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The Hidden Abdomen: Undocumented Prior Abdominal Surgery and Outcomes of Emergency Laparotomy — A Retrospective Cohort Study

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Abstract

Purpose

Emergency laparotomy in previously operated patients is hazardous, and surgeons rely on operative records to anticipate altered anatomy. We assessed whether undocumented prior abdominal surgery, which we term the “hidden abdomen”, is associated with worse outcomes.

Methods

This retrospective cohort study included adults with previous abdominal surgery who underwent emergency non-trauma laparotomy at a Moroccan university hospital between 2022 and 2025. Patients whose previous operation was undocumented at incision were compared with those whose documentation was available. The primary outcome was major morbidity (Clavien–Dindo grade III or higher). Multivariable logistic regression adjusted for age, American Society of Anesthesiologists class, sepsis or shock, multiple previous operations and previous digestive reconstruction.

Results

Of 212 patients, 87 (41.0%) had undocumented prior surgery. They had longer operations (median 185 versus 125 minutes), more extensive adhesiolysis (78.2% versus 24.0%), more unplanned changes of strategy (34.5% versus 4.8%), more iatrogenic injuries (11.5% versus 1.6%), more major morbidity (28.7% versus 11.2%), more intensive care admissions (18.4% versus 7.2%) and longer stays (median 14 versus 7 days) (all $p \leq 0.017$). Thirty-day mortality did not differ significantly (5.7% versus 2.4%; $p = 0.277$). Undocumented prior surgery was independently associated with major morbidity (adjusted odds ratio 2.80; 95% confidence interval 1.25–6.26).

Conclusion

Two in five previously operated patients underwent emergency laparotomy without a record of their earlier surgery and had almost three times the odds of major morbidity. Missing operative records are a measurable and potentially modifiable risk factor in emergency surgery.

Introduction

Emergency laparotomy is among the highest-risk procedures in general surgery. In a Danish cohort of 4346 patients scheduled for emergency abdominal surgery, 30-day mortality after laparotomy was 17% [1]. In a prospective study of 10,745 patients in 58 countries, 30-day mortality after emergency abdominal surgery was 5.4%, and the adjusted odds of death were almost three times higher in countries with a middle or low human development index than in those with a high index [2]. In the African Surgical

Outcomes Study, 18.2% of surgical patients had a postoperative complication, and patients were twice as likely to die after surgery as the global average [3].

Previous abdominal surgery adds a specific difficulty. In a Danish cohort of 754 patients undergoing major emergency abdominal surgery, 61% had previously undergone abdominal surgery, and a history of colorectal resection, laparotomy or severe adhesions was associated with operative complexity [4]. Adhesions form in most patients after laparotomy [5]. In a meta-analysis, previous surgery prolonged operative time by about 15 minutes, and adhesiolysis caused an enterotomy in 6% of operations [6]. In a cohort of 755 abdominal operations, adhesiolysis was required in 63% and caused an inadvertent bowel defect in 10.5% of those cases, and was associated with sepsis and a longer stay [7].

Surgeons limit this risk by knowing what was done before: which organs were resected, where the anastomoses lie and whether a mesh was implanted. That knowledge depends on the record reaching the operating team. Missing clinical information is a recognised safety problem: in a survey of primary care, clinicians reported that important information was missing in about one visit in seven [8]. In surgery, communication breakdowns contributed to 43% of errors reported by surgeons at three teaching hospitals, and system failures were more frequent in emergency cases [9]; handoffs and transfers of care are moments when communication is critical and errors are common [10]. In Morocco, electronic health records have developed within regions and individual institutions, but a nationwide shared record has not yet been implemented [11], so operative reports often remain in the hospital where the operation took place. The Lancet Commission on Global Surgery lists information management among the components of a national surgical plan [12]. Yet the consequences of missing operative records at the time of emergency surgery have not, to our knowledge, been quantified.

We use the term “hidden abdomen” for the situation in which a patient has had abdominal surgery whose nature is unknown to the operating team at the time of an emergency laparotomy. This study aimed to measure how often this situation occurs in a Moroccan university hospital and to compare operative findings, postoperative morbidity and resource use between patients with undocumented and documented prior abdominal surgery. We hypothesised that undocumented prior surgery would be associated with a higher rate of major morbidity.

Methods

Study design and setting

This retrospective cohort study was conducted in the Department of General Surgery of Mohamed VI University Hospital, Oujda, Morocco, between 1 January 2022 and 31 December 2025. The hospital has no electronic record shared with other institutions, and operative reports from other hospitals are available only if the patient brings them. The study is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [13].

Participants

We included consecutive patients who underwent emergency laparotomy for peritonitis, gastrointestinal perforation, intestinal obstruction or intra-abdominal sepsis, and who had at least one previous abdominal operation, identified from the history or from an abdominal scar. We excluded patients aged under 18 years, patients with no previous abdominal surgery, laparotomies for trauma, early reoperations for a complication of an operation performed during the same admission, and patients with incomplete outcome data.

Exposure

The exposure was the documentation status of the previous abdominal surgery at the time of incision. Previous surgery was classified as documented when an operative report, discharge summary or referral letter specifying the procedure performed was available to the operating team before surgery. It was classified as undocumented (hidden abdomen) when the patient or family reported a previous operation, or a scar was present, but no written record describing the procedure was available, so that the type of resection, the reconstruction and any implanted material were unknown at incision.

Documentation status was assessed retrospectively by review of the preoperative medical records, including admission notes, preoperative assessments, referral letters and any available previous operative reports. Reviewers were blinded to postoperative outcomes to limit outcome-related assessment bias.

Variables and data sources

Data were extracted retrospectively from the hospital medical records. We recorded age, sex, American Society of Anesthesiologists (ASA) physical status class, comorbidities, indication for surgery, sepsis or shock at presentation, and use of preoperative computed tomography (CT). For previous surgery we recorded the number of operations, the type of operation as established during or after the emergency procedure, the interval since the last operation, and the place where it was performed. We also recorded the grade of the operating surgeon.

Outcomes

The primary outcome was major morbidity within 30 days of surgery, defined as a complication of Clavien–Dindo grade III or higher [14]. Secondary outcomes were operative time, from incision to skin closure; extensive adhesiolysis, defined as intraoperative dissection of abdominal adhesions requiring more than 30 minutes, measured from the start to the completion of adhesiolysis and excluding time spent on other surgical steps; unplanned change of operative strategy caused by an unexpected anastomosis or prosthetic implant; iatrogenic injury, defined as an inadvertent enterotomy, a

seromuscular tear requiring repair, or a vascular or solid organ injury; length of hospital stay; and 30-day mortality, admission to the intensive care unit (ICU) and unplanned reoperation.

Statistical analysis

Continuous variables are reported as median and interquartile range (IQR) and were compared with the Mann–Whitney U test. Categorical variables are reported as number and percentage and were compared with Fisher's exact test.

The association between undocumented prior surgery and major morbidity was estimated by multivariable logistic regression and expressed as an odds ratio (OR) with a 95% confidence interval (CI). Covariates were chosen in advance on clinical grounds and because they differed between groups at baseline: age (per 10 years), ASA class III or higher, sepsis or shock at presentation, two or more previous operations and previous digestive reconstruction. With 39 events and six variables (6.5 events per variable), the model met the threshold of five to nine events per variable considered acceptable for confounder adjustment [15, 16]. Model discrimination was assessed with the C-statistic (area under the receiver operating characteristic curve) and calibration with the Hosmer–Lemeshow test using ten risk groups.

Robustness to unmeasured confounding was assessed with the E-value [17]. Because major morbidity was not rare, the E-value was computed after a square-root transformation of the odds ratio. Patients with incomplete outcome data were excluded before analysis (n = 16); no missing data were identified for the variables included in the final analysis, so no imputation was required. No formal sample size calculation was performed; the sample comprised all eligible patients during the study period. A two-sided p value below 0.05 was considered significant. Analyses were performed with IBM SPSS Statistics version 30.0 (IBM Corp., Armonk, NY, USA).

Ethics

The study was approved by the Ethics Committee for Biomedical Research of Oujda (CERBO), Faculty of Medicine and Pharmacy, Mohammed First University, Oujda, Morocco, on 9 October 2026 (approval No. 47/2026), before data extraction began. The committee waived individual consent because of the retrospective design. Data were anonymised before analysis. The study complied with the Declaration of Helsinki.

Use of artificial intelligence

The study design, data collection, statistical analysis and interpretation were performed by the authors. An artificial intelligence language model (Claude, Anthropic) was used to review and improve the English language, and grammar of the text, and to draw the figure from the authors' data with Matplotlib

(Python). All AI-assisted content was reviewed, verified against original sources, and approved by the authors, who take full responsibility for the manuscript.

Results

Participants

Between January 2022 and December 2025, 692 emergency laparotomies were screened. Of these, 480 were excluded: 359 patients had no previous abdominal surgery, 54 laparotomies were for trauma, 33 were early reoperations during the same admission, 18 patients were under 18 years of age and 16 had incomplete outcome data (Fig. 1). The final cohort comprised 212 patients with at least one previous abdominal operation (30.6% of those screened). Previous surgery was undocumented in 87 patients (41.0%) and documented in 125 (59.0%). The median age was 58 years (range 19–82) and the male-to-female ratio was 1.3.

Baseline characteristics are shown in Table 1. Patients with undocumented prior surgery were older (median 62 versus 55 years; $p < 0.001$), more often ASA class III or higher (42.5% versus 27.2%; $p = 0.026$) and more often septic or in shock at presentation (35.6% versus 21.6%; $p = 0.029$). They had more often undergone two or more previous operations (65.5% versus 41.6%; $p < 0.001$) or a digestive reconstruction (24.1% versus 11.2%; $p = 0.015$), and their last operation was more remote (median 8.1 versus 6.0 years; $p = 0.001$). Sex, comorbidities (at least one in 72.4% versus 61.6%; $p = 0.108$; Online Resource 1), indication for surgery, previous mesh and use of preoperative CT did not differ significantly. A senior surgeon operated more often in the undocumented group (77.0% versus 64.0%; $p = 0.050$).

Table 1
Baseline characteristics by documentation status

Characteristic	Undocumented (n = 87)	Documented (n = 125)	p
Age, years, median (IQR)	62 (54–71)	55 (45–64)	< 0.001
Male sex, n (%)	53 (60.9)	67 (53.6)	0.325
ASA class III or higher, n (%)	37 (42.5)	34 (27.2)	0.026
At least one comorbidity, n (%)	63 (72.4)	77 (61.6)	0.108
Sepsis or shock at presentation, n (%)	31 (35.6)	27 (21.6)	0.029
Indication: peritonitis or perforation, n (%)	35 (40.2)	45 (36.0)	0.566
Indication: intestinal obstruction, n (%)	45 (51.7)	65 (52.0)	1.000
Two or more previous operations, n (%)	57 (65.5)	52 (41.6)	< 0.001
Previous digestive reconstruction, n (%)	21 (24.1)	14 (11.2)	0.015
Previous prosthetic mesh, n (%)	20 (23.0)	17 (13.6)	0.098
Years since last operation, median (IQR)	8.1 (5.2–13.0)	6.0 (3.0–9.2)	0.001
Preoperative CT, n (%)	65 (74.7)	105 (84.0)	0.115
Senior surgeon operating, n (%)	67 (77.0)	80 (64.0)	0.050

IQR, interquartile range; ASA, American Society of Anesthesiologists; CT, computed tomography. Continuous variables were compared with the Mann–Whitney U test and categorical variables with Fisher's exact test. Individual comorbidities are given in Online Resource 1.

Operative findings

Operations lasted longer when previous surgery was undocumented: the median operative time was 185 minutes (IQR 164–215), against 125 minutes (IQR 107–149) in documented patients ($p < 0.001$). Extensive adhesiolysis was required in 78.2% of undocumented and 24.0% of documented patients ($p < 0.001$). The operative strategy had to be changed because of an unexpected anastomosis or prosthetic implant in 34.5% and 4.8% of patients respectively ($p < 0.001$). Iatrogenic injury occurred in 11.5% and 1.6% ($p = 0.004$) (Table 2).

Table 2
Operative and postoperative outcomes by documentation status

Outcome	Undocumented (n = 87)	Documented (n = 125)	p
Operative time, minutes, median (IQR)	185 (164–215)	125 (107–149)	< 0.001
Extensive adhesiolysis, n (%)	68 (78.2)	30 (24.0)	< 0.001
Unplanned change of strategy, n (%)	30 (34.5)	6 (4.8)	< 0.001
Iatrogenic injury, n (%)	10 (11.5)	2 (1.6)	0.004
Major morbidity (Clavien–Dindo ≥ III), n (%)	25 (28.7)	14 (11.2)	0.002
Length of stay, days, median (IQR)	14 (11–18)	7 (6–10)	< 0.001
30-day mortality, n (%)	5 (5.7)	3 (2.4)	0.277
ICU admission, n (%)	16 (18.4)	9 (7.2)	0.017
Unplanned reoperation, n (%)	10 (11.5)	5 (4.0)	0.054

IQR, interquartile range; ICU, intensive care unit. Continuous variables were compared with the Mann–Whitney U test and categorical variables with Fisher's exact test.

Postoperative outcomes

Major morbidity occurred in 28.7% of patients with undocumented prior surgery and 11.2% of patients with documented prior surgery (p = 0.002). Admission to the ICU was more frequent (18.4% versus 7.2%; p = 0.017), and unplanned reoperation tended to be more frequent (11.5% versus 4.0%; p = 0.054). The median hospital stay was 14 days (IQR 11–18) against 7 days (IQR 6–10) (p < 0.001). Thirty-day mortality was 5.7% against 2.4%; with eight deaths in total, this difference was not significant (p = 0.277).

Adjusted analysis

After adjustment for age, ASA class, sepsis or shock at presentation, two or more previous operations and previous digestive reconstruction, undocumented prior surgery remained independently associated with major morbidity (OR 2.80; 95% CI 1.25–6.26; p = 0.012). Sepsis or shock at presentation was the only other independent factor (OR 2.22; 95% CI 1.02–4.82). Neither multiple previous operations nor previous digestive reconstruction remained associated with major morbidity (Fig. 2). The model showed acceptable discrimination (C-statistic 0.72) and adequate calibration (Hosmer–Lemeshow χ^2 7.96, 8 degrees of freedom; p = 0.44).

The E-value was 2.7 for the point estimate and 1.5 for the lower confidence limit. An unmeasured confounder would need to be associated with both documentation status and major morbidity by a risk

ratio of at least 2.7 each to explain the association away.

Discussion

Principal findings

In this cohort, two in five previously operated patients underwent emergency laparotomy with no record of their earlier operation. These patients had longer operations, more iatrogenic injuries, more major complications and a hospital stay twice as long as patients whose previous surgery was documented. The association with major morbidity persisted after adjustment, with odds 2.8 times higher (Fig. 3).

Comparison with the literature

The hazards of reoperation are well described [6,7], but they have been studied without regard to what the surgeon knew beforehand. In our study, iatrogenic injury occurred in 1.6% of documented and 11.5% of undocumented patients, against 6% to 10.5% of operations involving adhesiolysis in published series [6,7], and the 60-minute difference in operative time was four times the average effect of previous surgery reported in a meta-analysis [6]. Rehné Jensen et al. showed that the content of a patient's surgical history is associated with the complexity of emergency abdominal surgery and suggested that knowing it helps teams plan [4]. Our data add a complementary finding: whether that history is known at all is associated with outcome.

These comparisons are indirect. Our definition of iatrogenic injury is broader than enterotomy alone, and the published series include elective surgery. With that caveat, our data suggest that the burden attributed to reoperation is unevenly distributed and may concentrate in patients whose anatomy is unknown to the surgeon.

The number of patients exposed to this risk is large. In a population-based cohort of 72,270 patients, 13.1% were readmitted within five years for an operation potentially complicated by adhesions [18], and ten-year follow-up after lower abdominal surgery had already shown a sustained burden of adhesion-related readmissions [19]. Adhesiolysis also carries a documented inpatient and economic burden [20,21]. Every repeat operation is an occasion on which the previous record is either available or not.

Possible mechanisms

Two explanations are plausible, and they are not mutually exclusive. The first is that missing information causes harm directly. Without the record, the surgeon cannot plan an incision away from a mesh, anticipate an anastomosis or a reconstructed limb, interpret the preoperative CT with confidence, or arrange for senior help and extra theatre time. The sevenfold difference in unplanned changes of strategy supports this pathway: it is the outcome that prior information is meant to prevent. Two patients

in our series illustrate it: one had a fistulised gastro-enteric anastomosis of unknown type, and another, who reported only an inguinal hernia repair, had two prosthetic meshes, a small bowel perforation and an incarcerated obturator hernia.

The second explanation is that patients without records differ from those with records. Documentation is more likely to be missing when the operation was performed long ago, in another institution, or several times. Table 1 confirms this: patients without records had more often undergone multiple or reconstructive operations, their last operation was older, and they were older and sicker at presentation. The large difference in extensive adhesiolysis is consistent with this, since documentation does not alter adhesions. However, neither factor remained associated with major morbidity after adjustment, whereas undocumented prior surgery did. The complexity of the previous surgery therefore does not appear to explain the association on its own, although residual confounding cannot be excluded.

One imbalance runs the other way: a senior surgeon operated more often on undocumented patients. Surgeons probably recognised these cases as difficult and escalated them. If anything, this should have reduced morbidity in the undocumented group, so it is unlikely to explain the excess.

Implications for practice

If the association is even partly causal, it is modifiable at low cost. We suggest four measures, none of which has been tested.

1. **A patient-held operative summary.** A one-page document given at discharge, stating the procedure, the anastomoses, any implant and any stoma, which the patient can also keep as a photograph on a telephone. Patient-held records have produced mixed results in other settings such as cancer care [22], so this measure should be evaluated before wide adoption.

2. **A documentation question at the preoperative briefing.** Asking whether the previous operative record is available, and who has tried to obtain it, follows the logic of the surgical safety checklist, whose introduction was associated with lower morbidity and mortality [23].

3. **Treating the undocumented abdomen as a risk marker.** When the patient's condition allows, this means obtaining a CT scan, which is recommended as first-line imaging when the cause of obstruction is uncertain [24], involving a senior surgeon, entering the abdomen away from previous scars and allowing additional theatre time.

4. **Shared electronic surgical records.** Health information exchange has been associated with fewer duplicated procedures, less imaging and improved patient safety [25]. Extending Morocco's regional electronic records into a shared national system [11] would address the problem at its source.

A proposed grading for future validation

The risk carried by a hidden abdomen probably depends on what is hidden. We propose three grades based on the previous operation, as established during or after the emergency procedure (Online Resource 2). This grading is a hypothesis: it has not been validated, and it should not be used to estimate individual risk until it has been tested prospectively.

Strengths and limitations

The study included consecutive patients, used a standardised definition of major morbidity, classified exposure blind to outcome, and compared two groups of previously operated patients, so that the effect of previous surgery itself was controlled by design.

It also has limitations. The study was retrospective and conducted in a single centre. Patients with and without documentation may differ in ways that were not measured, including the complexity of their previous surgery, their access to care and the delay before presentation; the E-value indicates how strong such a confounder would need to be but does not exclude one. Documentation status was established retrospectively from the medical file, and some misclassification cannot be excluded, for example if a record was available to the team but not filed. The extent of adhesiolysis and the change of strategy were judged by surgeons who knew the documentation status, although major morbidity and length of stay are less open to this bias. The model's 6.5 events per variable is below the classic threshold of ten, and the wide confidence intervals reflect this imprecision. With eight deaths in total, the study could not detect a difference in 30-day mortality. Finally, the findings apply to settings without shared electronic records and may not hold elsewhere.

Future research

A prospective multicentre study should record documentation status before incision, measure the same outcomes with blinded assessment, and test the proposed grading. An intervention study of patient-held operative summaries would establish whether the risk can be reduced.

Conclusion

In a hospital without shared electronic records, 41% of previously operated patients reached emergency laparotomy with no documentation of their earlier surgery. Undocumented prior surgery was associated with longer operations, more iatrogenic injury, a doubled hospital stay and 2.8 times the odds of major morbidity. Missing operative records should be regarded as a patient safety risk factor in emergency surgery. Patient-held operative summaries and shared surgical records are low-cost responses that deserve prospective evaluation.

Declarations

Competing interests.

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval.

This retrospective study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee for Biomedical Research of Oujda (CERBO), Faculty of Medicine and Pharmacy, Mohammed First University, Oujda, Morocco (approval No. 47/2026, 9 October 2026) before data extraction began.

Consent to participate.

The ethics committee waived the requirement for informed consent because of the retrospective design; all data were anonymised before analysis.

Consent to publish.

Not applicable. The manuscript contains no identifiable patient information or images.

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Author Contribution

M.A. conceived and designed the study, curated and analysed the data, and wrote the main manuscript text. T.D. contributed to the conception of the study and to data acquisition. A.B.C. curated the data. S.E. contributed to the methodology and the statistical analysis. A.B., A.D., A.G. and R.J. contributed to data acquisition. M.B. supervised the study and validated the results. All authors critically reviewed the manuscript and approved the final version.

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Not applicable.

Data Availability

The data supporting the findings of this study are not publicly available because they contain information that could compromise patient privacy, but anonymised data are available from the

corresponding author on reasonable request.

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Figures

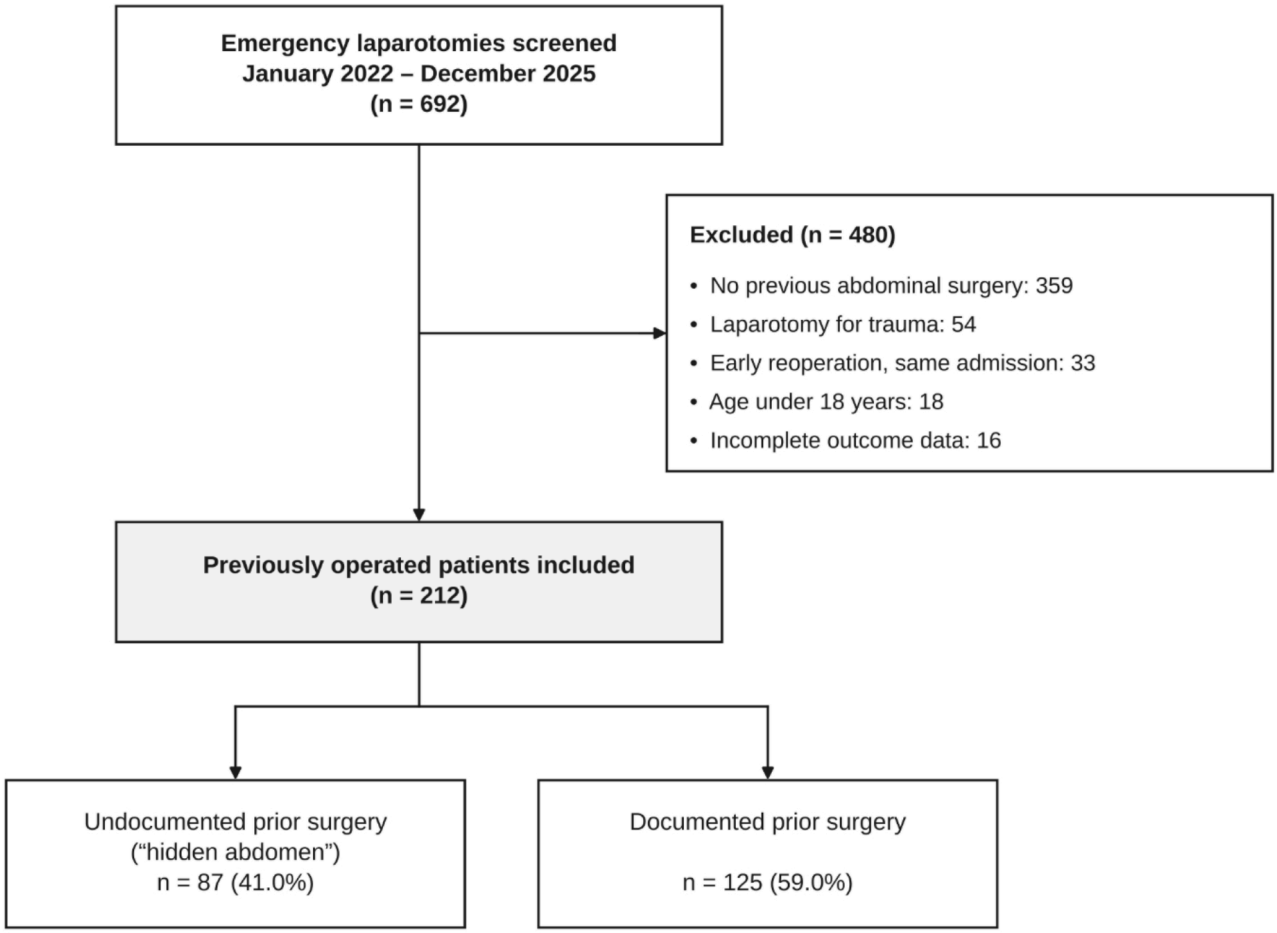


Figure 1

Flow of patients through the study. Of 692 emergency laparotomies screened between January 2022 and December 2025, 480 were excluded (no previous abdominal surgery, 359; trauma, 54; early reoperation during the same admission, 33; age under 18 years, 18; incomplete outcome data, 16). The final cohort of 212 patients comprised 87 with undocumented and 125 with documented prior abdominal surgery

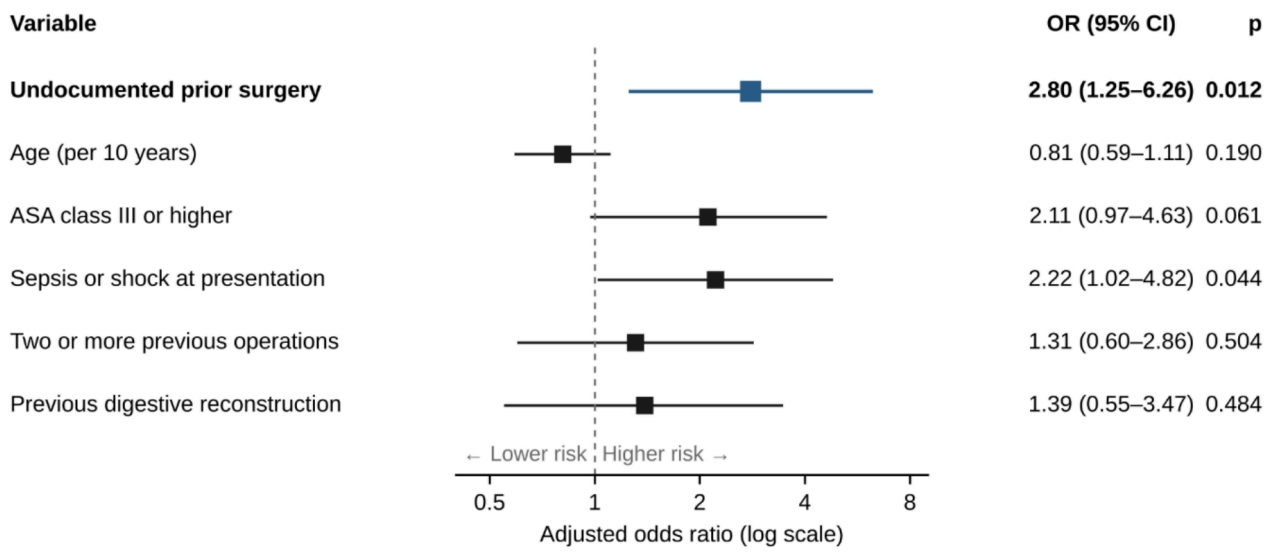


Figure 2

Adjusted odds ratios for major morbidity. Forest plot of the multivariable logistic regression model (39 events); squares show odds ratios and horizontal lines 95% confidence intervals on a logarithmic scale. The dashed line marks an odds ratio of 1. OR, odds ratio; CI, confidence interval; ASA, American Society of Anesthesiologists

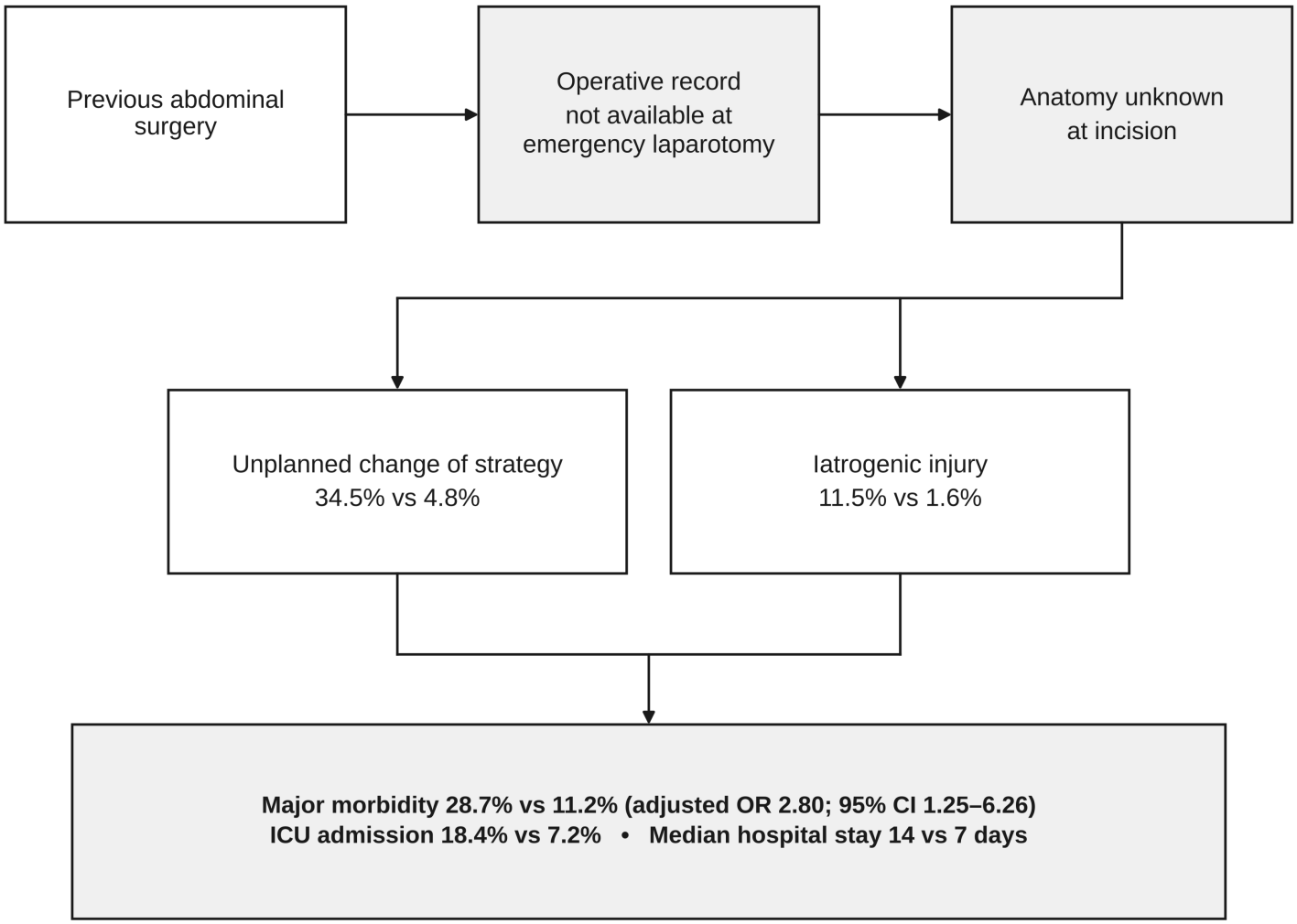


Figure 3

Proposed pathway from missing operative documentation to postoperative morbidity. When the previous operative record is not available at emergency laparotomy, the anatomy is unknown at incision, which may lead to unplanned changes of strategy and iatrogenic injury, and in turn to major morbidity, intensive care admission and a longer stay. Percentages compare undocumented with documented prior surgery; the odds ratio is adjusted for the baseline differences listed in Table 1. OR, odds ratio; CI, confidence interval; ICU, intensive care unit

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- ESM1.pdf
- ESM2.pdf