Evaluation of risk factors for unanticipated hospital admission following ambulatory surgery - An observational study

ABSTRACT

Context: Unanticipated admissions following ambulatory surgery significantly affect hospital admission and operation room flow. Most of the factors responsible for unanticipated admission following ambulatory surgery were preventable. It is, therefore, crucial to improve patient selection criteria and to identify the risk factors for unanticipated admission during preoperative period. These unanticipated admissions have now been considered as quality care indicator and a target to improve healthcare costs.

Aims: To assess the reasons and risk factors for unanticipated hospital admission after ambulatory surgery.

Methods and Materials: In this case-control study, cases who were re-admitted within 48 hours following ambulatory surgery were included. The convenience sampling was used to identify controls. Data including patients' demographics, type of anesthesia and surgery, any intraoperative or postoperative complications, etc., were extracted.

Statistical Analysis Used: Descriptive statistics is used to summarize the study variables. Mean and standard deviation were used for quantitative variables. Percentage and frequencies were used for qualitative variables. Univariate and multivariate logistic regressions were used to assess risk factors for unanticipated hospital admission after ambulatory surgery.

Results: There were 153 cases and 147 controls in this study. The study found postoperative pain as the most common reason for re-admission after ambulatory surgery followed by bleeding, fever, and asthma exacerbation. Multivariate logistic regression showed age, BMI more than 40, and presence of respiratory disease as risk factors \((P < 0.05)\).

Conclusions: Age, high BMI more than 40, and presence of respiratory disease increase the risk of unanticipated hospital admission after ambulatory surgery.

Key words: Ambulatory surgery, risk factors, unanticipated admission

Introduction

Eligibility criteria for ambulatory surgery have widened during the recent years because of better preoperative care, pharmacological agents, use of regional anesthesia, and advances in surgical techniques.\(^1,2\) As relatively more complex procedures and patients can now be considered for ambulatory surgery, the number of re-admissions following ambulatory surgery have also increased. Globally, incidence of unanticipated hospital admission after ambulatory surgery differs. A Canadian study reported the rate of admission as...
2.6%.\(^3\) Other studies reported varying rates from 0.5 to 9% of hospital visits after ambulatory surgery depending on type of surgery, type of admission, and also timing of admission.\(^4-7\)

In addition to inconvenience and sufferings resulting from unanticipated admissions following ambulatory surgery, these admissions significantly affect hospital admission and operation room flow. Although, most of the factors responsible for unanticipated admission following ambulatory surgery were preventable. It is, therefore, crucial to improve patient selection criteria and to identify the risk factors for unanticipated admission during preoperative period. These unanticipated admissions have now been considered as quality care indicator and a target to improve healthcare costs.\(^8,9\) This study was conducted to assess the reasons and risk factors for unanticipated admission in hospital after ambulatory surgery.

Subjects and Methods

Institutional ethical committee approval was taken for this study (20-439-51). This case–control study was done in Security Forces Hospital, Riyadh, Saudi Arabia. The cases included patients who were re-admitted in hospital within 48 hours following ambulatory surgery between 2009 and 2021. The controls included patients who underwent ambulatory surgery during the same time period but were not re-admitted within 48 hours after ambulatory surgery. Convenience sampling was used to identify controls. The list of cases was extracted electronically with the help of the medical record team. Patients' variables required for the study was obtained from hospital electronic medical record system.

Data including demographics of patient, American society of anesthesiologists (ASA) classification, type of anesthesia and surgery, and length of surgical procedure were collected. Other variables that were obtained included body mass index of patient, presence of medical comorbidities, current medication, and the occurrence of intra or postoperative complications or events, such as difficult intubation, laryngospasm bronchosopasm requiring inhaled bronchodilators, aspiration, hypotension, myocardial ischemia, and blood loss requiring blood products transfusion.

All collected study variables were coded numerically and managed, processed, and compiled in Microsoft Excel. To check for inaccuracy and incompleteness, the data were then imported to SPSS version 26. Descriptive statistics was used to summarize the study variables. Mean and standard deviation were used for quantitative variables. Percentage and frequencies were used for qualitative variables. Univariate analysis was performed to evaluate individual risk factors for unanticipated admission in hospital after ambulatory surgery. A final model was then made in which multivariate logistic regression evaluated risk factors for hospital admission after ambulatory surgery. A \(P\) value <0.05 was considered as significance level.

Results

Total number of patients in this study was 300. Among those, 153 were cases vs 147 as controls. The mean age was 54.95 years. There were 100 (65%) males and 53 (35%) females among cases, whereas 98 (67%) males and 49 (33%) females among controls. Most patients in cases belonged to ASA 1, 90 (59%) followed by ASA 2, 57 (37%) and ASA 3, 5 (3%), and ASA 4, 1 (1%). Most patients in control were ASA 2, 84 (57%) followed by ASA 1, 57 (39%), and ASA 3, 6 (4%). Thirty-nine (25%) patients in cases vs 45 (30%) in controls had BMI more than 30.

The most common surgical specialty in both groups were ENT as 50 (33%) in cases and 33 (22%) in control, followed by General surgery as 30 (20%), Urology as 27 (18%), and plastic as 17 (11%) in cases; whereas followed by General surgery as 33 (22%), Urology as 23 (16%), and plastic as 17 (11%) in controls as demonstrated in Graph 1.

Among cases, 139 (91%) patients had GA followed by other types of anesthesia 14 (9%), whereas 133 (90%) controls had GA followed by other types of anesthesia 14 (10%). Ten (6.5%) cases were known hypertensive vs 4 (3%) in controls. Six (4%) cases were diabetic vs 8 (5%) among controls. Sixteen (11%) in controls had some respiratory disease, whereas 41 (26.7%) had respiratory diseases in cases. Among controls, all patients having respiratory diseases were asthmatic, whereas among cases, 17 (41%) were asthmatic followed by smokers, 14 (34%), and obstructive sleep apnea (OSA), 9 (6%).

The most common reasons for re-admission after ambulatory surgery were pain as 83 cases (54%), followed by bleeding...
from surgical site as 35 (23%), fever as 9 (6%), asthma exacerbation as 7 (4.5%), and others as described in Graph 2.

In univariate analysis, BMI more than 40 and presence of respiratory diseases were found to be risk factors for re-admission, $P$ value as 0.023 and 0.001, respectively. A final multivariate logistic regression was then performed; Age, BMI more than 40, and presence of respiratory disease were found to be risk factors for re-admission after ambulatory surgery as shown in Table 1.

**Discussion**

According to scientific literature, factors that influence the unanticipated hospital admission following ambulatory surgery are related to surgical causes in 40% of the cases. Other causes are related to anesthesia in 20% cases and patient’s medical comorbidities in 19% of cases.[3] Most common reasons for unanticipated hospital admissions in this study included pain and bleeding (77%). Bleeding was found to be most common reason for re-admission following ambulatory sinonasal procedure in the study by Bhattacharyya.[10] They reported that it occurred in 1% of all cases. The other important causes in their study were postoperative pain, fever, dehydration, and postoperative nausea and vomiting (PONV). Awan et al.[11] reported PONV as the most common reason for unanticipated admission related to anesthetic cause. Although, PONV was reported in less than 1% of cases in this study. Patients undergoing ENT surgery, urological surgery, plastic surgery, and pain block were found to be at higher risk for admissions following ambulatory procedures.[12] In this study, most of cases for unanticipated hospital admission also belonged to ENT surgery followed by general surgery, urology, and plastic surgery.

Medical condition of patients also can have significant influence on the incidence of unanticipated hospital admissions. Chung et al.[13] concluded that advanced age subjects the patients at increased risk of perioperative complications. Whippey et al.[14] demonstrated that age more than 80 years was associated with five times more risk for unanticipated hospital admission. Bongiovanni et al.[15] also found increasing age as a risk factor for unplanned hospital visits. Multivariate analysis in this study also demonstrated that age increases the risk of unanticipated hospital admission following ambulatory surgery. ASA class of patients was also a strong predictor for unanticipated hospital admission in previous studies,[15,16] although this study did not find ASA class as a risk factor for unanticipated hospital admission.

Another review demonstrated increased admission rate in patients having coexisting diseases, such as chronic obstructive airway disease, Asthma, obesity and OSA.[16] Bhattacharyya et al.[10] showed that readmission rates in BMI upto 49 kg/m$^2$ was similar or low but higher and non-significant in patients with BMI more than 50 kg/m$^2$. This finding is consistent with SAMBA consensus statement that suggests that ambulatory surgery appears to be safe in patients having BMI less than 40 kg/m$^2$ assuming other medical comorbidities are well controlled.[17] Our study also showed that presence of respiratory diseases and BMI more than 40 are associated with increased hospital readmission following ambulatory surgery. Although this was in contrast to findings in studies by Stierer et al. and Bryson et al.,[15,16] which did not find any statistical difference in hospital readmission in patients with and without OSA. Few limitations are there in this study. First of all, it is a case–control study and has a small sample size. The study was done at a single centre. In conclusion, age, high BMI more than 40, and presence of respiratory disease increases the risk of unanticipated hospital admission following ambulatory surgery.

In conclusion increasing age, obesity, and presence of respiratory diseases are risk factors for unanticipated hospital admissions after ambulatory surgery.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**Table 1: Multivariate logistic regression for risk factors of re-admission after day case surgery**

| Characteristics       | Odds ratio | P       |
|-----------------------|------------|---------|
| Age                   | 1.021      | 0.016*  |
| High risk surgery     | 0.414      | 0.509   |
| Anesthesia type       | 1.101      | 0.835   |
| BMI more than 40      | 0.114      | 0.028*  |
| Respiratory disease   | 0.323      | 0.001*  |

*Indicates significance level
References

1. Aurini L, White PF. Anesthesia for the elderly outpatient. Curr Opin Anaesthesiol 2014;27:563-75.
2. White PF, White LM, Monk T, Jakobsson J, Raeder J, Mulroy MF, et al. Perioperative care for the older outpatient undergoing ambulatory surgery. Anesth Analg 2012;114:1190-215.
3. Whippey A, Kostandoff G, Paul J, Ma J, Thabane L, Ma HK. Predictors of unanticipated admission following ambulatory surgery: A retrospective case-control study. Can J Anaesth 2013;60:675-83.
4. Owens PL, Barrett ML, Raetzman S, Maggard-Gibbons M, Steiner CA. Surgical site infections following ambulatory surgery procedures. JAMA 2014;311:709-16.
5. Majholm B, Engbæk J, Bartholdy J, Oerding H, Ahlborg P, Ulrik AM, et al. Is day surgery safe? A Danish multicentre study of morbidity after 57,709 day surgery procedures. Acta Anaesthesiol Scand 2012;56:323-31.
6. Hollingsworth JM, Saigal CS, Lai JC, Dunn RL, Strope SA, Hollenbeck BK, et al. Surgical quality among Medicare beneficiaries undergoing outpatient urological surgery. J Urol 2012;188:1274-8.
7. Fox JP, Vashi AA, Ross JS, Gross CP. Hospital-based, acute care after ambulatory surgery center discharge. Surgery 2014;155:743-53.
8. Axon RN, Williams MV. Hospital readmission as an accountability measure. JAMA 2011;305:504-5.
9. Jha AK, Orav EJ, Epstein AM. Public reporting of discharge planning and rates of readmissions. N Engl J Med 2009;361:2637-45.
10. Bhattacharyya N. Unplanned revisits and readmissions after ambulatory sinonasal surgery. Laryngoscope 2014;124:1983-7.
11. Awan FN, Zulkiñi MS, McCormack O, Manzoor T, Ravi N, Mehigan B, et al. Factors involved in unplanned admissions from general surgical day-care in a modern protected facility. Ir J Med Sci 2013;106:153-4.
12. Bettelli G. High risk patients in day surgery. Minerva Anestesiol 2009;75:259-68.
13. Chung F, Mezei G, Tong D. Adverse events in ambulatory surgery. A comparison between elderly and younger patients. Can J Anaesth 1999;46:309-21.
14. Bongiovanni T, Parzynski C, Ranasinghe I, Steinman MA, Ross JS. Unplanned hospital visits after ambulatory surgical care. PLoS One 2021;16:e0254039. doi: 10.1371/journal.pone.0254039.
15. Stierer TL, Wright C, George A, Thompson RE, Wu CL, Collop N. Risk assessment of obstructive sleep apnea in a population of patients undergoing ambulatory surgery. J Clin Sleep Med 2010;6:467-72.
16. Bryson GL, Gomez CP, Jee RM, Blackburn J, Taljaard M, Forster AJ. Unplanned admission after day surgery: A historical cohort study in patients with obstructive sleep apnea. Can J Anaesth 2012;59:842-51.
17. Joshi GP, Ahmad S, Riad W, Eckert S, Chung F. Selection of obese patients undergoing ambulatory surgery: A systematic review of the literature. Anesth Analg 2013;117:1082-91.