Scientific Research Publishing

Open Journal of Anesthesiology, 2026, 16(1), 1-8
https://www.scirp.org/journal/ojanes
ISSN Online: 2164-5558
ISSN Print: 2164-5531

Anesthesiologic Management of Surgical Emergencies at the University Hospital "LE LUXEMBOURG"

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How to cite this paper: Coulibaly, M., Korogo, I., Dabo, A., Koita, S.A., Almeimoune, A., Mangane, M.I., Diop, T.M., Diallo, B., Traore, S.I., Coulibaly, B.B. and Coulibaly, Y. (2026) Anesthesiologic Management of Surgical Emergencies at the University Hospital "LE LUXEMBOURG". *Open Journal of Anesthesiology*, **16**, 1-8.
https://doi.org/10.4236/ojanes.2026.161001

Received: November 26, 2025
Accepted: January 3, 2026
Published: January 6, 2026

Abstract

Introduction: Emergency surgery represents a major challenge in anesthesiology, particularly in countries with limited resources where diagnostic delays, lack of qualified personnel, and logistical deficiencies increase the risk of morbidity and mortality. Patients undergoing emergency surgery have a significantly higher mortality than those undergoing elective surgery, due to an often-compromised physiological state and limited pre-operative optimization. In this context, understanding the epidemiological, organizational, and anesthetic characteristics of patients is essential to improve practices. **Methods:** This is a descriptive and analytical cross-sectional study conducted from October 1 to December 31, 2023. All patients operated on for an urgent surgical indication, except obstetric emergencies, were included. The data collected focused on socio-demographic, clinical, logistical, therapeutic, and prognostic characteristics. A statistical analysis using the chi-square test was performed to identify factors associated with mortality, with a significance threshold set at $p < 0.05$. **Results:** 100 patients were operated on during the study period. The average age was 31 ± 21.4 years, with a male predominance (62%). Abdominal pain was the main reason for admission (58%). According to the ASA classification, 53% were ASA 1U, while 28% were ASA 2U. The operating time exceeded three hours in 68% of patients, mainly due to organizational constraints. Anesthesia was provided in 87% of cases by a doctor in specialization. The most common intraoperative incidents were hypotension (11%), hemor-

rhagic shock (3%), and septic shock (2%). The overall post-operative mortality was 3%. Two factors were significantly associated with death: pericardial effusion ($p = 0.001$) and ASA 3U status ($p = 0.011$). **Discussion and Conclusion:** The study highlights significant delays in care, a high proportion of progressive pathologies, and a massive use of doctors in training, illustrating the structural limits of the healthcare system. The low mortality observed (3%) could be explained by the frequent presence of senior surgeons and by the predominance of digestive pathologies. However, hemodynamic complications remain frequent, highlighting the need for pre-operative optimization and resuscitation capacity building. Improvement of operative organization, anesthetic training, and access to emergency care appears essential to further reduce morbidity and mortality in a context with limited resources.

Keywords

Emergency Surgery, Anesthesia, Perioperative Mortality, Countries with Limited Resources, Intraoperative Complications

1. Introduction

Urgency refers to any circumstance that, by its occurrence or discovery, introduces or suggests a functional or vital risk if no immediate action is taken. Surgical emergencies concern all patients admitted in an emergency and for whom a surgical intervention decision may be required within 24 hours. Emergency surgery represents for the resuscitator a situation where the patient is at risk of hemodynamic instability. Hemodynamic precariousness concerns a vast nosological sector ranging from low flow syndrome to a global oxygen (O_2) transport defect (severe hypoxemia, major hypovolemia, cardiogenic shock) to O_2 distribution anomalies by alteration of microcirculatory regulation mechanisms as encountered during septic shock [1].

Patients undergoing emergency general surgery (EGS) have much higher mortality and morbidity than those undergoing elective or scheduled procedures. US outcomes, using data from the American College of Surgeons (ACS), National Surgical Quality Improvement Program (NSQIP), showed a mortality of 14% at 30 days for patients who had undergone emergency laparotomy. A comparison of hospital performance in emergency versus elective general surgery, adjusted for patient-related and operation-related risk factors, showed that emergency status was a significant predictor for morbidity, serious morbidity, and mortality [2].

Unfortunately, the worldwide human resource gap in anesthesia services often presents a barrier to accessing life-saving and life-improving surgeries [3].

Diseases whose treatment relies on a surgical procedure are among the top 15 causes of disability in the world. By conservative estimates, 11% of the global burden of disease is attributable to diseases that could be successfully treated with surgery, with low- and middle-income countries most affected. Conditions for which surgery is one of the primary therapeutic options are expected to become increasingly common in the coming years, and by 2030, a more than 45% increase in the

number of cases of common diseases, such as heart disease, cancer, diabetes, and traumas following a road accident, is expected.

It is in this context that the present study aims to contribute to the understanding of the problems related to the anesthesiological management of surgical emergencies.

2. Patients and Methods

This is a cross-sectional descriptive and analytical study with prospective data collection from October 1, 2023, to December 31, 2023. All patients operated on for urgent indications were included. Obstetric emergencies were excluded from this work. The variables studied were:

- Socio-demographic: Age; Sex.
- Clinics: Reasons for admission; Physical examination at the entrance; Diagnosis made.
- Logistics: Diagnostic delay; waiting time for surgery.
- Therapeutics: Surgical gestures, Anesthesia techniques, Incidents, and complications.
- Prognostics: Transfer service; Death.

Surgical emergencies were defined as a delay in surgical treatment of less than 3 hours. Delay in treatment was defined as a delay in surgical treatment of more than 3 hours.

A chi-square test was done to look for variables statistically related to mortality; the p-value was considered significant if <0.05.

The data collection was conducted using a previously established survey form that allowed the collection of data from anesthesia sheets and patient hospitalization records.

3. Results

During the study period, 100 patients were operated on for surgical emergencies.

The average age of our patients was 31 years ± 21.4. There was a male predominance at 62%. The main reasons for admission were: abdominal pain 58%, dyspnea 11%, and public road accident 9%. They are reported in Table 1.

Table 1. Reasons for admission.

Reason for Admission	Number (N = 100)	Percentage (%)
Abdominal pain	58	58
Dyspnea	11	11
Road accident	9	9
Other	8	8
Limb pain	6	6
Seizures	5	5
Foot gangrene	3	3
Total	100	100

According to the ASA classification, 53% of our patients were ASA 1U, and ASA 2U accounted for 28% of the series. A prediction of red blood cell transfusion was considered in 23% of patients. The surgical management time was >3 hours in 68% of patients. Table 2 reports the causes of the delay in management. 95% of the patients were operated on by a senior surgeon. Anesthesia was performed by a doctor in specialization in 87% of cases. The main surgical procedures are reported in Table 3. The anesthetic techniques used were: general anesthesia, 52%; rachianesthesia, 37%; sedation, 9%; and local anesthesia + sedation, 2%. Thiopental and propofol were the most used hypnotics, at 23% and 22%, respectively. The main ones at induction and during anesthesia are reported in Table 4. 12% of patients were transfused during surgery. After surgery, 5% of patients were transferred to intensive care. The average duration of surgery was 1.35 hours (0.3 - 6.2 h). We recorded a post-operative mortality of 3%. There was a statistically significant link between death and: the diagnosis of pericardial effusion ($p = 0.001$); and the ASA score 3U ($p = 0.011$).

Table 2. Reasons for the delay in care.

Cause of the Delay	Number (N = 68)	Percentage (%)
Unavailability operating room	**34**	**34**
Unavailability surgical team	14	14
Financial means	10	10
Preop preparation	6	6
Additional assessment	3	3
Request for blood	1	1

Table 3. Surgical acts.

Diagnosis	Number (N = 100)	Percentage (%)
Appendectomy	29	29
Cure for acute intestinal obstruction	20	20
Osteosynthesis of open fractures	15	15
Peritonitis cure	12	12
Pericardial effusion drainage	10	10
Brain abscess drainage	9	9
Testicular torsion cure	1	1
Treatment of traumatic spinal cord compression	1	1
Fracture cure occipital obstruction	1	1
Drainage hepatic abscess	1	1
Repair of a penile fracture	1	1
Cure of a renal abscess	1	1
Total	100	100

Table 4. Perioperative incidents and complications.

Incidents at induction	Number (N = 100)	Percentage (%)
Difficult intubation	3	3
Desaturation	2	2
Bronchospasm	1	1
Inhalation of gastric contents	1	1
Intraoperative incidents	**Number (N = 100)**	**Percentage (%)**
Persistent arterial hypotension	11	11
Hemorrhagic shock	3	3
Septic shock	2	2
Cardiac arrest	1	1
Post-operative complications	**Number (N = 100)**	**Percentage (%)**
Delay in waking up	6	6
Renal failure	4	4

4. Discussion

The present study describes the epidemiological, organizational, anesthetic, and prognostic characteristics of emergency-operated patients in a context with limited resources. The results highlight several major issues already reported in the international literature, while highlighting specific features of our health environment.

4.1. Patient Profile and Reasons for Admission

The young average age (31 years) and the male predominance observed in our series reflect a trend conventionally described in low- and middle-income countries (LMICs), where trauma and infectious pathologies are the main causes of emergency admission [4]-[7]. Abdominal pain accounted for more than half of the reasons for admission, followed by respiratory distress and trauma. This profile aligns with African and Asian data, where abdominal emergencies predominate, including complicated appendicitis, occlusion, and peritonitis [5] [7].

The high proportion of potentially progressive conditions (acute occlusions, peritonitis, open fractures, compressive pericardial effusions) reflects the frequent delay in seeking care, often attributed to economic, geographical, and sociocultural barriers [8].

4.2. ASA Status and Preo-Perative Clinical State

More than half of the patients were classified as ASA 1U, which at first glance could reflect a relatively stable clinical condition. However, in countries with limited resources, the ASA classification may underestimate the real severity, particularly in the absence of a complete pre-operative assessment, advanced monitor-

ing, and adequate pre-operative resuscitation [9].

The significant association between ASA 3U status and mortality in our study confirms the relevance of this score as a risk predictor for emergency surgery, as demonstrated in several studies [2] [10].

4.3. Support Deadlines and Organizational Constraints

The delay of more than three hours observed in 68% of patients is a decisive prognostic factor. The identified causes—unavailability of the operating room, lack of a surgical team, financial barriers—are typical of the constraints of hospital systems in sub-Saharan Africa [6] [8].

Several studies have demonstrated that emergency surgery is highly dependent on organizational fluidity and logistical support. A delay of more than two hours after the surgical decision significantly increases morbidity and mortality across all pathologies [2] [11].

4.4. Anesthesia and Perioperative Incidents

In our series, anesthesia was mostly provided by doctors in specialization (87%), which illustrates the shortage of qualified anesthetists in many LMICs. The WHO and several recent studies have highlighted the importance of strengthening the training of anesthetic personnel, as intraoperative safety largely depends on the level of competence of the operator [3] [6].

The most common intraoperative incidents were persistent hypotension (11%), hemorrhagic shock (3%), septic shock (2%), and one case of cardiac arrest. These complications are consistent with international emergency surgery series, where hemodynamic instability is common due to the fragile terrain and unoptimized character of patients [2] [11].

Perioperative transfusion, performed in 12% of patients, reflects the frequency of significant blood loss in emergency surgery. In this context, the difficulties of access to safe blood constitute an additional risk factor, to which is added the low availability of erythrocyte concentrates in some African hospitals [3] [8].

4.5. Pathologies Taken Care of and Local Specificities

The dominant pathologies—complicated appendicitis, occlusion, peritonitis, open fractures, brain abscess, and pericardial effusion—testify to the diversity of emergencies encountered and the high burden of infectious diseases. Compressive pericardial effusions accounted for 10% of the indications, which is significant compared to Western series where their operative incidence is very low [11]. This feature could reflect the endemic tuberculosis, viral, or parasitic diseases already reported in several countries of West Africa [12].

This diagnosis appeared as one of the main factors associated with mortality in our study ($p = 0.001$), which is consistent with data showing that cardiac tamponade represents a life-threatening emergency requiring rapid management, with a prognosis closely related to drainage delay [13].

4.6. Morbidity and Mortality

The overall post-operative mortality of 3% in our series is significantly lower than that reported in most African (5% - 15%) and international studies, notably the 14% mortality observed after emergency laparotomy in NSQIP data [2]. Several factors can explain this difference: a high proportion of senior surgeons (95%); a predominance of digestive pathologies rather than severe vascular or multiple trauma; the exclusion of obstetric emergencies; and relatively short operating times in the majority of cases. It should also be noted that the short post-operative follow-up period could also explain this low post-operative mortality rate.

Nevertheless, the morbidity remains significant: post-operative renal failure (4%), delayed awakening (6%), and perioperative hemodynamic complications. These rates are comparable to those found in the series of countries with limited resources where the post-operative resuscitation capacity remains restricted [3] [6].

4.7. Clinical and Organizational Implications

The results of our study highlight several key areas for improvement:

- Reduction of operating times through better availability of the block, the team, and financial resources.

- Optimization of pre-operative resuscitation, particularly in ASA class 3 patients.

- Development of intensive post-operative care units, essential for reducing the mortality of complex cases.

Limitations of the study: The main potential limitations of our study are its single-center nature, the modest size of the study sample, and the short data collection period (three months). These limitations should be taken into account when interpreting and generalizing these results.

5. Conclusion

This study confirms the significant weight of surgical emergencies in our context and highlights the challenges related to anesthetic management in a limited-resource environment. Mortality remains closely associated with the initial clinical severity (ASA 3U) and the vital nature of certain pathologies (tamponade). Improving the organization, the technical platform, and the level of staff training remains the key to reducing morbidity and mortality.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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