

Assessing the Clinical and Economic Burden of Surgical Bleeding in Switzerland

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Introduction

Bleeding is a common surgical complication that is associated with substantial clinical, economic and environmental burden. It not only raises the risk of additional complications and mortality but also results in increased healthcare resource utilization such as longer operative times, extended hospital and intensive care unit (ICU) stays, increased readmissions, and higher overall costs. Its economic burden is well-documented in the United States; however, there is a lack of recent, robust data estimating the burden of bleeding in Europe.¹⁻⁴

Objective

The objective of this study was to compare the healthcare resource utilization and costs across a range of surgical procedures in patients with and without surgical bleeding in the Swiss setting.

Methods

A retrospective observational study was conducted to quantify the clinical and economic burden of surgical bleeding in a national Swiss inpatient setting. The data was provided by the Swiss Federal Office of Statistics⁵, with the study analyzing data from 2017-2022 from adult patients that underwent a variety of surgical procedures. The dataset had comprehensive national level data, with complete total cost data for 70% of the medical records. The procedures of interest included hepatectomy, lung resection, valve procedures, coronary artery bypass grafting (CABG), cholecystectomy, pancreatectomy, gynecological surgeries, and spinal surgeries.

The primary objective was to compare the length of stay (LOS) during index hospitalization for patients with and without surgical bleeding. Secondary endpoints included total inpatient hospital costs, ICU admission and duration. Surgical bleeding was identified by the presence of a bleeding diagnosis, or the presence of a transfusion or bleeding management procedure.

For the analyses, descriptive and multivariable analyses were conducted. Patients without insurance coverage, that were pregnant, or had incomplete LOS or total inpatient cost data were excluded. Generalized linear models (GLMs) adjusted for confounders, with logistic regression applied to binary outcomes and lognormal models used for continuous variables. Variables with sparse data used two-part GLMs to account for the probability and magnitude of the costs. Significance was set as $p<0.05$.

Results

Patients with surgical bleeding were older (68 vs. 58 years) and more likely to be male (62% vs. 38%). Open procedures had a higher bleeding incidence than minimally invasive surgery (MIS) (66% vs. 16%) (Table 1). Overall, 11% of patients experienced surgical bleeding, with the highest risk observed in those undergoing CABG and valve procedures (Table 2).

Table 1. Patient Characteristics

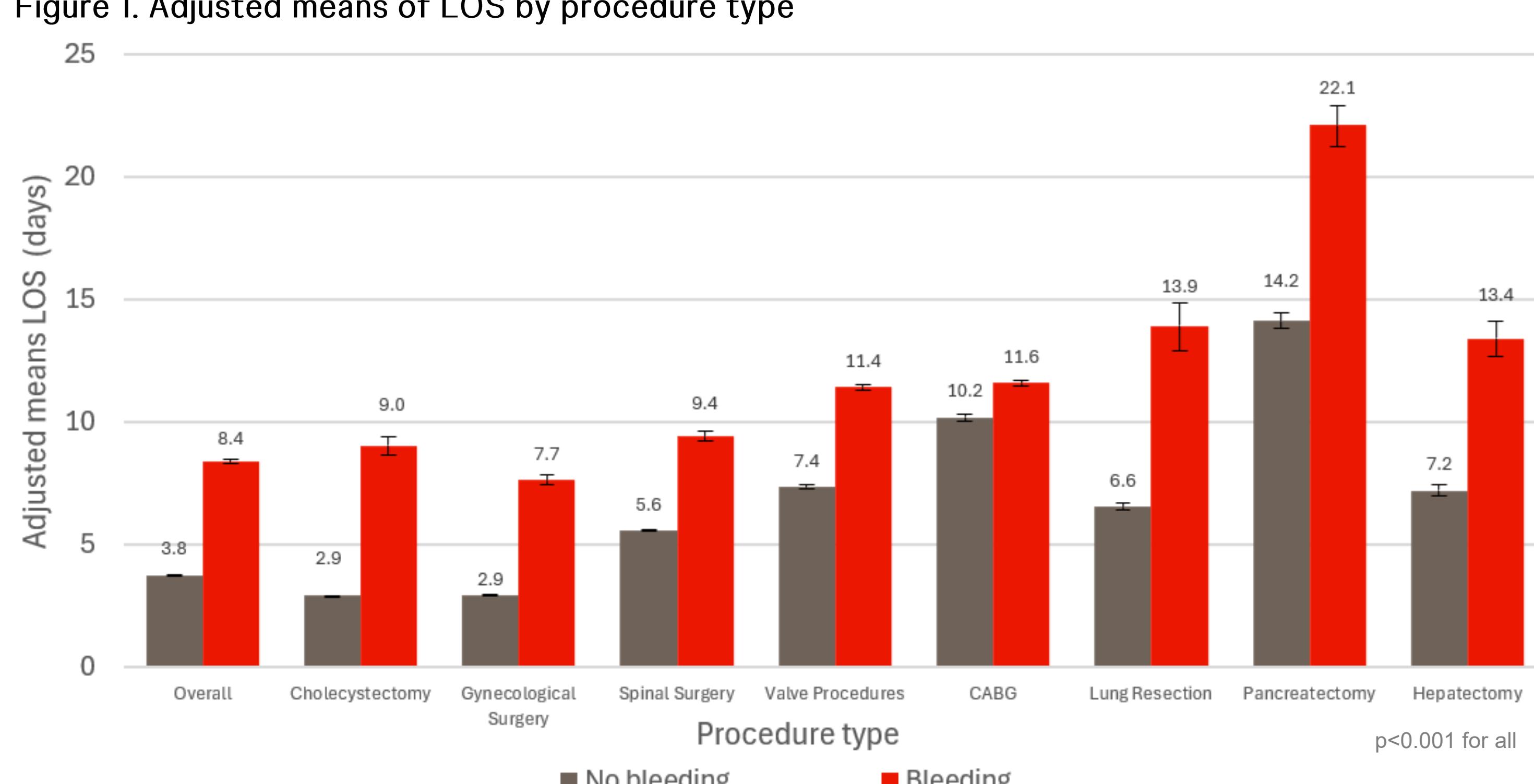
Characteristics	Overall		Surgical bleeding	
	No bleeding	Bleeding	No bleeding	Bleeding
N = 181,027	N = 160,314	N = 20,713		
Mean Age (sd)	59.32 (15.88)	58.20 (15.89)	67.93 (12.90)	
Sex				
F	119,775 (66%)	111,903 (70%)	7,872 (38%)	
M	61,252 (34%)	48,411 (30%)	12,841 (62%)	
Surgical approach				
MIS	123,064 (68%)	119,651 (75%)	3,413 (16%)	
Open	28,335 (16%)	14,645 (9%)	13,690 (66%)	
Undefined/other	29,628 (16%)	26,018 (16%)	3,610 (17%)	

Table 2. Surgical bleeding incidence by procedure type

	Overall	Cholecystectomy	Gynecological Surgery	Spinal Surgery	Valve Procedures	CABG	Lung Resection	Pancreatectomy	Hepatectomy
N =	N =	N =	N =	N =	N =	N =	N =	N =	N =
181,027	63,731	57,036	25,301	15,934	10,230	3,667	2,802	2,326	
Incidence of bleeding (2017-2022)	20,713 (11%)	880 (1%)	1,564 (3%)	2,586 (10%)	7,377 (46%)	6,610 (65%)	293 (8%)	816 (29%)	587 (25%)

Patients with surgical bleeding stayed more than twice as long in the hospital, averaging 8.4 days compared to 3.8 days for those without surgical bleeding. This was consistent across procedure types, with increases ranging from 1.4 day (CABG) to 7.9 days (pancreatectomy) (Figure 1).

Figure 1. Adjusted means of LOS by procedure type



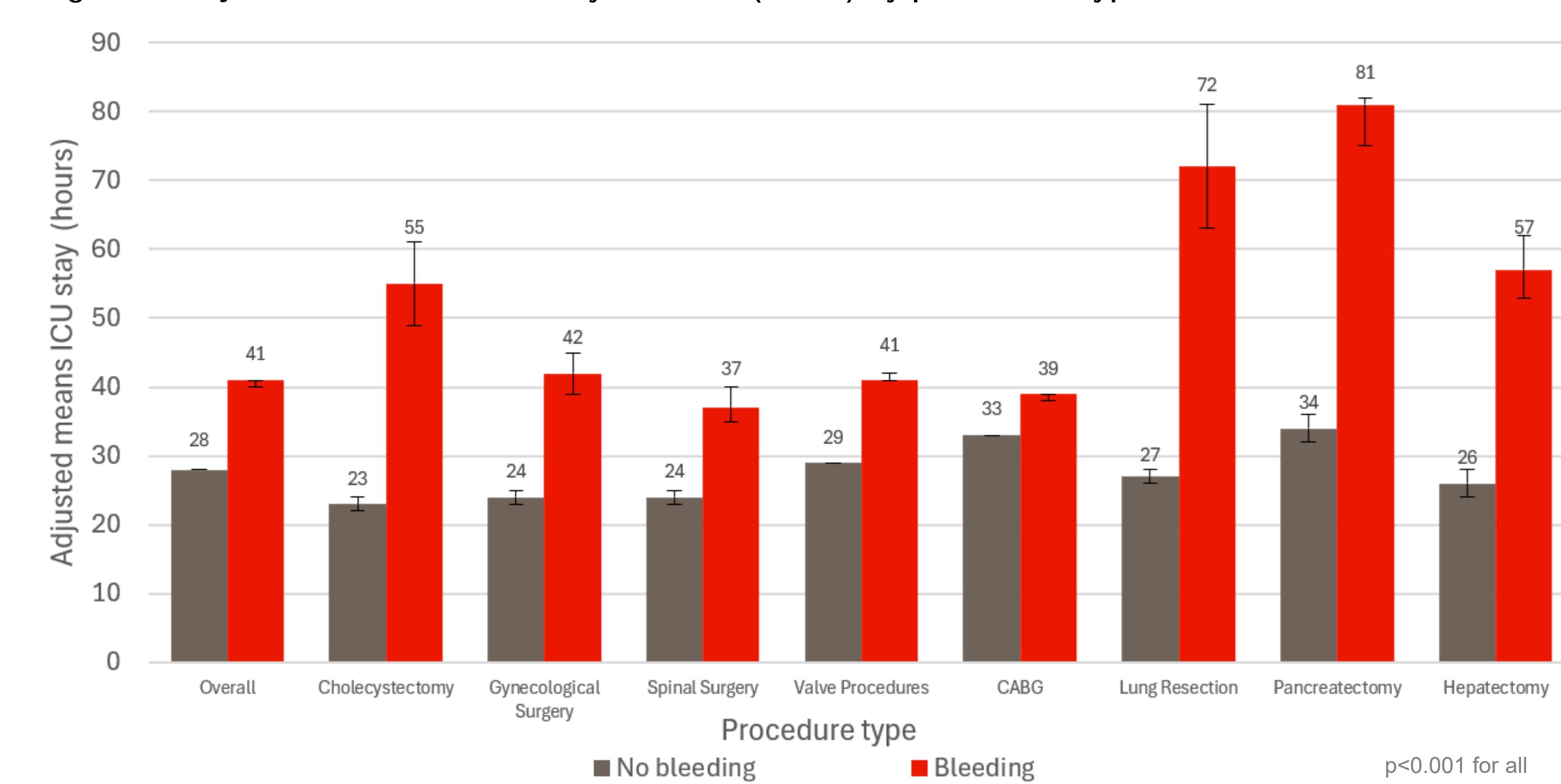
Patients that experienced surgical bleeding had a 51% likelihood of ICU admission, compared to 7% for those without surgical bleeding (Table 3). This translated to 14 times greater odds of ICU admission of those that experienced surgical bleeding versus those who did not. Odds ratios across procedures ranged from 1 (CABG) to 15 (cholecystectomy).

Table 3. Intensive care unit (ICU) admission rate by procedure type

	No bleeding Mean (CI)	Bleeding Mean (CI)	P-value
Overall	7% (6%-7%)	51% (50%-52%)	<0.001
Cholecystectomy	1% (0%-53%)	13% (0%-93%)	<0.001
Gynecological surgery	1% (0%-98%)	10% (0%-100%)	<0.001
Spinal Surgery	7% (7%-7%)	22% (20%-24%)	<0.001
Valve Procedures	61% (59%-62%)	92% (92%-93%)	<0.001
CABG	98% (54%-100%)	98% (47%-100%)	0.0286
Lung Resection	26% (24%-27%)	49% (43%-55%)	<0.001
Pancreatectomy	54% (34%-73%)	64% (43%-81%)	<0.001
Hepatectomy	39% (30%-49%)	54% (43%-64%)	<0.001

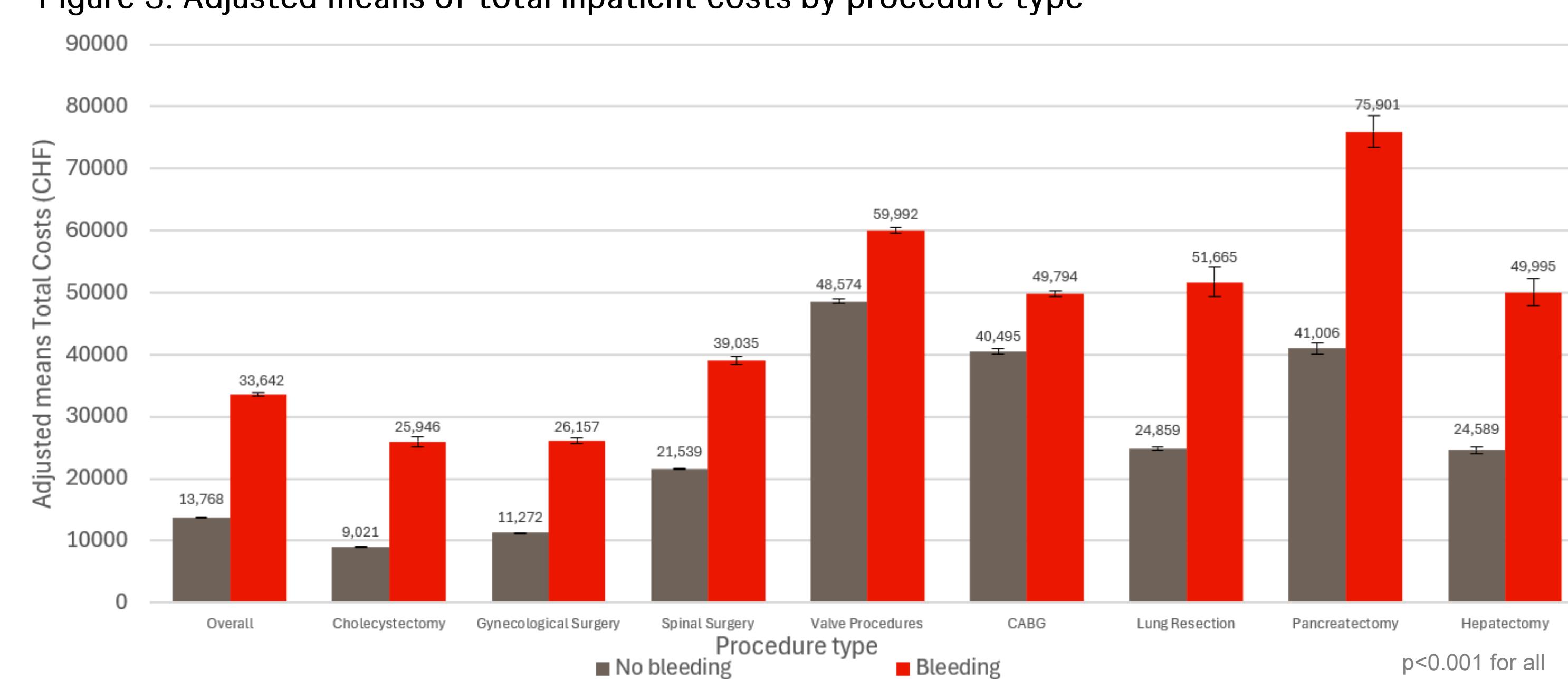
Across all procedures, patients experiencing surgical bleeding stayed on average 41 hours in ICU, compared to 28 hours for those without bleeding. The range of percentage increase in ICU stay associated with surgical bleeding varied from 18% in CABG procedures to 167% in lung resection (Figure 2).

Figure 2. Adjusted means of ICU stay duration (hours) by procedure type



Patients with surgical bleeding had 19,874 CHF higher total inpatient costs than those without surgical bleeding, with the largest increase observed in pancreatectomy (34,895 CHF) and the smallest in CABG (9,299 CHF) (Figure 3).

Figure 3. Adjusted means of total inpatient costs by procedure type



Conclusion

To our knowledge, this large observational study is the first of its kind in using the Swiss Federal Statistical Office database to report the impact of bleeding. Patients with surgical bleeding had significantly increased HRU and costs compared to those without bleeding. These results highlight the necessity for timely and effective strategies to reduce the risk of bleeding.

References

1. Corral, M., Ferko, N., Hollmann, S., Broder, M. S., & Chang, E. (2015). Health and economic outcomes associated with uncontrolled surgical bleeding: A retrospective analysis of the Premier Perspectives Database.
2. Johnston SS, Afolabi M, Tewari P, Danker W. Clinical and Economic Burden Associated with Disruptive Surgical Bleeding: A Retrospective Database Analysis. Clinicoecon Outcomes Res. 2023;15:535-547. Published 2023 Jul 3. doi:10.2147/CEOR.S411778
3. Johnston SS, Jamous N, Mistry S, et al. Association of In-Hospital Surgical Bleeding Events with Prolonged Hospital Length of Stay, Days Spent in Critical Care, Complications, and Mortality: A Retrospective Cohort Study Among Patients Undergoing Neoplasm-Directed Surgeries in English Hospitals. Clinicoecon Outcomes Res. 2021;13:19-29. Published 2021 Jan 8. doi:10.2147/CEOR.S287970
4. Kocaman M, Johnston S, Afolabi M, Danker W, Adshead F. Assessing the environmental impact associated with disruptive surgical bleeding. Surg Open Sci. 2025;26:54-60. Published 2025 Apr 29. doi:10.1016/j.sopen.2025.04.009
5. Federal Statistical Office, health services statistics 2017-2022