Adverse outcomes in ambulatory anesthesia — what can we improve?

Frances Chung *, Gabor Mezei

Department of Anaesthesia, University of Toronto, Toronto Western Hospital, 399 Bathurst St., Toronto, Ont., Canada, M5T 2S8

Received 16 July 1999; accepted 15 August 1999

Abstract

Currently, an estimated 65% of surgical procedures in North America are completed in ambulatory settings. In this review, we summarize the outcome measures that can be used in the assessment of the safety of ambulatory surgery and anesthesia. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Ambulatory surgery; Anesthesia; Safety

1. Mortality and morbidity

The traditional measures of quality and safety of surgery and anesthesia are perioperative mortality and morbidity rates (Table 1). Deaths related to ambulatory surgery or anesthesia are extremely rare events, and very low rates of major morbidity are reported repeatedly throughout the relevant literature. Warner et al. following 38 598 ambulatory surgical patients for 30 days after their surgery documented only four deaths and 31 cases of major morbidity [1]. In four other studies on ambulatory surgical patients, no perioperative deaths were identified [2–5]. Morbidity rates in the latter studies were under 10%, although these studies also included minor adverse events, such as blood pressure irregularities, postoperative pain, and postoperative nausea and vomiting (PONV) [3–6].

The inclusion of less serious adverse outcomes results in higher morbidity rates. However, it reflects the burden of ambulatory surgery on health care providers and on patients more appropriately, since even minor events may necessitate extra patient care and may prevent the patients returning to their preoperative functional level. Incidence rates of perioperative adverse events observed at our institution are listed in Tables 2 and 3.

1.1. Cardiovascular and respiratory adverse events

Cardiovascular adverse events are the most common ones occurring during ambulatory surgery [3,5,6]. Of these cardiovascular events, blood pressure abnormalities occur most frequently, followed by different types of rhythm disorders. Cardiovascular events also occur in the immediate postoperative period, with lower frequencies [3,6].

The occurrence of perioperative cardiovascular events may result in prolonged postoperative stay [7]. Cardiovascular events warranting unanticipated hospital admissions are relatively infrequent and life-threatening cardiovascular events, such as myocardial infarction, are extremely rare among ambulatory surgical patients [1,8]. Cardiovascular events occur with
higher frequency among patients with preexisting cardiovascular diseases. Increasing age is also associated with a higher incidence of cardiovascular events (Fig. 1) [3,6,9].

Respiratory problems are the second most frequent intraoperative events [3,5]. These are mostly laryngospasm and bronchospasm. Episodes of apnea, aspiration, pneumothorax, and pulmonary edema occurring during ambulatory surgery are also reported [2,3,5,10]. Respiratory complications may also result in unanticipated admission [8,10]. Smokers, obese patients and patients with asthma are at higher risk of developing perioperative respiratory events [3,9].

1.2. Postoperative pain, PONV and minor sequelae

Postoperative pain is one of the most frequent postoperative adverse events after ambulatory surgery. Type and invasiveness of surgery have the most significant effect on the incidence of severe postoperative pain (Fig. 2) [11–13]. Duration of the procedures is also associated with the incidence of postoperative pain.
Patients undergoing longer procedures experience a higher incidence of pain [11].

Severe and moderate postoperative pain decreases patients' postoperative functional level and it is also associated with longer postoperative stay, higher rate of unanticipated admission and readmission [7,8,14–16]. Pain and medications used for pain management, primarily opioids, precipitate PONV, which may also result in prolonged stay and hospital admissions, underlining the importance of appropriate pain management in ambulatory surgery.

PONV is an important and frequent complication related to ambulatory anesthesia. Although its incidence seems to decline, probably as a result of the widespread use of newer anesthetic drugs and surgical techniques, it is still one of the strongest predictors for prolonged postoperative stay and unanticipated hospital admissions [7,17].

The frequency of PONV shows wide variation by type and length of anesthesia, the anesthetic drugs used, type of surgery and different patient characteristics. General anesthesia is associated with the highest incidence, and usually there is an even higher frequency among patients receiving inhalation agents [18]. The frequency of PONV also varies widely by type of surgery (Fig. 3). Patients undergoing more painful procedures face a significantly higher risk [19]. Female sex, younger age, presence of obesity, history of motion sickness and history of previous PONV are also risk factors for a higher incidence of PONV, while smoking seems to decrease the incidence of PONV [3,18].

Sore throat, shivering, dizziness, drowsiness and headache are frequent minor complications, which could also result in prolonged postoperative stay, and strongly influence patient satisfaction and functional level (Fig. 4) [13,14].

1.3. Elderly patients and patients with preexisting medical conditions

Elderly patients face a higher risk of developing perioperative cardiovascular events than younger patients, but they are less likely to suffer from all other perioperative events [6]. The increase in the risk of cardiovascular events among the elderly does not contraindicate ambulatory surgery in these patients, but it calls for a more thorough perioperative cardiovascular management.

Certain preexisting medical conditions also increase the risk of perioperative adverse events (Table 4). These associations, while they do not preclude patients from undergoing ambulatory surgery, warn the anesthesiologists that the anesthetic care of each patient needs to be individualized based on the patient's characteristics.
Fig. 4. Postoperative symptoms 24 h after ambulatory surgery by telephone interview (n = 778). Nau/Vom, nausea/vomiting.

Table 4
Association between the presence of preexisting medical conditions and adverse outcomes

<table>
<thead>
<tr>
<th>Medical condition</th>
<th>Associated adverse outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive heart failure</td>
<td>12% Prolongation of postoperative stay</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Two-fold increase in the risk of intraoperative cardiovascular events</td>
</tr>
<tr>
<td>Asthma</td>
<td>Five-fold increase in the risk of postoperative respiratory events</td>
</tr>
<tr>
<td>Smoking</td>
<td>Four-fold increase in the risk of postoperative respiratory events</td>
</tr>
<tr>
<td>Obesity</td>
<td>Four-fold increase in risk of intraoperative and postoperative respiratory events</td>
</tr>
<tr>
<td>GE reflux</td>
<td>Eight-fold increase in the risk of intubation related adverse events</td>
</tr>
</tbody>
</table>

*a Data from the Ambulatory Surgical Unit of the Toronto Western Hospital.

Table 5
Association between the occurrence of perioperative adverse events and the duration of postoperative stay

<table>
<thead>
<tr>
<th>Adverse event</th>
<th>Associated percentage increase in duration of postoperative stay (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative event</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>8</td>
</tr>
<tr>
<td>Postoperative event</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>42</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>30</td>
</tr>
<tr>
<td>Dizziness</td>
<td>30</td>
</tr>
<tr>
<td>Excessive pain</td>
<td>24</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>19</td>
</tr>
<tr>
<td>Shivering</td>
<td>11</td>
</tr>
</tbody>
</table>

*a Data from the Ambulatory Surgical Unit of the Toronto Western Hospital.

2. Prolonged postoperative stay

Duration of postoperative stay is also a commonly used outcome measure of ambulatory surgery and anesthesia [20]. Duration of postoperative stay correlates well with the occurrence of minor or moderately severe complications (Table 5). Actual discharge time may be different from the time when the patient is ready for discharge, mostly as a result of late or unavailable escort, or inadequate discharge practices.

The length of postoperative stay and the occurrence of prolonged postoperative stay are most influenced by the type of anesthesia and surgery [7,21]. General anesthesia, which is associated with a high incidence of PONY, and certain painful procedures are associated with lengthy stays [11,12,17,19]. The occurrence of excessive pain and PONV increases the likelihood of prolonged stay by about 3 to 4-fold [7,11]. Cardiovascular events, drowsiness and dizziness may also significantly lengthen the duration of stay [7].

Sex and age are also associated with the incidence of adverse events predicting prolonged stay. Women are more prone to suffer from PONV than are men [18]. Younger patients are more likely to suffer from excessive pain and PONV, while the elderly are more likely to experience cardiovascular events [6].

3. Unanticipated hospital admissions

Unanticipated hospital admission rates usually mirror the frequency of severe complications. The reported rates of unanticipated admissions range between 0.3 and 1.4% [4,8,10,12,15].

The most frequent reasons for unanticipated hospital admissions are surgical complications (excessive pain, bleeding). Anesthesia related (PONV, somnolence, dizziness) and medical (mostly cardiovascular) complications may also lead to unanticipated admissions. A significant proportion of the unanticipated admissions is due to social reasons.

Patients undergoing painful surgery are about 4 to 30-fold more likely to be admitted following surgery [8]. Patients receiving general anesthesia are 2 to 5-fold more likely to be admitted than patients without general anesthesia, and with increasing duration of anesthesia the probability of admission also increases [8,10].

4. Return hospital visits and hospital readmissions

Complications may develop even after a safe discharge resulting in return hospital visits or hospital readmissions. Published results show that within the first 24–72 h, 4–8% of ambulatory surgical patients are seen by a doctor, while this proportion is up to 12% within the first postoperative month [4,22]. Hospital readmission rates are significantly lower, ranging between 0 and 3% within one month following ambulatory surgery [12,16,23]. Twersky et al. found that,
although 3% of their 6243 patients were admitted to hospital within one month of discharge, only 1.3% of the patients were admitted as a result of complications [16]. The most common reasons for complication related readmissions were bleeding, fever and infection, pain, wound disruption, and urinary retention. No anesthesia related readmissions were identified.

5. Patient satisfaction and postoperative functional level

Patient satisfaction with ambulatory surgery and anesthesia is generally high (97–99%) [12,24] The main reasons for dissatisfaction with anesthesia are the occurrence of perioperative adverse events. Dissatisfaction is also strongly associated with the number of postoperative symptoms the patients develop (Fig. 5) [24].

Ambulatory surgical patients’ postoperative functional level is shown to be significantly decreased [13,14,25]. Swan et al. showed that ambulatory surgical patients experienced decreased functional status during the first seven postoperative days and only 22% of the patients returned to work by the seventh day after operation [25].

6. Conclusion

Ambulatory surgery, as it is currently practiced, has an excellent safety record. Major morbidity is infrequent, and deaths are extremely rare events during or following ambulatory surgery. Less serious, non life-threatening perioperative events, such as intraoperative cardiovascular events, and most frequently postoperative pain and PONV, are occurring with higher incidence. These minor events may result in prolonged postoperative stay, unanticipated hospital admission or hospital readmission, and they also affect patient satisfaction and postoperative functional level. The occurrence of these minor adverse events is now the major area of quality assessment and an area where improvement should be targeted. The goal of lowering the incidence of these minor adverse events related to ambulatory surgery could be achieved by development of less invasive surgical techniques, use of newer shorter acting anesthetic drugs with fewer side effects and improved postoperative pain management.

References