

## Clavien Classification of Complication of Surgery in Emergency Laparotomy – A Study of 40 Cases in Combined Military Hospitals

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### Abstract

**Introduction:** Although quality assessment is gaining increasing attention, there is still no consensus on how to define and grade postoperative complications. This shortcoming hampers comparison of outcome data among different centers, therapies and over time.

**Objective:** Objective of the study was to assess the Clavien classification of surgical complications of patients who underwent emergency laparotomy.

**Materials and Methods:** The classification was tested on 40 patients who underwent emergency laparotomy in various Combined Military Hospitals (CMH) over a period of 09 years. Data recorded including demographics, clinical presentations, operating techniques, incision, post-operative complications and the duration of hospital stay.

**Results:** Out of the total 40 patients, 28(70%) were male and 12(30%) female. Male: Female ratio was 2.33:1. A total of 29(72.50%) patients experienced post-operative complications. More than one complications occurred in 14(35%) patients. There were 13(32.50%) patients in the Clavien grade-I category, 09(22.50%) patients were classified as grade-II and grade-IIIa, 05(12.50%) patients had IIIb complications, grade-IVb and V complications occurred in 03(07.50%) patients each. The mean length of hospital stay was 15.28 days.

**Conclusion:** This classification seems to be applicable in most parts of the world and may even be used by surgeons who are less experienced. In addition, standardization of postoperative care is essential to minimize postoperative complications.

**Key-words:** Clavien classification, surgical complications, emergency laparotomy.

### Introduction

Growing demand for health care, rising costs, constrained resources, and evidence of variations in clinical practice have triggered interest in measuring and improving the quality of health care delivery<sup>1</sup>. Emergency laparotomy is a common high-risk surgical procedure, but with few outcome data and few data on postoperative care<sup>2</sup>. The decision on whether to operate on a sick person with an intra-abdominal emergency is one of the most difficult in general surgery. Surgery may not be advised if the chance of success is slight and the risk of causing a fatal outcome is considered greater by operating. Scoring systems can provide objectivity and mortality prediction enabling communication and understanding of severity of illness. Incorporating subjective factors within scoring systems can allow clinicians to apply their experience and understanding of the situation to an individual but are not reproducible<sup>3</sup>. Many publications describe the use of post-operative scoring systems such as POSSUM (Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity) to compare predicted and observed outcomes<sup>4</sup>. In 1992, Clavien et al proposed a classification of complications<sup>5</sup>, which is based on the type of therapy needed to correct the complication. This Classification appears reliable and may represent a compelling tool for quality assessment in surgery<sup>1,6</sup>. The aim of this study was to test this classification on patients who underwent emergency laparotomy and to assess the reproducibility and acceptability of the classification through an international survey as well as to find out the measures to prevent those complications.

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## Materials and Methods

This observational study had been carried out in Combined Military Hospital (CMH) Dhaka, Main Dressing Station (MDS) 5 Field Ambulance, CMH Momenshahi and CMH Ghatail during the period of August 2002 to August 2011. A total of 40 patients underwent emergency laparotomy were studied. Patients were included if they underwent a midline exploration of the abdomen classified as 'urgent' defined as needing surgery within hours of diagnosis; or 'emergency', requiring surgery within minutes of diagnosis. Patients undergoing a 're-look laparotomy' were excluded, as were patients undergoing an emergency appendectomy. No patient was excluded with the ground of obesity or other co-morbid diseases (diabetes, bronchial asthma, hypertension etc.).

A detailed history was taken from the patients. Data were recorded including demographics, clinical presentations, preoperative laboratory investigation reports, operating techniques, operating time, incision, post-operative complications and the duration of hospital stay. All the patients were followed up regularly during their stay in the Hospital and as out patient.

## Results

The youngest patient of this series was 11 years and oldest was of 85 years. Male were 28 (70%) and Female 12 (30%); Male: Female = 2.33: 1 (Table-I).

**Table-I:** Distribution of Patients according to age and sex (n=40)

Age (Years)	<20	20–30	31–40	41–50	51 years and above	Total	%	M : F
Male	02	03	09	10	04	28	70	
Female	01	02	03	04	02	12	30	
Total	03	05	12	14	06	40	100	2.63:1

Maximum patients (11) were operated for intestinal obstruction, then perforation of hollow viscus. Only one patient underwent laparotomy for acute pancreatitis with 36 weeks pregnancy with foetal distress (Table-II). Total 08 patients required peri-operative blood transfusion.

**Table-II:** Distribution of Patients according to reasons of emergency laparotomy (n=40)

Cause of surgery	Number of patients	Percentage
Perforation of hollow viscus	10	25.00
Intestinal obstruction	11	27.50
Strangulated hernia	04	10.00
Burst appendix	03	07.50
Stab injury	03	07.50
Gun shot / blast injury	05	12.50
Blunt abdominal trauma	03	07.50
Acute pancreatitis with 36 weeks pregnancy	01	02.50

Nausea and vomiting were the most frequent complications. No complication observed in 11 (27.50%) patients. More than one complications occurred in 14(35%) patients. Maximum patients (32.50%) developed Grade-I complications, then Grade-II (22.50%) and Grade-IIIa (22.50%) complications. Total 3 (07.50) patients died (2 for liver injury due to blunt abdominal trauma and 1 for anastomotic leakage following previous surgery for colonic malignancy) (Table-III) and (Table-IV) and all other were back to their normal life and work without any significant problem during the period of follow up.

**Table-III : Distribution of Patients according to list of complications (n=40)**

Complications	Number of patients	Percentage
Nausea and vomiting	13	32.50
Bleeding (Post-operative)	01	02.50
Cardiac complications	03	07.50
Arrhythmia	02	05.00
Heart failure	01	02.50
Abdominal collection	02	05.00
Surgical Site Infection (SSI)	08	20.00
Wound dehiscence	02	05.00
GI bleeding	02	05.00
GI fistula	01	02.50
Prolonged ileus (TPN)	02	05.00
Anastomotic leak	01	02.50
Multiple organ failure	03	07.50
Respiratory complications	05	12.50
Death	03	07.50

**Table-IV: Distribution of Patients according to grade of complications (n=40)**

Gradings	Number of patients	Percentage
Grade-I	13	32.50
Grade-II	09	22.50
Grade-III	14	35.00
a)	09	22.50
b)	05	12.50
Grade-IV	03	07.50
a)	00	00.00
b)	03	07.50
Grade-V	03	07.50

Median length of hospitalization in patients without complication was 9.36 days. Hospital stay in patients with complications was, respectively, 10 days when patients developed Grade-I complications only, 11.17 days in those with Grade-II, 26.67 days in presence of Grade-IIIa, 31.20 days in Grade-IIIb and 49.00 days in Grade-IVb complications. Length of hospitalization of patients who died due to a complication (Grade-V) was 2.33 days. Average hospital stay was 15.28 days.

## Discussion

The rising cost of health care is given increasingly importance worldwide. A major factor affecting hospital cost is complications following surgery<sup>7,8</sup>. The absence of consensus within the surgical community on the best way to report surgical complications has hampered proper evaluation of the surgeon's work and possibly progress in the surgical field<sup>9</sup>. General surgical emergency admissions are the largest group of all surgical admissions to UK hospitals<sup>10</sup> and account for a large percentage of all surgical deaths<sup>11</sup>. Clavien Classification of Surgical Complications<sup>1,12</sup> is a useful tool for those interested in surgical audit or clinical investigation. It has subsequently been used by us for outcome assessment.

**Grade-I:** Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions.

**Grade-II:** Requiring pharmacological treatment with drug other than such allowed for Grade-I complications.

**Grade-III:** Requiring surgical, endoscopic or radiological intervention.

**Grade-IIIa:** Intervention not under general anaesthesia.

**Grade-IIIb:** Intervention under general anaesthesia.

**Grade-IV:** Life-threatening complication.

**Grade-IVa:** Single organ dysfunction.

**Grade-IVb:** Multiorgan dysfunction.

**Grade-V:** Death of a patient.

If the patients suffer from a complication at the time of discharge, the suffix "d" (for 'disability') is added to the respective grade of complication. This label indicates the need for a follow-up to fully evaluate the complication<sup>13</sup>. Compared with elective surgery, emergency abdominal surgery is associated with a higher risk of morbidity and mortality, especially in patients over the age of 65 and where 50% of these patients have significant associated comorbidities<sup>14</sup>.

Exploratory laparotomy is used to visualize and examine the structures inside of the abdominal cavity may be recommended for a patient who has abdominal pain of unknown origin or who has sustained an injury to the abdomen. Injuries may occur as a result of blunt trauma (e.g., road traffic accident) or penetrating trauma (e.g., stab or gunshot wound)<sup>15,16</sup>. Patients over 80 years of age are more likely to present for emergency surgery than for elective surgery<sup>17</sup>. In this study maximum patients were within 41 to 50 years of age. As this study have included some traumatic cases.

In order to minimize or even avoid complications it is crucial to know the risk factors and strategies to prevent, treat or reduce intra and postoperative complications<sup>18</sup>.

In multi-variant analyses, age on its own has been shown to be a poor predictor of mortality, morbidity or length of stay in hospital<sup>19</sup>. A fit elderly person should not be refused an emergency operation because of their age alone. Although the American Society of Anaesthesiologists (ASA) classification of fitness for surgery was not devised as a risk prediction

score, it has been used in this way, both on its own, and in conjunction with other patient or operative variables such as age, sex, urgency of surgery or APACHE-II (Acute Physiology and Chronic Health Evaluation II) score<sup>4</sup>.

Initially, it was thought that obese patients have a higher complication rate especially in the case of a laparoscopic approach. Some groups reported longer operating time, prolonged hospital stay and higher intraoperative complication rates<sup>20</sup>. Patients with a BMI over 25 kg/m<sup>2</sup> have a higher risk for incisional hernias and have an increased rate of surgical site infection<sup>21,22</sup>. Malnutrition has been recognized as an independent risk factor of perioperative morbidity for many decades, but there is currently no standardized definition of malnutrition<sup>23,24</sup>. The postoperative recovery of all surgical patients can be improved by an early start of enteric nutrition postoperatively. When the enteric administration of food is not possible, total parenteral nutrition can be given to bridge a long period without food<sup>25</sup>. Perioperative anemia is associated with increased postoperative complications and mortality<sup>26</sup>. In a recent study the 30 days mortality and cardiac event rates increased, with either positive or negative deviations from normal hematocrit levels<sup>27</sup>. In this study 08 patients required peri-operative blood transfusion.

The choice of incision for laparotomy depends on the area that needs to be exposed, the elective or emergency nature of the operation and the personal preference. Some authors report abdominal or neural dysfunction after transverse access because of nerve, muscle or vessel interruption<sup>28</sup>. A midline incision is still the incision of choice in conditions that require rapid intra-abdominal entry or where the preoperative diagnosis is uncertain, as it is quicker and can easily be extended<sup>29</sup>. Many studies showed that prolonged operating time correlated with higher intra and postoperative complications<sup>18</sup>.

Good postoperative pain control is an important part of adequate postoperative care. Inadequate postoperative pain relief may delay recovery, lead to a prolonged hospital stay and increase medical costs<sup>30</sup>. The improved outcome may be because of a better pain control with epidural analgesia, with subsequently enhanced respiratory function<sup>31</sup>. Early enteral nutrition is associated with reduced mortality,

though the mechanism is not clear<sup>32</sup>. When the enteric administration of food turns out to be impossible, total parenteral nutrition can be given to bridge a long period without food<sup>25</sup>.

The most frequent postoperative surgical complications are surgical site infection (SSI), anastomotic leakage, intra-abdominal abscess, ileus and bleeding. Some studies showed that perioperative oxygen supply and preoperative immunonutrition decreased surgical site infection significantly<sup>33,34</sup>. Most studies favour one to three intravenous doses of a second generation cephalosporine with or without metronidazole with the first dose being administered before skin incision<sup>35</sup>. Abdominal wound dehiscence remains a major cause of morbidity following any laparotomy whether elective or emergency. The burst abdomen is associated with high morbidity of up to 40% and mortality of up to 18% in elderly or malnourished patients in whom a burst represents a final additional insult to their already stressed physiology<sup>36</sup>. Interrupted whole layer closure during performance of emergency laparotomy for peritonitis patient is very effective for preventing postoperative wound-related complication and it is as effective as layered suture for preventing delayed ventral hernia in the long-term<sup>37</sup>. Here 08 (20.00%) patients developed SSI and 02 (05.00%) had burst abdomen which were managed subsequently.

Anastomotic leakage is the most serious complication specific to intestinal surgery and ranges from 2.9% to as high as 15.3%. In general, the leakage rate for intraperitoneal anastomoses is significantly lower than for extraperitoneal anastomoses<sup>18</sup>. Some leaks presents in a dramatic fashion early in the post-operative period, leaving little doubt about the diagnosis. However, many others present in a far more subtle fashion, often relatively late in the postoperative period, and can be difficult to distinguish from other postoperative infectious complications<sup>38</sup>. There seems to be no significant difference in leakage when comparing a handsewn and a stapled technique regardless of the level of anastomosis<sup>39</sup>. Only one patient (02.50%) developed anastomotic leak who had a typhoid ulcer perforation. Abscess formation and bleeding, organ injury and fistula formation at 'on demand' relaparotomies are well-known complications after surgery for intra-abdominal sepsis associated with fibrinous adhesions<sup>40</sup>. Postoperative ileus has long been considered an

an inevitable consequence of gastrointestinal surgery. It prolongs hospital stay, increases morbidity, and adds to treatment costs. The operating time and intraoperative blood loss are independent risk factors for a postoperative ileus<sup>41</sup>. Two patients (5.00%) in this study developed prolonged ileus and improved with subsequent management.

## Conclusion

The morbidity scale based on the therapeutic consequences of complications constitutes a simple, objective and reproducible approach for comprehensive surgical outcome assessment. This classification seems to be applicable in most parts of the world and may even be used by surgeons who are less experienced. The broad implementation of this classification into surgical literature may facilitate the evaluation and comparison of surgical outcomes among different surgeons, centers, and therapies. In addition, standardization of postoperative care is essential to minimize postoperative complications.

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