

# Genel Cerrahi Hastalarında Hastane İçi Mortalite Vakalarının Retrospektif Olarak İncelenmesi

A Retrospective Analysis Of Cases Of In-Hospital Mortality In General Surgery Patients

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## ÖZET

**Giriş:** Ölüm yaşamın sona ermesidir. Hastaneye yatış sırasında mortalite nedenleri genel popülasyondaki mortalite nedenlerinden farklıdır. Kanser hastaları terminal dönemlerinde palyatif bakım ünitesinde, dahiliye kliniğinde veya cerrahi kliniğinde kalmak isterler. Bu yerlerde ölmeyi, başka bir deyişle kaçınılmaz sonu beklemeyi bekliyorlar. Bu çalışmanın amacı, genel cerrahi kliniğinde yatan ve hastanede ölen hastaları retrospektif olarak incelemek ve mevcut literatür ışığında verileri tartışmaktır.

**Yöntemler:** Temmuz 2015-Temmuz 2019 tarihleri arasında hastanemizin genel cerrahi kliniğinde yatan ve hastaneye yatışları sırasında ölen hastaların tıbbi kayıtları hastane veri yönetim sistemi ve hasta dosyaları ile geriye dönük olarak incelendi.

**Bulgular:** Çalışmaya % 52.2 (n = 119) erkek ve % 47.8 (n = 109) kadın olmak üzere toplam 228 hasta dahil edildi. Hastalar acil vakalar ve seçmeli vakalar olarak iki gruba ayrıldı. Elektif grupta malignite ve komplikasyon oranı daha yüksekti (p <0.01). Enfeksiyon ve sepsis oranı acil grupta daha yüksekti (p <0.05, p <0.01). Komplikasyon gelişen hastalarda komplikasyon olmayanlara göre hastaneye yatıştan ölüme kadar geçen süre daha uzundu (p <0.01).

**Sonuç:** Yaşamlarının son dönemindeki hastalar için palyatif bakım ünitelerinin bulunmasına rağmen, genel cerrahi klinikleri hala bu ihtiyacı geniş ölçüde karşılamaktadır. Kanser ve sepsis, genel cerrahi kliniklerinde başlıca ölüm nedenleridir. Ölüm oranları, komplikasyonların zamanında saptanması ve önlenmesi ile azaltılabilir.

**Anahtar kelimeler:** Ölüm, Komplikasyonlar, Sepsis

## ABSTRACT

**Background:** Death is the termination of life. Causes of mortality during hospitalization differ from the causes of mortality in general population. Cancer patients wish to stay in palliative care unit, internal medicine clinic or surgery clinic during their terminal period. They wait dying, in other words, the inevitable end in these places. The aim of the present study was to retrospectively analyze the cases of mortality in patients who were being hospitalized at general surgery clinic and died at the hospital, and to discuss the data under the light of the current literature.

**Methods:** Medical records of the patients who were being hospitalized at general surgery clinic of our hospital between July 2015 and July 2019 and who died during their hospitalization were retrospectively analyzed through hospital data management system and patient files.

**Results:** A total of 228 patients of whom 52.2% (n=119) were males and 47.8% (n=109) were females were included in the study. Patients were allocated to two groups as the emergency cases and the elective cases. Ratio of malignity and complications was higher in elective group (p<0.01). Ratio of infection and sepsis was higher in the emergency group (p<0.05, p<0.01). Duration from hospitalization to death was longer in the patients who had complications as compared to the ones without complications (p<0.01).

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**Conclusion:** Despite the presence of palliative care units for the patients in terminal period of their lives, general surgery clinics still meet this need widely. Cancer and sepsis are the major causes of mortality in general surgery clinics. Mortality rates may be reduced by timely detection and prevention of complications.

**Key words:** Death, Complications, Sepsis

## INTRODUCTION

Death is the permanent termination of all biologic activities including cardiac, respiratory and cerebral functions together with brainstem (Sarbey, 2016:743). Definition of the causes of mortality influence not only the condition accepted as “death” but also the legal and ethical considerations including mourning, medical treatment, organ donation and legacy (Sarbey, 2016:743). Causes of mortality during hospitalization differ from the causes of mortality in general population. Death during hospitalization usually occurs at the clinic where the patient stays due to the disease that causes death, and at the intensive care unit where the patients is referred to due to impaired vital functions. Comorbid conditions, cause of hospitalization, post-treatment complications and malpractices of the patients that died in hospital are reported in different ways in death certificates (Üzün, 2016:365). Reporting is done in accordance with the technical substructure of the countries and the procedures of Ministry of Health. Sepsis is a severe cause of mortality also in general surgery clinics as in all medical branches (Moore, 2010:695). The complications which develop in the course of treatment may sometimes result in death although managed well.

Cancer is the second leading cause of death worldwide and responsible for almost 10 million deaths annually. One out of 6 deaths is globally related with cancer. Cancer-related deaths are associated with high body mass index, low vegetable and fruit consumption, lack of physical activity and smoking and alcohol consumption (GBD, 2016:1659). Particularly smoking is the most important risk factor for cancer and responsible about 22% of cancer-related deaths. Economic burden of cancer is great and gradually increases. Annual total cost of cancer treatments is about 1.16 trillion dollars worldwide (Stewart, 2014). The three leading causes of death are lung, colorectal and gastric cancers worldwide. Particularly the patients with colorectal cancer and gastric cancer are important both during treatment and in the natural course of the disease for general surgery clinics. These patients want to stay in palliative intensive care unit, internal medicine and general surgery clinics of the hospitals or at home during their palliative period and meet the inevitable end, namely death at these places.

The aim of the present study was to retrospectively analyze the causes of mortality in patients who were being hospitalized at general surgery clinic and died at the hospital, and to discuss the data under the light of the current literature.

## MATERIAL and METHODS

Medical records of the patients who were being hospitalized at general surgery clinic of our hospital between July 2015 and July 2019 and who died during their hospitalization were retrospectively analyzed. Cause of mortality, previous operations, ASA score, duration of hospital stay, the operations done for the treatment of the present disease, duration between the operation and death, non-surgical minimally invasive interventions, whether complications developed, treatment method for the complication, presence of sepsis, presence of malignity and place of death of the patients were analyzed.

Statistical analyses were done with NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program. Descriptive analyses (mean, standard deviation, median, frequency, percent, minimum, maximum) were used. Normality distribution of quantitative data was tested with Shapiro-Wilk test and graphic analyses. Student- t test was used for inter-group comparison of the normally distributed quantitative data and Mann-Whitney U test was used for inter-group comparison of the non-normally distributed quantitative data. Qualitative data were compared with Pearson chi-square test and Fisher-Freeman-Halton exact test. A p level of <0.05 was accepted as statistically significant.

## RESULTS

A total of 228 patients of whom 52.2% (n=119) were males and 47.8% (n=109) were females were included in the study. Patients were allocated to two groups as the emergency cases and the elective cases. Ratio of male patients were higher in elective group (p<0.05). Mean age of the patients was 73.15±14.50 years (range: 17-97). No difference was found between groups with regard to age, place of death (intensive care unit of surgery clinic), ratio of chronic diseases, diabetes, cardiac diseases, hypertension, pulmonary diseases, renal diseases and cerebral diseases and the ratio of previous surgeries (p>0.05) (Table 1). ASA scores were higher in emergency group (p<0.01). While ratio of gastrointestinal system (GIS) diseases was higher in emergency group, ratio of hepato-pancreato-biliary (HPB) system diseases was higher in elective group (p<0.05) (Table 2). Ratio of malignity and operations due to HPB system diseases was higher in elective group (p<0.01). Duration of hospital stay was longer in emergency group as compared to elective group (p<0.01). Complication rates were higher in elective group (p<0.01) (Table 3). While infection and sepsis were more frequent in emergency group, hemorrhage was more common in elective group (p<0.05). Duration between hospitalization and death was longer in the patients who had



complications as compared to the ones without complications ( $p < 0.01$ ) (Table 4).

## DISCUSSION

Death is termination of life. People may die at any place where they live or at a different place during travel or at a health institution where they stay for treatment. Although death is inevitable, many people do not think about where they will die. Lobet et al. detected that 61.5% of the participants wanted to die at home and 9.7% at the hospital in a questionnaire study about death anxiety (Lobet, 2020:30444). This choice varies among communities and it may also vary with age, gender, presence of a chronic disease and socio-economic status (Gomes, 2008:33). While ratio of deaths at the hospital is 11% in Albania, this ratio reaches 78% in Japan (Broad, 2013:257). The patients who have a severe chronic disease or whose quality of life is severely impaired are treated at palliative care units and usually die at these centers. In palliative care centers, it is aimed to improve the quality of life of the patients and the relatives through reducing symptoms, mainly pain, instead of curative treatments.

Death in the hospital not only occurs at palliative care centers and also during hospitalization at the clinics. About 58% of the deaths in the hospital are expected, symptoms like dyspnea and severe pain are seen during the last hours in 75% of the patients (Toscani, 2005:33). Ratio of death in the hospital is a measurable value and an indicator of hospital quality. Post-operative mortality is one of these quality indicators. Post-operative mortality audit that has started in New Zealand and Australia is being generalized worldwide (Raju, 2014:618). Many hospitals regularly hold mortality and morbidity meetings however their effect on patient care is limited due to insufficient reporting (Heeney, 2014:121). Oral intake and mobility of the terminal cancer patients are limited. The patients who cannot be accepted to palliative care units are intermittently hospitalized at internal medicine and surgery clinics for supportive treatment. Ratio of newly diagnosed malignancy patients among the dying is higher in elective group in our study as these patients electively undergo surgery.

American Society of Anesthesiologist (ASA) has developed a classification system that uses physical condition of the patients for prediction of operative risk. Many revisions have been done for ASA until today (De Cassai, 2019:53). While ratio of post-operative complications is 0.41/1000 in ASA I patients, this ratio elevates to 26.5/1000 in emergency patients and ASA IV and V patients (Tiret, 1988:947). However, studies are also available reporting that pre-operative ASA score does not have a predictive value for morbidity and mortality following a great abdominal surgery (Owens, 2001:378). In our study, mean ASA score of the dying patients was 2.71 and it was found to be 2.79 in emergency group. This ratio was higher in emergency patients as their general condition and actual physical capacity are impaired more and faster.

Death ratio is higher in emergency surgery group together with high ASA score as compared to elective surgery group.

Respiratory failure, pneumonia, sepsis, renal diseases and cancer are the most common causes of death among hospitalized patients (Hall, 2013:1). Causes of death vary among the clinical departments. Heeney A. et al. found that the most common causes of death in general surgery clinic were advanced stage cancer (36.5%), sepsis (14.9%), cardiovascular failure (13.2%) and trauma (11%) (Heeney, 2014:121). Cancer is an important cause of death for both gender and colo-rectal cancer is one of the most common cause of death due to its high incidence in general population, and gastric and hepatic cancers are another most common cause of cancer deaths in general surgery due to their poor prognosis (Bray, 2018:394). In our study, ratio of presence of malignancy in dying patients (37.7%) is consistent with literature and ratio of trauma-related deaths is low (1.8%). This may have resulted from our center's being a trauma center due to its location. Ratio of gastro-intestinal diseases was found to be high in dying patients both in elective and emergency patients. Higher ratio of GIS diseases in emergency group is associated with mechanic intestinal obstruction, malnutrition, inadequate fluid intake and undergoing operation under emergency conditions. Of these cases, 49.6% were treated with gastro-intestinal system surgery and death has occurred mean on day 15.2 after surgery.

Although different efforts are being paid by many centers for reducing post-operative mortality, this ratio can never be zero (Endo, 2017:160). Most of the studies which reported no mortality are retrospective, single center studies conducted with small number of patients. Mortality rates may be reduced by performing operations with proper indications, providing appropriate care before and after surgery and successful management of complications considering patient's age, nutrition status and comorbid conditions. In the present study, complication rates were 68.2%, 41.3% and 46.5% in elective group, emergency group and overall, respectively. Infection, fistula development and pneumonia are the first leading complications in dying patients. Infection and sepsis are severe risk factors both in operated patients and in the patients followed non-operatively. Sepsis is usually of intra-abdominal origin in general surgery clinics and mortality rate is quite high despite proper aggressive treatment (Moore, 2011:672). In current literature, sepsis mortality varies between 10% and 52% (Kemoker, 2016:165). Control of infection sources is quite important for treatment (Ho, 2019:126). Ratio of sepsis was found to be high in the present study and gastro-intestinal fistulas are the most common cause. The second leading cause is respiratory infections. We consider that the long duration between hospitalization and death is related with the management and treatment of the complications. Shorter duration in the patients without complications is related with these patients' dying from mainly cardiac diseases, in other words, related with their comorbid conditions.

Postoperative pulmonary complications are one of the most important causes of post-operative morbidity and



mortality following abdominal surgery (Sabate, 2014:201). These complications which develop in presence of chronic obstructive pulmonary disease may result from anesthesia and surgery. These pulmonary complications may be seen in a wide spectrum from temporal hypoxia to the need for re-intubation. Widely used minimally invasive procedures like laparoscopy impair pulmonary functions less than conventional methods and carry less risk for development of pulmonary complications (Jiang, 2013:2466). Pulmonary complications are more common in patients who undergo emergency surgery as compared to the ones who undergo elective surgery and result in more morbidity and mortality (Canet, 2015:458). Respiratory complications like pneumonia were more common in emergency group in our study.

Hemorrhage is another severe complication in surgery clinics and leads to death unless diagnosed early and treated. Hemorrhagic shock is the second most common cause of death in trauma patients and a leading cause of early deaths in the hospital (Suaia, 1995:185). Hemorrhagic shock should be treated with the control of hemorrhage and rapid fluid resuscitation. Fluid replacement is done both with crystalloid fluids, blood and blood products. Blood transfusions are restricted today due to transfusion-related infection, wrong transfusions, immunologic risks, and metabolic complications like coagulopathy, acidosis and hypothermia (Smilowitz, 2016:315). Studies are available reporting that restriction has decreased complication rates (Smilowitz, 2016:315). In our study, ratio of hemorrhage was 10% and resuscitation was done for all patients and hemorrhage-related death did not occur.

## CONCLUSION

Terminal period general condition disorders due to previous malignancy are important for in-hospital deaths. Despite the presence of palliative care centers for terminal period cancer patients, general surgery clinics still meet a significant part of this need. Complication development, mainly infections that may cause sepsis is a severe risk for death. Mortality rates may be reduced by timely recognition and proper management of these complications. New regulations may be done through better reporting of causes of mortality and holding more effective mortality meetings. In-hospital mortality rates may be reduced with these regulations and under the light of new studies.

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Table 1: Descriptive characteristics by groups

		Group			Value
		Emergent (n=184)	Elective (n=44)	Total	p
Age	Min.-Max. (Median)	17-97 (77,5)	41-92 (73)	17-97 (77)	t:0,665
	Mean±SD (Mean)	73,46±14,89	71,84±12,83	73,15±14,50	<b><i>a</i>0,506</b>
Gender	Male	90 (48,9)	29 (65,9)	119 (52,2)	$\chi^2$ :4,111
	Female	94 (51,1)	15 (34,1)	109 (47,8)	<b><i>b</i>0,043*</b>
Department	Service	63 (34,2)	12 (27,3)	75 (32,9)	$\chi^2$ :0,781
	ICU	121 (65,8)	32 (72,7)	153 (67,1)	<b><i>b</i>0,377</b>
Chronic Disease	No	29 (15,8)	6 (13,6)	35 (15,4)	$\chi^2$ :0,123
	Yes	155 (84,2)	38 (86,4)	193 (84,6)	<b><i>b</i>0,725</b>
Diabetes Mellitus (n=193)	No	102 (65,8)	24 (63,2)	126 (65,3)	$\chi^2$ :0,094
	Yes	53 (34,2)	14 (36,8)	67 (34,7)	<b><i>b</i>0,759</b>
Cardiac Disease (n=193)	No	71 (45,8)	21 (55,3)	92 (47,7)	$\chi^2$ :1,094
	Yes	84 (54,2)	17 (44,7)	101 (52,3)	<b><i>b</i>0,296</b>
Hypertension (n=193)	No	58 (37,4)	13 (34,2)	71 (36,8)	$\chi^2$ :0,135
	Yes	97 (62,6)	25 (65,8)	122 (63,2)	<b><i>b</i>0,713</b>
Pulmonary Disease (n=193)	No	114 (73,5)	25 (65,8)	139 (72,0)	$\chi^2$ :0,912
	Yes	41 (26,5)	13 (34,2)	54 (28,0)	<b><i>b</i>0,340</b>
Renal Disease (n=193)	No	126 (81,3)	35 (92,1)	161 (83,4)	$\chi^2$ :2,581
	Yes	29 (18,7)	3 (7,9)	32 (16,6)	<b><i>b</i>0,108</b>
Cerebral Disease (n=193)	No	111 (71,6)	31 (81,6)	142 (73,6)	$\chi^2$ :1,559
	Yes	44 (28,4)	7 (18,4)	51 (26,4)	<b><i>b</i>0,212</b>
Previous Surgery	No	71 (38,6)	23 (52,3)	94 (41,2)	$\chi^2$ :2,745
	Yes	113 (61,4)	21 (47,7)	134 (58,8)	<b><i>b</i>0,098</b>
ASA	Min.-Max. (Median)	1-5 (3)	1-3 (3)	1-5 (3)	Z:-2,650
	Ort±Ss	2,79±0,91	2,36±0,75	2,71±0,90	<b><i>c</i>0,008**</b>

<sup>a</sup>Student-t Test    <sup>b</sup>Pearson Chi-Square Test    <sup>c</sup>Mann Whitney U Test    \*p<0,05    \*\*p<0,01

ICU: Intensive Care Unit, ASA: American Society of Anaesthesiologists Physical Status Classification Score



Table 2: Evaluation of disease characteristics by groups

		Group			Value
		Emergent (n=184)	Elective (n=44)	Total	p
<b>Diagnosis</b>	<b>GID</b>	134 (72,8)	24 (54,5)	158 (69,3)	$\chi^2$ :6,202
	<b>HPBD</b>	28 (15,2)	13 (29,5)	41 (18,0)	<b><sup>b</sup>0,045*</b>
	<b>Other</b>	22 (12,0)	7 (15,9)	29 (12,7)	
<b>Malignancy</b>	<b>No</b>	133 (72,3)	9 (20,5)	142 (62,3)	$\chi^2$ :40,602
	<b>Yes</b>	51 (27,7)	35 (79,5)	86 (37,7)	<b><sup>b</sup>0,001**</b>
<b>Surgical Operation</b>	<b>No</b>	83 (45,1)	8 (18,2)	91 (39,9)	$\chi^2$ :18,561
	<b>GI</b>	87 (47,3)	26 (59,1)	113 (49,6)	<b><sup>d</sup>0,001**</b>
	<b>HPBD</b>	6 (3,3)	8 (18,2)	14 (6,1)	
	<b>Other</b>	8 (4,3)	2 (4,5)	10 (4,4)	
<b>Second Operation</b>	<b>No</b>	154 (83,7)	34 (77,3)	188 (82,5)	$\chi^2$ :1,013
	<b>Yes</b>	30 (16,3)	10 (22,7)	40 (17,5)	<b><sup>b</sup>0,314</b>
<b>Non-surgical Intervention</b>	<b>No</b>	139 (75,5)	38 (86,4)	177 (77,6)	$\chi^2$ :11,421
	<b>Percutaneous Abscess Drainage</b>	13 (7,1)	1 (2,3)	14 (6,1)	<b><sup>d</sup>0,245</b>
	<b>NPWT</b>	16 (8,7)	1 (2,3)	17 (7,5)	
	<b>ERCP</b>	0 (0,0)	1 (2,3)	1 (0,4)	
	<b>Cholecystostomy</b>	6 (3,3)	0 (0,0)	6 (2,6)	
	<b>Endoscopy</b>	1 (0,5)	0 (0,0)	1 (0,4)	
	<b>Chest Tube</b>	2 (1,1)	1 (2,3)	3 (1,3)	
	<b>Angiography + Stent Placement</b>	1 (0,5)	0 (0,0)	1 (0,4)	
	<b>PTC</b>	3 (1,6)	1 (2,3)	4 (1,8)	
	<b>Thrombolytic Therapy</b>	1 (0,5)	1 (2,3)	2 (0,9)	
	<b>PEG</b>	2 (1,1)	0 (0,0)	2 (0,9)	
<b>Exitus time after operation</b>	<i>Min-Maks (Medyan)</i>	0-103 (8)	0-70 (9)	0-103 (8)	Z:-0,673
	<i>Ort±Ss</i>	15,19±18,89	15,25±16,32	15,20±18,19	<b><sup>c</sup>0,501</b>

<sup>b</sup>Pearson Chi-Square Test

<sup>c</sup>Mann Whitney U Test

<sup>d</sup>Fisher Freeman Halton Test

\*p<0,05

\*\*p<0,01

GID: Gastro-intestinal Tract Disease, HPBD: Hepato-pancreaticobiliary Disease, NPWT: Negative-pressure Wound Therapy, ERCP: Endoscopic Retrograde Cholangiopancreatography, PTC: Percutaneous Trans-hepatic Cholangiography, PEG: Percutaneous Endoscopic Gastrostomy



Table 3: Evaluations on complication and exitus time by groups

		Group			Value
		Emergent (n=184)	Elective (n=44)	Total	p
Exitus day after hospitalization	Min.-Max. (Median)	0-157 (7)	1-74 (15,5)	0-157 (8)	Z:-3,537
	Mean±SD (Mean)	14,21±20,48	20,21±16,46	15,36±19,88	<sup>c</sup> 0,001**
Complication	No	108 (58,7)	14 (31,8)	122 (53,5)	$\chi^2$ :10,311
	Yes	76 (41,3)	30 (68,2)	106 (46,5)	<sup>b</sup> 0,001**
Type of Complication	No	1 (1,3)	1 (3,3)	2 (1,9)	$\chi^2$ :19,340
	Infection	27 (35,5)	4 (13,3)	31 (29,2)	<sup>d</sup> 0,025*
	Hemorrhage	5 (6,6)	6 (20,0)	11 (10,4)	
	Leakage	16 (21,1)	9 (30,0)	25 (23,6)	
	Pneumonia	18 (23,7)	5 (16,7)	23 (21,7)	
	Evisceration	3 (3,9)	0 (0,0)	3 (2,8)	
	CVD	2 (2,6)	0 (0,0)	2 (1,9)	
	DVT	1 (1,3)	1 (3,3)	2 (1,9)	
	Compartment Syndrome	1 (1,3)	1 (3,3)	2 (1,9)	
	Pleural Effusion	1 (1,3)	0 (0,0)	1 (0,9)	
	ARF	0 (0,0)	2 (6,7)	2 (1,9)	
	Pneumothorax	0 (0,0)	1 (3,3)	1 (0,9)	
	Decubitus	1 (1,3)	0 (0,0)	1 (0,9)	

<sup>b</sup>Pearson Chi-Square Test<sup>c</sup>Mann Whitney U Test<sup>d</sup>Fisher Freeman Halton Test

\*p&lt;0,05

\*\*p&lt;0,01

CVD: Cardiovascular Disease, DVT: Deep Venous Thrombosis, AFR: Acute Renal Failure

Table 4: Assessment of exitus time and presence of sepsis by complication

		Complication		Value
		No (n=122)	Yes (n=106)	p
Exitus day after hospitalization	Min.-Max. (Median)	0-66 (4)	1-157 (18)	Z:-8,451
	Mean±SD (Mean)	6,97±8,98	25,03±24,18	<sup>c</sup> 0,001**
Sepsis	No	81 (66,4)	14 (13,2)	$\chi^2$ :66,011
	Yes	41 (33,6)	92 (86,8)	<sup>b</sup> 0,001**

<sup>b</sup>Pearson Chi-Square Test<sup>c</sup>Mann Whitney U Test

\*\*p&lt;0,01