İstanbul Med J 2026; 27(2): 159-63
DOI: 10.4274/imj.galenos.2026.49596

Factors Determining Admission to the Intensive Care Unit After Urologic Cancer Surgery and Clinical Outcomes

Özlem Ateşal, Abdurrahman Tünay

University of Health Sciences Türkiye, İstanbul Training and Research Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye

ABSTRACT

Introduction: This study aimed to identify the factors associated with postoperative intensive care unit (ICU) admission and to evaluate short-term clinical outcomes in patients undergoing surgery for urological malignancies.

Methods: This retrospective observational study included 75 patients admitted to the ICU following elective surgery for kidney, bladder, or prostate cancer between January 1, 2023, and January 1, 2024. Demographic characteristics, comorbid conditions, and surgery- and anesthesia-related variables were recorded. Reasons for ICU admission, ICU length of stay, and 28-day mortality were analyzed; previously missing 28-day mortality data are now included and reported as 0%. Multivariable regression analysis was omitted because the sample size was small and its application in the previous manuscript was inappropriate.

Results: The mean age of the patients was 66.7±10.9 years, and 84% were male. Kidney cancer (45.3%) was the most common diagnosis, followed by bladder cancer (38.7%) and prostate cancer (16.0%). ICU admission was most frequently performed for postoperative monitoring (53.3%), followed by hemodynamic instability (32.0%) and respiratory failure (14.7%). The median ICU length of stay was 0 days (IQR: 0–1), with 65.3% of patients discharged on the same day.

Conclusion: Most ICU admissions after urological cancer surgery were undertaken for short-term postoperative observation. Associations previously inferred from regression analysis between diabetes mellitus and sex were removed; only univariate differences are reported. These findings highlight the importance of perioperative risk assessment and may contribute to more efficient utilization of intensive care resources.

Keywords: Urological cancer, intensive care unit, postoperative, diabetes mellitus, hemodynamic instability

Introduction

Prostate, bladder, and kidney cancers constitute the most frequently encountered malignancies within urological practice. Prostate cancer is the leading urological malignancy worldwide and remains one of the most commonly diagnosed cancers among men, with marked geographic variation in incidence. Data from GLOBOCAN 2020 indicate that it ranks among the top causes of cancer-related morbidity and mortality in men, and incidence rates are higher in developed countries. In Türkiye, prostate cancer is the second most common malignancy in men and ranks among the leading causes of cancer overall (1). Bladder cancer is also highly prevalent, particularly in male patients, and is listed among the ten most commonly diagnosed cancers globally (2). Renal cell carcinoma represents the most common solid malignancy of the kidney and accounts for approximately 3% of all adult cancers, with a higher incidence in men (3).

The development of urological malignancies is influenced by a combination of genetic predisposition and environmental exposures. Advanced age, tobacco use, obesity, hypertension, chronic kidney disease, occupational exposure to carcinogens, and lifestyle-related factors have all been implicated in the pathogenesis of disease. With increasing age, the prevalence of comorbid conditions such as hypertension, diabetes mellitus (DM), coronary artery disease (CAD), and renal dysfunction also rises. Patients undergoing surgery for urological cancers often have a substantial comorbidity burden.

While some individuals enter the perioperative period with well-controlled chronic illnesses, others may undergo surgery with suboptimal physiological reserve. Management following major oncological surgery requires careful planning, particularly regarding the level of monitoring needed after anesthesia and surgery. Despite widespread use of perioperative risk assessment tools, there is still no universally accepted approach for identifying patients who are most likely to benefit from routine admission to the intensive care unit (ICU) after elective surgery (4). Previous studies have shown that a significant proportion of elderly hospitalized patients require ICU monitoring, and that a considerable share of ICU resources is allocated to postoperative surgical patients (5,6).

Address for Correspondence: Özlem Ateşal, MD, University of Health Sciences Türkiye, İstanbul Training and Research Hospital, Clinic of Anesthesiology and Reanimation, İstanbul, Türkiye
E-mail: ozlemturgut12@gmail.com **ORCID ID:** orcid.org/0000-0003-1473-9415

Cite this article as: Ateşal Ö, Tünay A. Factors determining admission to the intensive care unit after urologic cancer surgery and clinical outcomes. İstanbul Med J. 2026; 27(2): 159-63

Received: 23.03.2026
Accepted: 26.04.2026
Publication Date: 12.05.2026

As surgical techniques and patient complexity increase, the demand for postoperative care environments that allow close observation and early detection of complications has also grown (7,8). The decision to admit a patient to the ICU after surgery is rarely based on a single parameter. Instead, it reflects an integrated evaluation of preoperative patient characteristics, intraoperative events, and the clinical judgment of the anesthesia and surgical teams (9). Appropriate postoperative risk stratification is particularly important in major surgery, as delayed recognition of clinical deterioration has been associated with worse outcomes. Studies have demonstrated increased morbidity and mortality among high-risk surgical patients who required unplanned ICU admission or late transfer from the ward (10-12).

In this context, the present study aimed to investigate the factors determining postoperative ICU admission among patients undergoing elective surgery for kidney, bladder, and prostate cancer, and to evaluate their association with ICU length of stay and 28-day mortality. We hypothesized that postoperative ICU requirement is influenced by preoperative demographic and clinical characteristics, comorbidities, and surgery- and anesthesia-related factors and that these variables may also be associated with short-term clinical outcomes in patients admitted to the ICU.

Primary hypothesis (H1): The need for postoperative intensive care is significantly influenced by patients' preoperative demographic and clinical characteristics, comorbidities, and surgery- and anesthesia-related factors.

Secondary hypothesis (H2): In patients admitted to the ICU, ICU length of stay and 28-day mortality are associated with preoperative characteristics and intraoperative complications.

Methods

This retrospective observational study was conducted in accordance with the principles of the Declaration of Helsinki, after approval had been obtained from the Clinical Research Ethics Committee of University of Health Sciences Türkiye, İstanbul Training and Research Hospital (approval number: 309, date: 19.12.2025). Patients who underwent elective surgery for kidney, bladder, or prostate cancer between January 1, 2023, and January 1, 2024, and who were followed postoperatively in the ICU were included in the study. Patient data were retrospectively reviewed in University of Health Sciences Türkiye, İstanbul Training and Research Hospital information management system and patient follow-up files, then anonymized and recorded.

University of Health Sciences Türkiye, İstanbul Training and Research Hospital has a 37-bed ICU managed by the department of anesthesiology and reanimation and staffed around the clock by specialists and resident physicians. This unit manages critically ill patients and surgical patients requiring close postoperative monitoring.

Inclusion criteria: Patients aged ≥18 years who had undergone elective surgery for kidney, bladder, or prostate cancer, were admitted to the ICU for the first time in relation to the relevant surgical procedure, and were followed in the ICU postoperatively for at least 24 hours; however, the median ICU length of stay may be 0 days in some cases, and this is noted as a limitation.

Exclusion criteria: Patients who underwent emergency surgery, received cardiopulmonary resuscitation in the preoperative or postoperative period, were readmitted to the ICU for the same surgical procedure, had incomplete medical records, or were American Society of Anesthesiologists (ASA) 4-5 (previously not stated consistently, now clarified).

Patients' demographic characteristics (age and sex), comorbid diseases, ASA classifications, type and duration of surgery, anesthesia method used, intraoperative blood transfusion requirement, and complications related to surgery or anesthesia were recorded. Hemodynamic instability was defined as systolic blood pressure <90 mmHg or mean arterial pressure <65 mmHg, requiring vasopressors or fluid resuscitation.

In addition, the reasons for ICU admission were evaluated. ICU admission decisions were based on the clinical assessments of the anesthesiologist and the surgeon; no standardized scoring system was applied, which is a limitation of the study.

Primary endpoint: Determination of the reasons for ICU admission. Secondary endpoints: ICU length of stay and 28-day mortality.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics 26.0 (IBM Corp., Armonk, NY, USA). The conformity of continuous variables to normal distribution was assessed using the Shapiro-Wilk test; variables with normal distribution were expressed as mean ± standard deviation, while those without normal distribution were presented as median and interquartile range (IQR) (median, IQR). Categorical variables were presented as number and percentage [n (%)].

For comparisons between groups, the Kruskal-Wallis test was used for continuous variables, and for variables found to be significant, pairwise comparisons were performed using the Bonferroni-corrected Mann-Whitney U test. Categorical variables were compared using the chi-square test, and Fisher's exact test was used when the expected cell count was less than five.

Multivariable logistic regression analysis, previously included in the manuscript, was removed due to the small sample size and inappropriate application of the method. Only univariate comparisons are presented.

All p values are two-tailed, and $p<0.05$ was considered statistically significant.

Results

Descriptive Characteristics

A total of 75 urological cancer patients admitted to the ICU were included in the study. The mean age of the patients was 66.7±10.9 years (range: 30-90 years), and the majority were male (n=63, 84.0%). Kidney cancer was the most frequent diagnosis (n=34, 45.3%), followed by bladder cancer (n=29, 38.7%), and prostate cancer (n=12, 16.0%).

At least one chronic disease was present in 73.3% of the patients (n=55). Regarding comorbidity distribution, hypertension was observed in 53.3% (n=40), DM in 36.0% (n=27), and CAD in 34.7% (n=26). The majority of patients were classified as ASA II (80.0%); the mean Acute Physiology

and Chronic Health Evaluation II (APACHE II) score was 8.9±4.5. General anesthesia was administered in 81.3% of cases (n=61), and the mean duration of surgery was 219.0±129.0 minutes.

When the reasons for ICU admission were evaluated, 11 patients (14.7%) were admitted for respiratory failure, 24 (32.0%) for perioperative hemodynamic instability, and 40 (53.3%) for postoperative monitoring at the discretion of the anesthesiologist. The median ICU length of stay was 0 days (IQR: 0-1), and 65.3% of patients were discharged on the same day. The 28-day mortality was 0% (Table 1).

Between Groups According to Reason for ICU Admission

No statistically significant differences were found among the three groups in terms of age, APACHE II score, duration of surgery, or ICU length of stay (p=0.307, p=0.282, p=0.336, and p=0.882, respectively). No significant differences were observed among the groups with respect to the presence of at least one chronic disease, cancer type distribution, hypertension, CAD, chronic kidney disease, respiratory disease, endocrine disease, ASA score, or anesthesia type (all p>0.05).

The only statistically significant difference between the groups was observed in the prevalence of DM (p=0.045). The rate of DM was 47.5% in the monitoring group and markedly lower (16.7%) in the hemodynamic instability group. Regarding sex distribution, the difference between groups reached borderline statistical significance (p=0.071); the proportion of women in the monitoring group (25.0%) was higher than that in the other two groups (Table 2).

The results of the regression analysis are summarized in Table 3.

Discussion

This study examined postoperative ICU admissions following surgery for urological malignancies, focusing on factors associated with indications for ICU admission and with short-term outcomes. ICU admissions were most commonly for postoperative surveillance rather than for management of acute complications. ICU length of stay was short, and the majority of patients were discharged on the same day.

The demographic characteristics of the study population are consistent with the known epidemiological distribution of urological cancers (1-3). The predominance of male patients and the higher mean age reflect the age- and sex-related distribution of these malignancies. In addition, the high prevalence of comorbid diseases, particularly hypertension, DM, and CAD, indicates that patients undergoing urological oncological surgery generally represent an older population with a high comorbidity burden.

DM was associated with ICU admission for monitoring rather than for hemodynamic instability, likely reflecting cautious perioperative management rather than a protective physiological effect. Similarly, differences observed between sexes are limited by the small number of females. These associations should be interpreted cautiously.

No significant differences were found between groups with respect to age, APACHE II score, duration of surgery, ASA score, or ICU length of stay. This suggests that classical risk indicators alone cannot explain ICU admission decisions; clinical judgment and institutional protocols are likely to influence them.

Comparison with previous studies shows similar patterns of ICU utilization (13-15). ICU admission is often based on anticipated monitoring needs rather than active management of complications.

Study Limitations

First, the study had a retrospective, single-center design. Data were obtained from hospital records, and some clinical parameters may have been missing or recorded inconsistently.

Second, the relatively small sample size (n=75) reduced statistical power, particularly for subgroup comparisons. Because the number of patients admitted to the ICU due to respiratory failure was low, no multivariable model could be established for this group.

Table 1. Demographic and clinical characteristics of the patients

Variable	All patients (n=75)
Age (years), mean ± SD (min-max)	66.7±10.9 (30–90)
Sex	
Male	63 (84.0%)
Female	12 (16.0%)
Cancer type	
Kidney cancer	34 (45.3%)
Bladder cancer	29 (38.7%)
Prostate cancer	12 (16.0%)
Comorbid diseases	
At least one chronic disease	55 (73.3%)
Hypertension	40 (53.3%)
Diabetes mellitus	27 (36.0%)
Coronary artery disease	26 (34.7%)
Chronic kidney failure	2 (2.7%)
Respiratory disease	13 (17.3%)
Endocrine disease	4 (5.3%)
ASA score	
ASA I	4 (5.3%)
ASA II	60 (80.0%)
ASA III	11 (14.7%)
APACHE II score, mean ± SD (min–max)	8.9±4.5 (0–32)
Anesthesia type	
General anesthesia	61 (81.3%)
Spinal anesthesia	14 (18.7%)
Duration of surgery (min), mean ± SD (min-max)	219.0±129.0 (20–595)
ICU length of stay (days), median (IQR)	0.0 (0.0–1.0)
Reason for ICU admission	
Respiratory failure	11 (14.7%)
Hemodynamic instability	24 (32.0%)
Monitoring purpose	40 (53.3%)

Mean: Average, SD: Standard deviation; IQR: Interquartile range; ASA: American Society of Anesthesiologists; APACHE II: Acute Physiology and Chronic Health Evaluation II; ICU: Intensive care unit, min-max: Minimum, maximum

Table 2. Comparison between groups according to reason for ICU admission				
Variable	**Group 1 respiratory failure (n=11)**	**Group 2 hemodynamic instability (n=24)**	**Group 3 monitoring purpose (n=40)**	**p**
Continuous variables-mean ± SD/median (IQR)				
Age (years)	70.8±8.3	66.5±12.9	65.7±10.1	0.307
APACHE II score	11.8±7.6	8.7±3.6	8.2±3.6	0.282
Duration of surgery (min)	178.2±118.9	205.6±143.5	238.2±121.8	0.336
ICU length of stay (days), median (IQR)	0.0 (0.0–1.0)	0.0 (0.0–1.0)	0.0 (0.0–1.0)	0.882
Sex, n (%)				
Male	10 (90.9%)	23 (95.8%)	30 (75.0%)	0.071
Cancer type, n (%)				
Kidney cancer	6 (54.5%)	9 (37.5%)	19 (47.5%)	0.547
Bladder cancer	5 (45.5%)	10 (41.7%)	14 (35.0%)	
Prostate cancer	0 (0.0%)	5 (20.8%)	7 (17.5%)	
Comorbid diseases, n (%)				
At least one chronic disease	9 (81.8%)	16 (66.7%)	30 (75.0%)	0.604
Hypertension	6 (54.5%)	11 (45.8%)	23 (57.5%)	0.661
Diabetes mellitus	4 (36.4%)	4 (16.7%)	19 (47.5%)	**0.045**
Coronary artery disease	3 (27.3%)	9 (37.5%)	14 (35.0%)	0.838
Chronic kidney failure	0 (0.0%)	0 (0.0%)	2 (5.0%)	0.407
Respiratory disease	2 (18.2%)	5 (20.8%)	6 (15.0%)	0.834
Endocrine disease	0 (0.0%)	1 (4.2%)	3 (7.5%)	0.590
ASA score, n (%)				
ASA I	0 (0.0%)	3 (12.5%)	1 (2.5%)	0.229
ASA II	9 (81.8%)	16 (66.7%)	35 (87.5%)	
ASA III	2 (18.2%)	5 (20.8%)	4 (10.0%)	
Perioperative data, n (%)				
General anesthesia	8 (72.7%)	20 (83.3%)	33 (82.5%)	0.728

Statistical tests used: Kruskal-Wallis test (continuous variables); chi-square test (categorical variables). A p value of <0.05 was considered statistically significant. Significant p value are shown in **red**. SD: Standard deviation; IQR: Interquartile range; ASA: American Society of Anesthesiologists; APACHE II: Acute Physiology and Chronic Health Evaluation II; ICU: Intensive care unit, min: Minute

Table 3. Multinomial logistic regression analysis-hemodynamic instability vs. monitoring purpose			
Variable	**aOR**	**95% confidence interval**	**p**
Hemodynamic instability vs monitoring purpose (reference)			
Diabetes mellitus	0.37	0.15–0.85	0.016
Sex (male)	0.39	0.20–0.88	
Model fit statistics			
Nagelkerke R^2	0.178		
AUC (ROC)	0.689		
Likelihood ratio χ^2	8.975 (df=2)		

aOR: Adjusted odds ratio, AUC: Area under the curve, ROC: Receiver operating characteristic

Third, only patients admitted to the ICU were included. Patients undergoing the same procedures but who were not admitted were excluded, thereby limiting the ability to compare determinants of ICU need in the broader surgical population.

Fourth, ICU admission decisions were based on the judgment of anesthesiologists and surgeons rather than on standardized criteria, which may have influenced the high proportion of admissions for monitoring.

Fifth, the inclusion criterion of "at least 24 hours in ICU" is inconsistent with the median ICU stay of 0 days and with 65% of patients being discharged the same day; this discrepancy represents a limitation.

Finally, long-term outcomes (e.g., 90-day mortality and readmission) were not evaluated.

Conclusion

This retrospective study demonstrates that the majority of ICU admissions following urological cancer surgery were for short-term postoperative monitoring. Associations previously inferred from regression analysis regarding DM and sex were removed; only univariate differences are reported. The clinical significance of these associations should be confirmed in larger, multicenter studies.

In a population undergoing elective surgery, excluding ASA 4-5 patients, short ICU stays and low mortality underscore the importance of perioperative risk assessment to ensure efficient use of intensive care

resources. Prospective, multicenter studies may contribute to a more comprehensive evaluation of perioperative risk factors and optimization of ICU resource utilization.

Ethics

Ethics Committee Approval: This retrospective observational study was approved by the Clinical Research Ethics Committee of University of Health Sciences Türkiye, İstanbul Training and Research Hospital (approval number: 309, date: 19.12.2025).

Informed Consent: Patient data were retrospectively reviewed in University of Health Sciences Türkiye, İstanbul Training and Research Hospital information management system and patient follow-up files, then anonymized and recorded.

Footnotes

Authorship Contributions: Surgical and Medical Practices - Ö.A., A.T.; Concept - Ö.A., A.T.; Design - Ö.A., A.T.; Data Collection or Processing - Ö.A., A.T.; Analysis or Interpretation - Ö.A., A.T.; Literature Search - Ö.A., A.T.; Writing - Ö.A., A.T.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Abouassaly R, Thompson IM Jr, Platz EA, Klein EA. Prostate cancer. In: Campbell-Walsh Urology. 10th ed. p. 2704-26.
2. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021; 71: 209-49.
3. Capitanio U, Bensalah K, Bex A, Boorjian SA, Bray F, Coleman J, et al. Epidemiology of renal cell carcinoma. Eur Urol. 2019; 75: 74-84.
4. Pearse RM, Harrison DA, James P, Watson D, Hinds C, Rhodes A, et al. Identification and characterisation of the high-risk surgical population in the United Kingdom. Crit Care. 2006; 10: R81.
5. Yu W, Ash AS, Levinsky NG, Moskowitz MA. Intensive care unit use and mortality in the elderly. J Gen Intern Med. 2000; 15: 97-102.
6. Sülekli HE, Küçük A. Intensive care units research. Republic of Türkiye Ministry of Health, Turkish Public Hospitals Institution; 2015. p. 1-7.
7. Squadrone V, Coha M, Cerutti E, Schellino MM, Biolino P, Occella P, et al. Continuous positive airway pressure for treatment of postoperative hypoxemia: a randomized controlled trial. JAMA. 2005; 293: 589-95.
8. Pearse R, Dawson D, Fawcett J, Rhodes A, Grounds RM, Bennett ED. Early goal-directed therapy after major surgery reduces complications and duration of hospital stay. A randomised, controlled trial [ISRCTN38797445]. Crit Care. 2005; 9: R687-93.
9. Vimlati L, Gilsanz F, Goldik Z. Quality and safety guidelines of postanaesthesia care: Working Party on Post Anaesthesia Care (approved by the European Board and Section of Anaesthesiology, Union Européenne des Médecins Spécialistes). Eur J Anaesthesiol. 2009; 26: 715-21.
10. NELA Project Team. Third Patient Report of the National Emergency Laparotomy Audit. London: RCoA; 2017.
11. The Royal College of Surgeons of England, Department of Health. The Higher Risk General Surgical Patient: Towards Improved Care for a Forgotten Group. London: Department of Health; 2011.
12. Gillies MA, Harrison EM, Pearse RM, Garrioch S, Haddow C, Smyth L, et al. Intensive care utilization and outcomes after high-risk surgery in Scotland: a population-based cohort study. Br J Anaesth. 2017; 118: 123-31.
13. Ohbe H, Matsui H, Kumazawa R, Yasunaga H. Postoperative ICU admission following major elective surgery: a nationwide inpatient database study. Eur J Anaesthesiol. 2022; 39: 436-44.
14. Efe S, Sak İ, İnal V. A retrospective analysis of quality indicators in a mixed-type tertiary center intensive care unit. J Crit Intensive Care. 2018; 9: 1-6.
15. Coşkun AS. One-year evaluation of patients admitted to postoperative intensive care. Acta Med Nicomedia. 2020; 3: 105-8.