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Research Letter

Impact of postoperative complications on cost and length of stay: multicentre prospective clinical study

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Retrospective studies have shown an association between postoperative complications, increased length of stay (LOS), and higher healthcare costs[1,2]. However, their findings are limited by methodological constraints including confounding bias, incomplete data capture often linked to coding practices, selection bias, and variability in reporting. Collectively these may contribute to the underreporting of complications[3]. Even large variable-based data registries are not exempt from discrepancies in the reporting of complications[4]. By adhering to strict protocols, minimizing variability across surgical practices, and improving the control of confounding variables, prospective studies and clinical trials are the most reliable methods to accurately capture complications and their impact.

Here, we report data from a prospective multicentre study, involving both tertiary and general hospitals, to assess the impact of abdominal surgery complications on LOS and hospitalization costs. The study accounts for key factors such as patient demographics, co-morbidities, and surgical complexity to enhance the accuracy of complication risk estimates, refine cost predictions, and inform resource allocation strategies.

This prospective study (NCT05523713, ClinicalTrials.gov) analysed patient data from four hospitals following major digestive surgery between 6 October 2022 and 29 November 2023. It was approved by an institutional review board (Comité de Protection des Personnes Ouest IV—Nantes—#22.01724.000056, June 2022). All complications were independently assessed by a physician and validated by an independent observer (F.V.). Cost data were obtained from a national database that records administrative data for each hospital stay in France, including reimbursement amount. Multivariate linear regression models assessed the impact of nine postoperative complications, including surgical site infections, infectious lung disease, symptomatic urinary tract infection, cardiac complications, pulmonary complications, acute renal failure, haemorrhage or acute anaemia, ileus, and other complications, on LOS and healthcare costs. Each complication was treated as an independent variable, adjusting for Charlson score and surgical type. Additionally, an extended model included LOS as a covariate to determine whether the excess costs associated with complications were attributable to prolonged hospitalization or if other factors contributed to the financial burden. Statistical significance was set at $P < 0.05$ for analyses.

A total of 268 patients (aged 62 ± 14 years) were included, of whom 73.8% developed at least one complication. The average LOS for patients without any complications was 6.8 days (±2.6 days), with hospitalization costs of €11 364 (±€3313). Surgical site infections were associated with an increased LOS of 8.1 days ($P < 0.001$) and additional costs of €8899 ($P < 0.001$). Infectious lung disease prolonged hospitalization by 6.3 days ($P = 0.02$) with an additional cost of €10 142 ($P = 0.005$). Cardiac complications had the most substantial effect, increasing LOS by 15.2 days ($P < 0.001$) and costs by €17 689 ($P < 0.001$). Ileus was also significant, extending LOS by 5.7 days ($P = 0.005$) and increasing costs by €6389 ($P = 0.01$). Other complications did not reach statistical significance.

After adjusting for LOS, the costs associated with cardiac complications (€6258, $P = 0.009$) remained statistically significant. In contrast, the excess costs for surgical site infection, infectious lung disease and ileus were largely explained by extended LOS, suggesting that their economic impact is primarily driven by prolonged inpatient care (*Table 1*).

Discussion

These findings underscore the substantial burden of postoperative complications, with significant increases in LOS and hospitalization costs. Patients experiencing surgical site infection, infectious lung disease, cardiac complications and ileus incur additional costs (+€6389 to +€17 689) and prolonged

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Table 1 Adjusted impact of postoperative complications on hospitalization costs accounting for length of stay (LOS)

Variable	Coefficient (€)	Standard error	t-statistic	P	95% c.i. Lower	95% c.i. Upper
Intercept	4468	2118	2.1094	0.0356	291	8646
Surgical site infection	3996	1404	2.8443	0.005	1232	6753
Infectious lung disease	4201	2292	1.8322	0.0686	−305	8706
Symptomatic urinary tract infection	2347	2559	0.917	0.3595	−2700	7394
Cardiac complications	6258	2376	2.6336	0.0092	1595	10,921
Pulmonary complications	−2036	3063	−0.6647	0.5066	−8038	3966
Acute renal failure	−3251	3066	−1.0603	0.2901	−9272	2769
Haemorrhage or acute anaemia	−4299	1648	−2.6074	0.0101	−7534	−1064
Ileus or occlusion	829	1645	0.5041	0.6148	−2416	4074
Other complications	−3277	1488	−2.2017	0.0288	−6201	−352
Length of stay	865	52	17.1263	0	783	947
Charlson Score	233	308	0.757	0.4493	−373	840
Site: Colon/rectum	−1153	1126	−1.0236	0.3063	−5907	1399
Site: Small intestine	6020	1528	3.9394	0.0001	2754	9286
Site: Oesophagus	2728	1526	1.7872	0.0744	−287	5742
Site: Stomach	−1230	1285	−0.9586	0.3387	−3753	1293
Site: Liver	2524	1993	1.2662	0.2061	−1397	6445
Site: Spleen	−2428	3421	−0.7094	0.4786	−9133	4277
Site: Pancreas	−5415	2310	−2.343	0.0199	−9951	−879
Site: Perineum	−2652	2730	−0.9713	0.3321	−8036	2732
Site: Other	−4383	1503	−2.9161	0.0039	−7347	−1419

Outcome variable: total hospitalization cost (€).

hospitalizations (+5.7 to +15.2 days). Consequently, reducing complications not only alleviates financial strain but also optimizes hospital resources. Achieving this goal requires a multifaceted strategy combining personalized preoperative interventions, tailored patient pathways, and continuous perioperative monitoring[5]. Future research should further explore the cost-effectiveness of these strategies to inform healthcare policy and improve surgical outcomes.

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Disclosure

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Downey CL, Bainbridge J, Jayne DG, Meads DM. Impact of in-hospital postoperative complications on quality of life up to 12 months after major abdominal surgery. *Br J Surg* 2023;**110**:1206–1212
2. Healy GL, Stuart CM, Dyas AR, Bronsert MR, Meguid RA, Anioke T *et al.* Association between postoperative complications and hospital length of stay: a large-scale observational study of 4,495,582 patients in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) registry. *Patient Saf Surg* 2024;**18**:29
3. DeLong MR, Hughes DB, Blau JA, Hollenbeck ST. Publication bias and the under-reporting of complications in the literature: have we dug our own pay-for-performance grave? *Plast Reconstr Surg* 2014;**134**:42–43
4. Epelboym I, Gawlas I, Lee JA, Schrope B, Chabot JA, Allendorf JD. Limitations of ACS-NSQIP in reporting complications for patients undergoing pancreatectomy: underscoring the need for a pancreas-specific module. *World J Surg* 2014;**38**:1461–1467
5. Verdonk F, Einhaus J, Tsai AS, Hedou J, Choisy B, Gaudilliere D *et al.* Measuring the human immune response to surgery: multiomics for the prediction of postoperative outcomes. *Curr Opin Crit Care* 2021;**27**:717–725