 2.9%, 2.4% and 1.8% respectively. In a previous report we identified hypotension due to poor hydration as a significant problem in our day unit and an important contributory factor to hospital admission.⁸ Even though liberalization in fasting criteria (clear fluids up to three hours before surgery) has occurred in our unit, it appears not to have lowered the incidence of hypotension. A study by Yogendran *et al.* has shown that aggressive hydration with isotonic electrolyte solutions ($20 \text{ mL} \cdot \text{kg}^{-1}$) results in a lower incidence of complications such as dizziness due to hypotension and inadequate hydration.⁹ Implementation of, and voluntary compliance with, such a regimen may be useful in reducing the incidence of hypotension and would seem warranted in our unit.

Hypothermia was diagnosed in 8.4% of patients in our day unit. This was a higher rate than found in two other studies of 6,914 outpatients⁴ and 96,107 hospital patients² (0.1% and 0.3% respectively). It would be unreasonable financially to apply warming devices to all our outpatients. A less expensive solution would be to raise the ambient temperature in the operating room and the PACU and consider warming devices for longer cases and in those patients more likely to

develop hypothermia (for example, elderly patients receiving spinal anesthesia).

The incidence of PONV in our patients was 6.5% and compares favourably with incidences of 7.2% and 2.7% in other institutions.^{4,10} On the other hand, 37% of our patients described their pain as unbearable compared to reports of 6.2% in other units.¹⁰ The mean number of nursing visits for pain was 1.2 ± 1.8 and 45% of patients did not require any visit for pain management. One postoperative nursing visit for pain was required in 27.9% of patients, while 8, 6.9, 4.3 and 3.9% of patients required two, three, four and five visits respectively (Figure). Since pain is an important factor contributing to unanticipated admission after ambulatory surgery, it seems reasonable to address this finding aggressively.¹¹ In some outpatient facilities that rely exclusively on opioids for analgesia, 40% of patients report moderate to severe pain.¹² Michaeloliakou *et al.* showed that a multimodal approach to pain treatment consisting of opioids, NSAIDs and local anesthesia, allowed more painful procedures to be performed on an outpatient basis with a low risk of PONV.¹³ It is also important to note that patients continue to express a strong desire to avoid outcomes such as pain and vomiting.¹⁵ Anesthesiologists should therefore pay special attention to ensure that the incidence of these adverse events is as low as possible.¹⁵

One surprising finding of our study was that Asiatic patients bled more than Caucasian patients did whereas supplemental oxygen was required more frequently in Caucasian patients. Preliminary reports seem to suggest that ethnicity may be an important factor in the development of adverse events.¹⁴ However, our results need to be substantiated by other centres before specific recommendations can be made on these interesting findings.

In summary, in a mini-audit of a cohort of 462 outpatients, we showed that, whereas the overall quality of care was acceptable, there were specific areas where improvements in quality could be made. The incidence of hypotension, hypothermia and pain was higher than that reported from other centres. Mini-audits may help to improve quality of care in areas not previously identified when it does not meet established bench marks.¹⁵

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