

Morbidity and mortality of emergency surgery in octogenarian patient

Morbimortalidad de la cirugía de urgencia en el paciente octogenario

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Abstract

Objective: To evaluate the health outcomes (postoperative morbidity and mortality) and the functional status at discharge of elderly patients older than 80 years who underwent emergency surgery. **Method:** Patients > 80 years of age who underwent emergency surgery during one year at the Marqués de Valdecilla University Hospital, Santander, Spain. Preoperative data (age, sex, type of surgery, comorbidity) and postoperative data (complications) were evaluated, as well as in-hospital mortality, at 30 days and 6 months after surgery. **Results:** Five-hundred-sixty-eight patients underwent emergency surgery between 2018 and 2019. After the review, 407 patients were included in the study. Average age: 86.9 years. Women 61.7%. Mean hospital stay: 10.4 days. Traumatic interventions 41.3%, vascular surgery 19.7%, general-digestive surgery 25.3%. Medium ASA risk: 2.88. Functional status at discharge: 3.15. Postoperative complications: Clavien-Dindo I 40.8%, II 40.3%, IIIA 3.4%, IIIB 2.5%, IVA 3.9%, IVB 2.0% and V 7.1%. Hospital mortality 7.1%, 30-day mortality 10.3%, mortality at 6 months 24.6%. **Conclusions:** Patients > 80 years of age undergoing urgent surgery have high preoperative comorbidity, postoperative complications, and high mortality at 30 days and 6 months after surgery. This mortality is more significant in those ASA IV, nonagenarians and those undergoing high-risk surgery.

Keywords: Elderly patient. Octogenarian. Emergency surgery. Morbidity. Mortality.

Resumen

Objetivo: Evaluar los resultados en salud (morbilidad y mortalidad posoperatorias) y el estado funcional al alta de los pacientes mayores de 80 años sometidos a cirugía de urgencia. **Método:** Pacientes de edad > 80 años sometidos a cirugía de urgencia durante 1 año en el Hospital Universitario Marqués de Valdecilla, Santander, España. Se evaluaron datos preoperatorios (edad, sexo, tipo de cirugía, comorbilidad) y posoperatorios (complicaciones), así como mortalidad hospitalaria, a los 30 días y a los 6 meses de la cirugía. **Resultados:** En 2018-2019 fueron operados de urgencia 568 pacientes, de los cuales 407 fueron incluidos en el estudio. Edad media: 86.9 años. El 61.7% fueron mujeres. Estancia media hospitalaria: 10.4 días. El 41.3% fueron intervenciones traumatológicas, el 19.7% cirugía vascular, el 25.3% cirugía general-digestiva. Riesgo ASA medio: 2.88. Estado funcional al alta: 3.15. Complicaciones posoperatorias: Clavien-Dindo I 40.8%, II 40.3%, IIIA 3.4%, IIIB 2.5%, IVA 3.9%, IVB 2.0%, V 7.1%. Mortalidad hospitalaria 7.1%, mortalidad a los 30 días 10.3%, mortalidad a los 6 meses 24.6%. **Conclusiones:** Pacientes > 80 años sometidos a cirugía de urgencia tienen alta comorbilidad preoperatoria, complicaciones posoperatorias y alta mortalidad a los 30 días y a los 6 meses de la cirugía. Esta mortalidad es más significativa en aquellos ASA IV, noagenarios y aquellos sometidos a cirugía de alto riesgo.

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IVA 3.9%, IVB 2.0% y V 7.1%. Mortalidad: hospitalaria 7.1%, a los 30 días 10.3% y a los 6 meses 24.6%. **Conclusiones:** Los pacientes > 80 años sometidos a cirugía urgente presentan elevada comorbilidad preoperatoria, complicaciones posoperatorias y elevada mortalidad a 30 días y 6 meses de la cirugía. Esta mortalidad es más significativa en los ASA IV, nonagenarios y sometidos a cirugía de alto riesgo.

Palabras clave: Paciente anciano. Octogenario. Cirugía de urgencia. Morbilidad. Mortalidad.

Introduction

For the first time in history, the number of people aged 65 and older exceeds the number of people aged 65 and younger worldwide. Aging is the result of socioeconomic development and improvements in healthcare systems over recent decades.

Life expectancy in Spain is among the highest in the world. According to the World Health Organization, Spain ranks third in life expectancy (83.1 years on average; 80.3 years for men and 85.7 years for women), behind Switzerland (83.3 years) and Japan (84.2 years). Currently, 20% of Spanish society is older than 65 years, and it is estimated that by 2050 this figure will rise to more than 30%. The number of older individuals will increase dramatically in the coming decades, with population projections for 2055 indicating a 66% increase in the 65 to 74-year age group¹. Aging is associated with a decline in the functional reserve of all organs. Our hypothesis is that patients older than 80 undergoing emergency surgery present high morbidity and mortality, both of which are proportional to their pre-existing comorbidities or frailty.

The aim of this research was to study a cohort of elderly patients undergoing emergency surgery to assess their preoperative functional status, comorbidities, and health outcomes following surgery in terms of postoperative complications, morbidity, and hospital mortality, at 30 days and 6 months.

Method

The Admission and Clinical Documentation Service (SADC) of Hospital Universitario Marqués de Valdecilla (HUMV), in Santander, Spain, was requested to provide a list of all patients older than 80 years who underwent emergency surgery between October 2018 and October 2019, from any surgical specialty offered in HUMV service portfolio. Clinical data were obtained from each patient's individual health history, the Altamira electronic health record, and the Visor Medical Record system. The following variables were recorded

for all patients: age, sex, surgical specialty, length of stay, surgical risk², type of anesthesia, pathological history, hypertension, atrial fibrillation, heart failure, chronic kidney disease, chronic obstructive pulmonary disease, ischemic heart disease, diabetes mellitus, stroke, anemia, and cognitive impairment. In cases requiring surgery due to traumatic disease, it was noted whether it was a hip fracture; if surgery was required for general-digestive disease, it was noted whether the clinical picture was compatible with acute abdomen.

Postoperative complications occurring from the first day after surgery until discharge or death were recorded: respiratory failure, acute renal failure, atrial fibrillation, pneumonia, atelectasis, deep vein thrombosis, pulmonary embolism, mechanical ventilation, acute myocardial infarction, stroke, urinary tract infection, sepsis, bacteremia, suture dehiscence, surgical site infection, cognitive impairment or worsening at discharge, delirium, and need for blood transfusion. Preoperative risk values were recorded according to the ASA (American Society of Anesthesiologists) classification and complication classes according to the Clavien-Dindo classification³. Functional status at discharge was assessed using a simplified system created by the authors based on walking ability. Finally, hospital mortality, mortality at 1 month, and mortality at 6 months after discharge were recorded.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS®; IBM, Armonk, NY, United States). Descriptive (means, frequencies) and bivariate analyses (analysis of variance, ANOVA, and Student t-test) were used to obtain results, along with regression analysis and factors if deemed necessary. A p-value < 0.05 was considered statistically significant.

Results

According to the HUMV SADC, a total 568 patients older than 80 years old underwent surgery from October 2018 through October 2019. After review, a total

of 407 patients were included in the study (Fig. 1). The reasons for excluding the remaining 161 patients were: reoperation by the same service (118), recording only the first intervention (generally vascular surgery), or being registered as urgent (43) when in fact they were scheduled surgeries (mostly intracranial pressure recordings).

The patients' mean age was 86.9 ± 4.3 years, with the following age groups: 40.5% were 80-85 years, 38.4% were 86-90 years, 17.2% were 91-95 years, and 3.9% were older than 95 years. In terms of sex distribution, 61.7% ($n = 251$) were women and 38.3% ($n = 156$), men. The mean length of stay was 10.4 ± 12.5 days, and the mean length of ICU stay was 0.5 ± 2.1 days. Regarding surgical specialties, 41.3% of all interventions were associated with traumatology, 19.7% with vascular surgery, 25.3% with general-digestive surgery, 5.7% with neurosurgery, 3.9% with urology, 1.7% with ophthalmology, 0.7% with gynecology, 0.7% with maxillofacial surgery, 0.5% with thoracic surgery, 0.2% with plastic surgery, and 0.2% with cardiac surgery. The mean ASA risk was 2.8 ± 0.7 , with the following distribution: ASA I 2%, ASA II 26.8%, ASA III 52%, and ASA IV 19.2%.

Functional status at discharge was 3.1 ± 1.2 . Postoperative complications were as follows: Clavien-Dindo I, 40.8%; Clavien-Dindo II, 40.3%; Clavien-Dindo IIIA, 3.4%; Clavien-Dindo IIIB, 2.5%; Clavien-Dindo IVA, 3.9%; Clavien-Dindo IVB 2.0%; and Clavien-Dindo V, 7.1%. It should be noted that many of the urgently reoperated patients (category IIIA/B) may have required admission to the ICU due to isolated organ failure or multiple organ failure, thus shifting them to category IV, which may have slightly affected the actual distribution of reoperated patients. Regarding mortality, it was distributed as follows: hospital mortality, 7.1%; 30-day mortality, 10.3%; and 6-month mortality, 24.6%. Six-month mortality rate according to surgical specialty, age range, ASA risk, and presence of hip fracture or acute abdomen is shown in table 1. Postoperative complications and their Clavien-Dindo classification by surgical specialties are shown in table 2, and by surgical risk in table 3. Postoperative complications occurring up to discharge are outlined in table 4.

Discussion

It is estimated that by 2040 more than 40% of the population will be older than 65 years old. This rapid

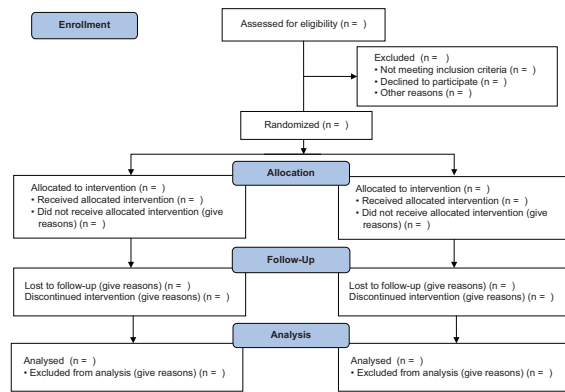


Figure 1. Flowchart of patient inclusion.

increase in aging requires studying its pathological characteristics, care needs, and recovery possibilities following emergency surgery. With current longevity prospects, a considerable number of elderly patients are expected to continue living with good function and excellent quality of life after surgery. However, the mortality rate for emergency surgery can reach 15% up to 30%, double if complications are associated, and is notably higher in patients aged 75-80 years.

Our study highlights that most patients older than 80 years have comorbidities, with more than 70% having an ASA III or IV risk. In-hospital mortality was relatively low (7%) vs other studies⁴ reporting a mean of 14.7% in patients undergoing emergency general surgery, going up to 33% in nonagenarians. For the same type of surgery, our study reported an in-hospital mortality rate of 8%.

The ASA score, described by Saklad⁵, is a subjective assessment of a patient's overall health that considers 4 classes (I to IV), and is used as a tool to predict short- and mid-term outcomes in surgical patients. It has also proven to be a good predictor of mortality and postoperative complication rates⁶.

In the present study, the mean ASA score was 2.9, and more than 70% of patients were ASA III/IV. Since there were only 8 cases of ASA I (with 3 deaths), the rest of ASA II to IV determined a direct relationship between their value and 6-month mortality (from 11.9% up to 44.8%), that is, nearly half of ASA IV patients died at 6 months. The study by Merani et al.⁴ in patients undergoing general surgery with ASA IV found an in-hospital mortality rate > 30%, and while it did not assess the 6-month mortality rate, it is likely to approximate or exceed the rates found in our study.

Table 1. In-hospital mortality, mortality at 30 days, and mortality at 6 months, by disease, age range, surgical risk, and surgical specialty

Criteria	In-hospital Mortality	30-day mortality rate	6-month mortality rate
All (%)	7.1	10.3	24.6
Hip Fracture			
81-85 years	5.2	7.3	32.7 ^a
86-90 years	9.4	32.7	20.1
> 90 years	5.8	20.1	
Acute abdomen			
81-85 years	8.3	29.6 ^c	
86-90 years	11.1	40 ^c	
> 90 years	17.9	25 ^b	
Surgical risk			
Low			
Intermediate			
High	20.05	22.9	36.5% ^d
ASA			
I	37.5 ^e		
II	11.9	23.1	
III	23.1	44.8 ^f	
IV	44.8 ^f		
Surgical Specialty			
Traumatology	20.2		
Cardiac	100		
Vascular	30		
Neurosurgery	13		
General	28.1		
Urology	31.2		
Plastic	0		
Thoracic	0		
Ophthalmologic	28.5		

^ap < 0.001 vs other age groups.^bp < 0.001 vs hip fracture.^cp < 0.001 between age ranges.^dp < 0.001 vs low and intermediate surgical risk.^eOnly 8 ASA I patients, with 3 deaths.^fp < 0.001 vs ASA II-III.**Table 2. Clavien-Dindo classification of postoperative complications by surgical specialty**

Surgical specialty	Clavien-Dindo score
Traumatology	1.88
Neurosurgery	1.95
General surgery	2.65
Cardiac surgery	5.00
Maxillofacial surgery	1.33
Plastic surgery	1.00
Gynecology	3.33
Urology	2.81
Thoracic surgery	3.50

Table 3. Clavien-Dindo classification of postoperative surgical complications by surgical risk

Surgical risk	Clavien-Dindo score
Low Risk	1.67
Intermediate Risk	2.02
High Risk	3.92

p < 0.005 between risk levels.

Table 4. Postoperative complications until discharge

Complication	Incidence rate (%)
Respiratory failure	9.1
Pulmonary embolism	0.2
Postoperative mechanical ventilation	4.9
Heart failure	8.6
Atrial fibrillation	3.4
Surgical wound infection	11.1
Sepsis	6.1
Acute renal failure	11.5
Transfusion of 1 red blood cell concentrate	32.7
Pneumonia	6.4
Atelectasis	2.5
Acute myocardial infarction	0.7
Transient or established ischemic stroke	1.0
Wound dehiscence	3.9
Bacteremia	7.6
Urinary tract infection	7.6
Delirium	17.2
Transfusion of 2 or more red blood cell concentrates	21.6

Total respiratory complications: 18%

Total cardiovascular complications: 13.7%

The most involved surgical specialties in emergency care for the elderly are consistent in such studies: traumatology (mainly hip fractures), vascular surgery (related to lower limb ischemia), and general surgery (usually for acute abdomen processes). Hip fractures are highly prevalent (almost 1 million cases annually in the United Kingdom), considered a “fragility fracture,” along with osteoporosis, osteopenia, and other comorbidities. After surgery, up to one-third of patients die within 12 months, more than 20% of

survivors become more dependent, and many require institutionalization⁷.

In our study, the in-hospital mortality for patients with hip fractures can be considered low (5%), with a 6-month mortality rate of 20%, which is consistent with the literature. In younger patients (mean age, 81 years), Krishnan et al.⁸ found a 30-day mortality rate of 10.5% (9.3% in our cohort), and Patel et al.⁹ reported a 1-year mortality rate of 20.5% in a cohort also younger than ours (mean age, 81.5 years). It is recommended that the best way to reduce mortality in this disease is through a multidisciplinary approach with significant geriatric oversight, including early surgery, early mobilization, and avoiding polypharmacy.

The second group consists of vascular surgery for lower limb ischemia. Atherosclerosis and atrial fibrillation are very common in the elderly, as are other vascular risk factors (heart failure, diabetes mellitus, etc.). Therefore, vascular ischemia due to embolic or terminal ischemia is a common finding. In a 1998 study¹⁰, in-hospital mortality in elderly patients undergoing vascular surgery approached 40%, with a 5% rate of amputations. More recent studies show no improvement in outcomes, with mortality around 25% and an amputation rate of 12%^{11,12}.

General surgery is another area of urgent surgical intervention in the elderly, with a wide range of pathology severity, from simple appendicitis to intestinal ischemia, including intermediate conditions, such as cholecystitis, incarcerated hernias, or intestinal perforations or obstructions. For appendicitis, its incidence over 60 years is 10%, yet the incidence of morbidity is high in this age group, generally due to delayed diagnosis, with a high rate of complications¹³. Regarding cholecystitis, it is noteworthy that up to 50% of the population older than 65 years has cholelithiasis, and like appendicitis, it often presents silently, leading to late diagnoses, with a 10% mortality rate in elderly patients¹⁴. Intestinal disease is highly variable (obstruction, perforation, volvulus), requiring emergency surgery in any case, and up to 20% of colon cancers present urgently. Except for cases of associated peritonitis, outcomes are not much worse in the elderly population, yet the stoma rate is significantly higher¹⁵.

Another aspect that should be taken into consideration is chronological age as a determinant of mortality. Although it seems logical that comorbidity, and specifically frailty, are the determining factors for outcomes, we found a direct relationship between 6-month

mortality and age in our cohort of patients older than 80 years. This was evident in patients undergoing surgery for both hip fractures and acute abdomen.

Previous comorbidity and the lack of adequate preparation in the context of emergency surgery resulted in an increase in postoperative complications. Among these, there was a high incidence of delirium, respiratory and cardiovascular complications, and need for transfusion. The study by Merani et al.⁴ found a 16% incidence of respiratory complications, which is very similar to our study. Naturally, there was a direct relationship between mortality and surgical risk, with high-risk surgery nearly doubling the 6-month mortality vs low-risk surgery. Our study highlights a high rate of surgical complications in elderly patients, significantly higher in high-risk surgeries and specialties such as gynecology, thoracic surgery, and general surgery.

This study is limited by its retrospective nature and being conducted in a single hospital center. It is evident that many other patients with acute surgical diseases went to the ER and were managed non-interventionally, or simply approached from a palliative perspective due to their diminished functional status and null survival chances.

In conclusion, deciding to undertake surgical treatment in an emergency situation for the elderly is challenging. Patients older than 80 undergoing emergency surgery present preoperative comorbidity, postoperative complications, and a high mortality rate at 30 days and 6 months after surgery. This mortality is more significant in those with ASA IV, nonagenarians, and those undergoing high-risk surgery, with a 6-month mortality approaching 50%, and in cases of survival, a high degree of dependence measured by walking ability. Regardless of this, as a cohort of patients aged > 80 years, most patients in this study had severe functional limitations at discharge (bed-to-chair life or requiring care for ambulation at home). Further studies are needed to define the therapeutic benefit of emergency surgery in elderly patients, allowing both families and the surgical team to make decisions from a realistic perspective with appropriate end-of-life care considerations.

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Conflicts of interest

None declared.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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