



# Emergency thoracic surgery in elderly patients

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## DECLARATIONS

### Competing interests

None declared

### Funding

None

### Ethical approval

Not applicable

### Guarantor

SL

### Contributorship

SL, PK and MH were the surgeons who performed the operations; SL wrote the paper; LU helped to organize the manuscript; RC collected the data and references, and helped with the statistical analysis

### Acknowledgements

None

### Reviewer

Chih-Hao Chen

## Summary

**Objectives** Emergency thoracic surgery in the elderly represents an extreme situation for both the surgeon and patient. The lack of an adequate patient history as well as the inability to optimize any co-morbidities, which are the result of the emergent situation, are the cause of increased morbidity and mortality. We evaluated the outcome and prognostic factors for this selected group of patients.

**Design** Retrospective chart review.

**Setting** Academic tertiary care referral center.

**Participants** Emergency patients treated at the Department of Thoracic Surgery, University Hospital of Luebeck, Germany.

**Main outcome measures** Co-morbidities, mortality, risk factors and hospital length of stay.

**Results** A total of 124 thoracic procedures were performed on 114 patients. There were 79 men and 36 women (average age  $72.5 \pm 6.4$  years, range 65–94). The overall operative mortality was 25.4%. The most frequent indication was thoracic/mediastinal infection, followed by peri- or postoperative thoracic complications. Risk factors for hospital mortality were a high ASA score, pre-existing diabetes mellitus and renal insufficiency.

**Conclusions** Our study documents a perioperative mortality rate of 25% in patients over 65 who required emergency thoracic surgery. The main indication for a surgical intervention was sepsis with a thoracic/mediastinal focus. Co-morbidities and the resulting perioperative complications were found to have a significant effect on both inpatient length of stay and outcome. Long-term systemic co-morbidities such as diabetes mellitus are difficult to equalize with respect to certain organ dysfunctions and significantly increase mortality.

## Introduction

According to the American Heart Association Guidelines, thoracic surgical interventions are classified as high-risk procedures.<sup>1</sup> Although it is well-known that there is a significantly increased peri- and postoperative morbidity and mortality associated with such procedures,<sup>2,3</sup> surgical treatment is often the only possibility available for saving the patient's life. Because preoperative evaluation and aggressive perioperative management of existing co-morbidities is often impossible, life-threatening complications must be taken into account by such unknown co-morbidities. Patient outcome can also be adversely affected due to a lack of information regarding these co-morbidities, which, on the one hand, is due to the emergency situation itself, and, on the other, to the age of the patient, who may have a reduced mental capacity (dementia, Alzheimers, OBS, etc.), or to the unavailability of third-party caregivers.

According to the definition of the World Health Organization (WHO) (1969), 65–75-year-olds are classified as 'elderly' and patients over 75 are classified as 'old'. As an exception to this, 70- or 80-year-olds were termed 'elderly' or 'octogenarians' in English language literature.

The proportion of patients over 65 years who underwent surgery was 38.8% in 2006 (source: German Hospital Association statistics), of which about 30% were emergency care patients with an increasing tendency. There have been several reports regarding the significance of elective thorax interventions in highly selected patient populations;<sup>4</sup> the advantage of minimally-invasive operative techniques on elderly patients has also been described.<sup>5</sup>

The term 'emergency' is not well-defined and is handled very individually. In general, an emergency situation represents the opposite of an elective situation. In contrary to emergency, elective surgery has a conditioned temporal urgency, so that between indication and surgery there will usually be sufficient time for the patient, information to catch up as well as place and time of the surgical therapy to plan. Emergencies, however, are particularly characterized by their high urgency and the required fast, medical intervention. Within the conceptualness of the emergency still further divided into acute life danger

(<1 h), subacute emergency (<2 h), by-acute emergency (<6 h), urgent supply (<8 h) and postponed urgency (following the routine program). However, elective surgery always presupposes a planning of 24 hours minimum. All patients within this study did fulfil the criteria of an emergency care, i.e. the surgical supply still took place on the admission day or night.

In risk analyses on highly selected disease groups treated (e.g. NSCLC), certain negative predictive factors were revealed.<sup>6</sup> However, only little information can be found in the literature regarding the outcome for elderly patients who have received emergency thoracic surgery.<sup>7</sup> Thus, we carried out a retrospective analysis based on data from our own records of thoracic diseases treated surgically.

## Methods

Data were gathered on all consecutive patients aged 65 years or older who underwent emergency thoracic surgery between 1 January 2004 and 31 December 2008 at a single facility: the Department of Thoracic Surgery (University Hospital of Schleswig-Holstein, Luebeck campus), an academic tertiary care referral medical centre covering an area of approximately 250,000 inhabitants. Three surgeons specializing in thoracic surgery carried out the operations on the patients, who received postoperative care from the same experienced team at the Surgical Intensive Care Unit (SICU).

Emergency treatment was defined as each surgical treatment of a patient within the admission day. In accordance with WHO, all patients included in this retrospective study were aged 65 years or older. Data collection and preoperative evaluation included patient characteristics, blood cell counts and chemistries, chest X-ray, thorax CT scan (if available), surgical treatment and any relevant co-morbidities. Preoperative patient status was classified using the 5-grade classification of the American Society of Anesthesiology (ASA).<sup>8</sup>

All patient risk factors and relevant co-morbidities were evaluated and documented either by means of preoperative anesthesiologist management or intensive care records. The NYHA classification<sup>9</sup> was used for grading cardiac insufficiency. Diagnosis of coronary artery disease (CAD) was based on a history of myocardial infarction or

angina pectoris, pathological electrocardiogram, positive myocardial stress test or angiographical evidence of coronary artery stenosis. The following cut-off points were selected: for renal function (serum creatinine  $>85 \mu\text{mol/L}$ ), haemoglobin level ( $<120 \text{ mg/dl}$ ), leukocytosis ( $>9000/\mu\text{l}$ ) and the inflammatory parameter C-reactive protein CRP ( $>5 \text{ mg/L}$ ). All minor and major complications were taken from medical and nursing records. A major complication was defined as any complication requiring invasive treatment (e.g. drainage, re-surgery, re-intubation). A minor complication was defined as non-invasive treatment such as medical treatment or prolonged wound healing. Mortality was defined as postoperative death within 30 days, or death occurring during hospital stay for patients remaining in hospital after surgical treatment. An excluding criterium was considered an initial pneumothorax treated only with a drain.

### Statistical analysis

Statistical analysis was performed using the SPSS 17.0 (SPSS, Chicago, IL, USA) non-paired sample t-test for mean values. The results are presented as mean value  $\pm$  standard deviation unless otherwise stated. The chi-square test was used to analyse nominal data. The significance of relations between patient groups and pathological parameters were analysed using Pearson's chi-square, t-test or Fisher's exact test. Survival analysis was performed using Kaplan-Meier<sup>14</sup> (for univariate analysis) and Cox regression model (multivariable model) with the date of the first thoracic surgery as the starting point. Survival curves were compared using the log-rank test. A *P* value less than 0.05 was considered significant.

### Results

Over a five-year period between January 2004 and December 2008, 124 interventions were performed on patients over 65 years old at our thoracic surgery department. There were 114 patients (78 men, 36 women). The average age was 72.5 years (standard deviation  $\pm 6.2$ , range 65–94). Eighty-two patients were 65–75 years old and 32 patients were over 75. Fourteen patients (12.3%) were over 80 years old. The total mortality-amounted to 25.4%; morbidity was 35%. It was

possible to perform minimally-invasive surgery (VATS) on 15.8% of the patients. A total of 84.2% patients had to be given emergency open thoracotomy. In accordance with the ASA classification, the distribution was as follows: only five patients (4.3%) who underwent surgery were classified as ASA stage II, 65 patients (57.4%) were ASA III, 41 patients (35.7%) were ASA IV and three patients (2.6%) were ASA V.

### Indications and surgical procedures

In 60 patients (52.6%), the eradication of a septic/inflammatory process focus was the indication for surgery. The main reasons for an emergency eradication of the thoracic cage were severe thoracic empyema, consolidating lung abscess or infections of the mediastinum in patients with or without immunodeficiency. Thirty-six patients had suffered a blunt or open thoracic trauma. Complications induced by a malignant tumour (sepsis due to tumour abscess, endobronchial tumour erosion hemorrhage, tumour-related tracheal or bronchial obstruction, etc.) were present in 18 patients (Table 1).

On further analysis of patients with mediastinitis ( $n = 15$ ), an esophageal perforation was found to be the cause in 10 cases, an abscess spreading throughout the mediastinum was found in three patients (Pancoast tumour, descending submandibular fasciitis), and two were the result of cardiovascular interventions. However, in one-third of the cases ( $n = 5$ ) the mediastinitis was due to a postoperative complication (esophageal resection, gastrectomy, CABG, thoracic aorta replacement).

The predominant majority of the interventions was accomplished by means of conventional thoracotomy (106/85.5%); minimally-invasive procedures were performed in 18 cases (14.5%). Twenty-seven surgical resections were performed (12 lobectomies, 13 wedge resections, two segmentectomies). In 41 cases, emergency thoracotomy was carried out and individual situation-dependent care given.

### Duration of hospital stay

The median length of stay was 21 days (average 32.1 d  $\pm 29.3$ ). Patients with up to nine accompanying

**Table 1****Clinical characteristics and outcome of 114 surgically treated elderly patients**

	<i>Infection</i>	<i>Trauma</i>	<i>Cancer</i>
<i>n</i> (%)	60 (52.6%)	36 (31.6%)	18 (15.8%)
Mean age (years)	72.4 y (median 70.3y)	72.9 y (median 70.8 y)	71.6 y (median 69.3 y)
Range, SD	[64.7–94.2 y], SD ± 6.6 y	[64.5–87 y], SD ± 6.7 y	[65.5–84.4], SD ± 5.3 y
Sex (male:female)	42 : 18	24 : 12	12 : 6
Open surgery	57/60 (95%)	30/36 (83.3%)	9/18 (50%)
VATS	3/60 (5%)	6/36 (16.7%)	9/18 (50%)
Hospital stay (days)	36.1 d (median 26 d)	27.1 d (median 21)	28.8 d (median 19.5 d)
Range, SD	[5–141 d], SD ± 33.4 d	[1–110], SD ± 25.3 d	[6–69 d], SD ± 19.5 d
Co-morbidity ( <i>n</i> )	12.1 (median 12.0)	13.2 (median 12.5)	12.0 (median 11.0)
Range, SD	[3–29], SD ± 6.0	[2–29], SD ± 6.8	[5–22], SD ± 5.4
Minor/Major complications	8/60 (13.%)	7/36 (19.4%)	2/18 (11.1%)
	17/60 (28.3%)	2/36 (5.6%)	4/18 (22.2%)
Mortality	15 /60 (25%)	6/36 ( 16,7%)	8/18 (44.4%)

SD = standard deviation

chronic conditions ( $n = 39$ ) stayed an average of  $19.1 \pm 2.8$  days. In patients with 10 or more chronic conditions ( $n = 85$ ), inpatient stay was prolonged by a factor of 2.0 (average  $39.7 \pm 3.6$  d). Co-morbidity was decisive with regard to the duration of the inpatient stay ( $p < 0.001$ ). The duration of hospital stay was significantly influenced by the presence of pre-existing COPD, anaemia, elevated CRP level, hypertension and age  $> 80$  years. There was no significant correlation found between the presence of CAD, renal dysfunction, drug abuse (alcoholics, smoking) or gender and prolonged hospital stay (Table 2).

### Morbidity and mortality

Major complications were observed in 20.2% ( $n = 26$ ), including nine re-thoracotomies. The most common major complications requiring intervention were pleural effusions and post-operative bleeding (thoracic wall haematoma or haemothorax). Minor complications were only seen in 14.9%. These were predominantly urinary tract infections, pneumonia, pleural effusions treated conservatively and cardiac complications.

An average of  $12.7 \pm 0.6$  (median 12, range 2–29) relevant chronic co-morbid conditions

were found per patient. There was a greater than average incidence of cardiovascular, respiratory and metabolic primary diseases, but pre-existing psychiatric illnesses were also found in 30.7% of the patients. Depending on the character of the emergency care given, a complete history was most often obtained postoperatively (Table 3).

The overall hospital mortality was 25.4% ( $n = 29$ ). The majority of the patients ( $n = 22$ ) died within the first 30 days, four patients died within 60 days and two patients within 90 days. One patient died after 126 days of treatment in our SICU.

Statistical univariate analysis demonstrated that overall mortality was related to a high ASA score, the presence of diabetes mellitus or pre-existing renal insufficiency (requiring dialysis). Mortality was not related to gender, former drug abuse, blood count or blood chemistry parameters (Table 4).

Patients with an ASA score of 2 had a mortality rate of 20%, which is nearly equal to that patients in ASA class 3 (18.7%). ASA class 4 patients had a mortality rate of 31.7%. All patients with an ASA class of 5 died (3/100%). Univariate analysis showed no significant benefit for ASA class 3 as compared to ASA class 2 or 4. The mortality rate for patients with up to 12 co-morbidities was 14.9% compared to 42.4% for patients with 13 or more co-morbidities ( $p = 0.006$ ). State VI renal

**Table 2**  
Univariate analysis of preoperative risk factors for prolonged hospital stay among 114 patients who received emergency treatment in thoracic surgery (t-test)

Variable	n	Average number of days $\pm$ standard deviation	95% CI	P value
<b>Gender</b>				
Male	78	31.8 $\pm$ 3.3	10.9, 12.5	0.62
Female	36	32.7 $\pm$ 4.9	10.9, 12.6	0.62
<b>Age</b>				
>80	14	14.9 $\pm$ 2.8	3.4, 35.8	0.003
>75	32	27.2 $\pm$ 4.9	4.9, 18.7	0.22
Co-morbidities > 10	75	39.7 $\pm$ 3.6	8.9, 30.6	0.001
Nicotine abuse	22	40.1 $\pm$ 6.9	4.2, 23.2	0.22
Alcohol abuse	8	49.0 $\pm$ 12.3	3.2, 38.9	0.09
COPD	30	42.8 $\pm$ 6.7	2.4, 26.1	0.02
<b>ASA score*</b>				
Class 2	7	27.0 $\pm$ 12.8	21.2, 32.0	0.7
Class 3	64	30.2 $\pm$ 3.6	6.6, 15.5	0.43
Class 4	41	37.7 $\pm$ 4.7	2.5, 19.9	0.13
Diabetes mellitus	26	36.2 $\pm$ 6.3	7.9, 18.0	0.44
Anaemia (haemoglobin <120 mg/dl)	79	35.8 $\pm$ 3.6	0.42, 23.6	0.006
<b>Cardiac insufficiency</b>				
NYHA classes 3 and 4	30	35.0 $\pm$ 4.4	8.8, 15.8	0.53
<b>Renal dysfunction</b>				
Serum creatinine level $\geq$ 85	42	34.9 $\pm$ 4.7	6.9, 15.9	0.46
Leukocytosis <9000/ $\mu$ l	74	34.3 $\pm$ 3.8	5.2, 17.5	0.23
Elevated CRP level >5 mg/dl	101	34.5 $\pm$ 2.9	11.2, 30.4	0.015
CAD	35	35.1 $\pm$ 4.6	7.7, 15.3	0.5

NYHA = New York Heart Association; ASA = American Society of Anesthesiology physical status

insufficiency was found to be a prognostic factor for increased mortality. Mortality in patients with preexisting renal insufficiency was 42.3% compared to 15.5% for patients with normal renal function ( $p < 0.02$ ). The mortality for patients with long-term diabetes mellitus was 38.4%, compared to 20.6% for patients without diabetes ( $p < 0.06$ ).

Multivariate analysis confirmed ASA score and renal dysfunction as risk factors. Pre-existing anaemia, diabetes mellitus and an elevated CRP level were also found to have an impact on mortality and survival (Table 5).

## Discussion

Our study reports a single institution's experience with elderly patients undergoing thoracic surgery in an emergency situation. The main finding of this study was that long-term systemic co-morbidities had a significant effect on both inpatient length of stay and postoperative outcome.

It is difficult to carry out comparative studies on emergency thoracic surgery patients due to the inhomogeneity of the patient groups and the non-standardized initial conditions and such studies are mostly limited to a certain entity<sup>10</sup> and organized retrospectively.<sup>11</sup> Naturally, the analysis of a certain age group of emergency cases cannot fulfill the criteria of a randomized study.

On comparing literature data with our own results, it became apparent that only data regarding selected or highly selected patients exist. No dependable analyses of results within the scope of emergency treatment can be found in the literature.

The overall mortality of elderly patients treated in an emergency case was 26.4% in our study group, compared with 2.4% in elective procedures (own patient population<sup>7</sup>). Several studies have reported a morbidity of 8–59%<sup>12</sup> and a mortality of 2–12%<sup>13</sup> in elective lung resections in elderly patients.

In half of the cases studied, the problem could be attributed to a pre-septic situation. Bed rest, reduced immunity as well as chronic heart or kidney failure favour the development of pulmonary infections. The development of a meta-pneumonic pleural empyema or a lung abscess is correspondingly high in this age group. Besides thoracic infections originating in the lung parenchyma, mediastinal infections were especially prominent. In this regard, postoperative complications after resection and reconstruction procedures of the upper gastrointestinal tract, or coronary artery bypass grafts were mainly to blame. Reduced general condition on the one hand and infection on the other, were also both significant prognostic factors.

Regardless of age, in our series the ASA score as an expression of all the patients' co-morbidities correlated with a prolonged hospital stay and an increased perioperative mortality. As early as 1999, Licker *et al.*<sup>14</sup> reported ASA class 3 or 4 as being independent predictors of perioperative



**Table 3**  
**Preoperative co-morbid conditions in 114 patients undergoing emergency thoracic surgery**

	Total number (multiple mentions possible)	n
<i>Respiratory diseases</i>	119	
Chronic obstructive disorder		38
Bronchial asthma		2
Emphysema		7
Pneumonia		38
Purulent infection		34
<i>Cardiovascular diseases</i>	195	
Conduction disorder		38
Ischaemic heart disease		49
Cardiomyopathy		33
Valve disorder		13
Arterial hypertension		62
<i>Cerebrovascular disease</i>	9	9
<i>Metabolic disorders</i>	133	
Diabetes mellitus		26
Thyroid dysfunction		10
Renal failure requiring dialysis		27
Liver dysfunction		12
Chronic pancreatitis		3
Obesity (BMI $\geq 40$ )		9
Hyperlipidaemia		18
Electrolyte imbalance		28
<i>Psychiatric disorders</i>	48	
Chronic alcohol abuse		8
Chronic nicotine abuse		22
Depression		10
Personality disorder		8
<i>CNS lesions</i>	13	
Palsy or plegia		6
Parkinson's disease		4
Polyneuropathy		3
<i>Specific infections</i>	46	
Bacterial infections (multiresistant)*		10
Viral infections		3
<i>Candida albicans</i>		16
<i>Aspergillus fumigatus</i>		4
<i>Salmonella typhi</i>		3
<i>Clostridium difficile</i>		5
<i>Yersinia enterocolitica</i>		1
<i>Mycobacterium tuberculosis</i>		4

\*5  $\times$  Methicillin resistant staph. aureus (MRSA), 1  $\times$  extended spectrum beta-lactamases (ESBL), 1  $\times$  *Stenotrophomonas maltophilia*, 1  $\times$  *Pseudomonas aeruginosa*

death in lung resection for non-small cell carcinoma. In 2000, Stéphan *et al.* also found that the ASA score, a prolonged operation, and the need for prolonged postoperative ventilation were

independent risk factors with respect to postoperative pulmonary complications.<sup>15</sup> Myrdal *et al.*<sup>12</sup> and Beshay *et al.*<sup>16</sup> also confirmed that age alone was not an independent risk factor with respect to perioperative complications. Previous studies confirmed our findings that general health and disorders existing prior to surgery can crucially influence perioperative outcome.<sup>17-19</sup>

In our study group, anaemia as an indicator of a chronic deficiency was significantly related to long inpatient stays. However, as this condition is easily treated by means of adequate and rapid substitution, anaemia was not found to lead to increased mortality in univariate risk analysis, but was shown to have a significant impact on mortality in multivariate analysis.

Furthermore, if a patient already has a chronic disease such as diabetes mellitus or renal insufficiency as a single co-morbidity, this can significantly increase postoperative mortality.

With the aid of intensive medical care, singular or several organ dysfunctions, including kidney replacement therapy, were found to be readily controllable, which normally lead to extended hospital stays, but not to increased mortality. It is well-known in the literature that serious NYHA III or IV cardiac insufficiency or a systemic disease such as diabetes mellitus – especially chronic diabetes – are factors associated with increased mortality in patients undergoing elective procedures. In the end, such systemic co-morbidities also turned out to be decisive with respect to significantly increased mortality for emergency procedures.

According to recent studies, the most frequent causes of death after lung resection are pneumonia and respiratory failure, tendency increasing, whereas older studies generally reported broncho-pulmonary fistula and empyema to be the most life-threatening complications.<sup>20</sup> Despite the ages and multimorbidities of our patients, we observed only a small number of minor complications (15%). Major complications were seen in 20% of cases (Table 4). In the literature, cardiac arrhythmias, prolonged air leak (PAL), respiratory failure, postoperative bleeding and pleural effusions are described as the most common postoperative complications following elective thoracic surgery.<sup>21,22</sup> Previous studies on patients undergoing elective procedures emphasize the importance of not only nicotine abuse,<sup>23</sup> but also

**Table 4**  
Univariate analysis of preoperative risk factors for hospital mortality among 114 patients who received emergency treatment ( $\chi^2$  test)

Variable	n	Mortality (%)	P value
Gender			
Male	78	28.2	
Female	36	19.4	0.22
Nicotine abuse	22	22.3	0.52
Alcohol abuse	8	25.0	0.63
COPD	30	23.3	0.48 <sup>†</sup>
Co-morbidities $\geq 13$	50	42.4	0.006
ASA score			
Class 2	5	20.0	0.62
Class 3	65	18.7	0.13
Class 4	41	31.7	0.17
Class 5	3	100	0.003
Diabetes mellitus	26	38.4	0.06 <sup>†</sup>
Anaemia (Hb <120 mg/dl)	80	26.2	0.47
Cardiac insufficiency			
NYHA classes 3 and 4	30	20.0	0.32
Hypertension	66	21.2	0.21
Renal dysfunction			
Serum creatinine level $\geq 85$	42	28.0	0.35
Renal insufficiency (requiring dialysis)	27	42.3	0.02
Leukocytosis >9000/ $\mu$ l	74	24.3	0.43
Elevated CRP level >5 mg/dl	101	25.7	0.56
CAD	35	22.8	0.47

NYHA = New York Heart Association, ASA = American Society of Anesthesiology physical status

<sup>†</sup>Fisher's exact test

**Table 5**  
Multivariate analysis of preoperative risk factors for hospital mortality among 114 patients who received emergency treatment (cox regression model)

Variable	n	Mortality (%)	P value
ASA score			
Class 4	41	31.7	0.069
Class 5	3	100	0.009
Diabetes mellitus	26	38.4	0.06
Anaemia (Hb <120 mg/dl)	80	26.2	0.027
Renal dysfunction			
Renal insufficiency (requiring dialysis)	27	42.3	0.04
Elevated CRP level >5 mg/dl	101	25.7	0.002

impaired preoperative lung function, cardiac co-morbidities, and, in particular, age<sup>24</sup> as risk factors for increased morbidity and mortality.

Our study showed that the total amount of co-morbidities has a significant influence on the length of hospital stay. However, the prognostic influence of individual co-morbidities varies widely, and, consequently, a patient with coronary heart disease or rheumatoid arthritis cannot be compared to one with renal failure or severe COPD. Nevertheless, the total number of chronic illnesses reflects the overall physiological state of a patient, and mortality and morbidity are directly correlated with the number of relevant chronic co-morbidities. Accordingly, the ASA classification is again seen to be an important indicator related to the length of recovery. Patients with high perioperative CRP levels or low Hb values had to remain in the hospital significantly longer than the remaining patient population. In our opinion, these laboratory values are to be regarded as markers for the potential occurrence of perioperative complications.

Recent studies also suggest that elderly patients could greatly benefit from the advantages of minimally-invasive procedures, as the result of faster recovery times and shorter hospital stays.<sup>25</sup> Despite these possible benefits, the decision for VATS must be made individually. Short timeframes (caused by trauma) or pulmonary insufficiency often do not allow for the necessary perioperative measures (e.g. double lumen intubation). In addition, a complete lung atelectasis, which is a prerequisite for performing VATS, is often not available in an emergency situation. In our opinion, using VATS as emergency treatment when there is severe hemorrhage or extensive infection is not suitable due to the poor visibility and the reduced technical possibilities. In our patient population, almost 15% of all emergency thoracic operations were performed using minimally-invasive procedures (VATS).

Several limitations of this study need to be addressed. This is a retrospective, non-randomized observational study with a relatively small number of patients ( $n = 114$ ). Therefore, interpretation of multivariate analysis to evaluate the independent effect of variables is limited. In addition the heterogeneity of the patient population as well as the varying co-morbidities will make a comparison difficult. Despite these limitations, to our knowledge, this is the first report to examine risk factors on clinical outcomes in these patients.

In conclusion, one must be aware that elderly patients undergoing emergency thoracic surgery have a significantly increased mortality due to their co-morbidities and not due to their biological age. Long-term systemic co-morbidities indicate a decreased survival rate.

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