



Predictive Factors for a Prolonged Stay in the Surgical Intensive Care Unit

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/119758>

Original Research Article

Received: 05/05/2024

Accepted: 06/07/2024

Published: 11/07/2024

ABSTRACT

The intensive care unit (ICU) is a place of acute care, where patients' vital prognosis, substitution techniques, and family anxiety are intertwined. A prolonged ICU stay often has a negative connotation, raising numerous questions about patient management, functional prognosis, and the appropriateness of continuing intensive care. This study aims to better understand the characteristics and outcomes of patients with prolonged ICU stays and to identify specific management needs.

A retrospective analytical study was conducted in the anesthesia and surgical intensive care department of the Ibn Rochd University Hospital in Casablanca from January 2015 to December 2017. The study included 184 patients aged ≥ 18 years with ICU stays ≥ 10 days. Data were collected from admission registers and medical records and analyzed using statistical tests to assess factors influencing prolonged ICU stay.

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From January 2015 to December 2017, 2291 patients were admitted to the ICU at CHU Ibn Rochd. Of these, 184 (8.03%) had extended stays, with an average age of 49.2 years and a predominance of males (55%). The main comorbidities were diabetes (30%) and hypertension (26%). Most patients were admitted via the emergency department (27%) for scheduled (48%) and emergency (19%) surgical conditions. On admission, 40% had a Glasgow score of 13-15, 89% were afebrile, 83% had a normal respiratory rate, and 91% had oxygen saturation >95%.

Mechanical ventilation was required for 80% of patients. The main reasons for admission were neurological distress (35%) and post-operative management (29%). During their stay, 109 patients died, primarily due to infectious complications (58%) and hemorrhage (17%). The mean APACHE II score was 20.79. The average length of stay was 20.59 days, ranging from 10 to 119 days. Factors associated with prolonged stay included age, chronic renal failure, and neurosurgical conditions.

Prolonged ICU stays have significant economic and physical repercussions, with high rates of nosocomial infections and other complications. The length of stay is closely associated with increased morbidity and mortality, necessitating optimal patient care to minimize duration. Neurosurgical pathologies were a major cause of prolonged stays, with demographic factors like age and sex also playing a role.

The study highlights that neurosurgical and traumatic reasons for admission, along with high APACHE II scores, significantly influence prolonged ICU stays. Efforts to reduce stay duration should include setting up weaning or post-intensive care units, especially for neurosurgical patients, to maintain specific care in a safe environment and reduce the economic impact of prolonged stays.

Keywords: Long stay; intensive care unit; predictive factors.

1. INTRODUCTION

The intensive care unit is usually identified as a place of acute care, concentrated over a short period of time, where the patient's vital prognosis, substitution techniques and the anguish of families are often intertwined. For a number of reasons, a prolonged stay in intensive care often has a pejorative connotation for the intensive care physician. It can in fact be the source of many questions for the intensive care teams, both within the team and in relation to the patient and his family [1-3]. These questions may concern, in particular, the management to be adopted in the face of a slow or even absent evolution, the patient's functional prognosis after resuscitation, or the lawfulness or otherwise of continuing resuscitation care.

Our work is a retrospective, epidemiological and analytical longitudinal study of the prolonged stay in the surgical intensive care unit of the Ibn Rochd University Hospital in Casablanca over a period of three years.

In the light of the above, it is clear that the aim of our work is to find out more about these patients and what happened to them, which can certainly provide an important baseline. We will therefore attempt to identify this specific group of patients whose stay in the ICU is prolonged, before considering the specific features of their management.

2. PATIENTS AND METHODS

A retrospective analytical study was conducted in Pavilion 17 of the anaesthesia and surgical intensive care department of the Ibn Rochd University Hospital in Casablanca over three years, from January 2015 to December 2017. It included 184 patients who stayed ≥ 10 days, aged ≥ 18 years. Data were collected from admission registers and medical records, then analysed to assess factors influencing prolonged length of stay, using statistical tests such as Student's T-test for quantitative variables and Fisher's test or chi-square test for qualitative variables.

3. RESULTS

From January 2015 to 2017, 2291 patients were admitted to the Surgical Intensive Care Unit (Pavilion 17) at CHU Ibn Rochd in Casablanca. Of these, 184 had an extended stay, representing an incidence of 8.03% of all admissions. The average age of the patients was 49.2 years, with a notable distribution in the 41-60 age group. They were predominantly male (55%). The main comorbidities were diabetes (30%) and arterial hypertension (26%).

The majority of patients were admitted via the emergency department (27%), mainly for scheduled (48%) and emergency (19%) surgical

conditions. On admission, 40% of patients had a Glasgow score between 13 and 15, and most were afebrile (89%). Around 83% had a normal respiratory rate, while 91% had an oxygen saturation of >95%. Regarding haemodynamic constants, 86% had a normal heart rate, but 24% had a mean arterial pressure < 70 mm Hg.

Of the 184 patients, 80% required mechanical ventilation. The main reasons for admission were neurological distress (35%) and post-operative management (29%).

109 patients died during their stay, mainly due to infectious complications (58%) and haemorrhage (17%). The mean Apache II score was 20.79, with significant variation in scores over the years studied. The average length of stay was 20.59 days, with a range from 10 to 119 days.

Factors associated with a prolonged stay included age, certain medical histories such as chronic renal failure, and specific reasons for admission such as neurosurgical pathologies.

4. DISCUSSION

Prolonged stay appears to have major economic as well as physical repercussions. We observed very high rates of nosocomial infections and trophic and thromboembolic disorders in patients with prolonged stays.

The length of stay in intensive care is an important tool in the development of the quality of care and activity in an intensive care unit. For the practitioner, ensuring optimal patient care on a daily basis with the shortest possible length of stay is an essential challenge, given the close association between longer length of stay and increased morbidity and mortality in the intensive care unit [4], because the longer the stay in the ICU, the greater the risk of iatrogenic complications, especially infectious complications [5], due to the use of invasive techniques and the lack of patient immunity [6]. Among patient-related factors, age is significantly associated with a long stay in intensive care [7].

It can be said that a prolonged stay may be associated with a more or less advanced age, but this may be explained by the frequency of comorbidities at this period of life.

Numerous studies have shown that length of stay differs according to the source of admission of patients [8].

In our study, using bivariate analysis, we found that there was a statistically significant association between the length of stay and the length of stay of patients admitted from neurosurgery (35%). This result may be attributed to the fact that neurosurgical patients often present with more severe pathologies and benefit from more prolonged and specialised procedures. As a result, they require longer periods of monitoring, unlike other post-operative patients who have shorter lengths of stay [9].

Our study clearly highlights the seriousness of the traumatic pathology: 19% of prolonged stays, represented by head trauma associated or not with polytrauma (80%), which is reproducible in most series showing a high length of stay in head trauma patients [10]. Scheduled surgeries accounted for the highest rate of prolonged stays (48%) in our study. This result contrasts with the study by Dvir Froylich and colleagues [11], which examined 4296 patients who underwent bariatric surgery. Of these, 124 (2.8%) were admitted to the ICU: 19 (15.3%) had scheduled admissions, and 105 (84.7%) were admitted due to complications (respiratory distress 31.4%, hemorrhages 25.7%, and anastomotic leak 19%). In the scheduled admissions group, the average length of stay was 5.7 ± 9.7 (1-42) days, whereas, in the unscheduled admissions group, it was 12.5 ± 2.6 (4-75) days. This study shows a significantly longer length of stay in the unscheduled surgery group compared to the scheduled surgery group.

Another study by Rubano and colleagues [12] at Stony Brook University Hospital in the USA, conducted between 2007 and 2013, showed that the average length of stay in the unscheduled hospitalization group was 15 days, compared to 9 days in the scheduled hospitalization group. Additionally, this study found that neurosurgical pathology and abdominal surgery were the most frequent causes of unscheduled admissions.

Numerous generalist scores have been developed, but only a limited number are used routinely, in addition to visceral failure scores, which are more useful for daily monitoring of a patient than for predicting the final prognosis [13].

In our study, we were mainly interested in the APACHE (Acute Physiologic and Chronic Health Evaluation) score. The high value of APACHE II had a significant relationship with the incidence of prolonged stay ($p > 0.05$) and the mean APACHE II is 20.79.

In the literature, severity scores at admission such as APACHE II have been reported to be higher in patients exposed to a prolonged stay, but they remain at an intermediate level. This is because the interpretation of severity scores must consider that patients with the highest severity scores often die before reaching the definition of a prolonged stay [7,14,15].

This APACHE II-mortality association has already been studied within the Surgical Intensive Care Unit at the Mohammed V Military Teaching Hospital in Rabat by EL MAIMOUNI [16] in 2015. The study concluded that the APACHE II score was significantly higher in deceased patients (16.62 ± 6.36 versus 7.38 ± 4.53 , $p < 0.0001$), with an average APACHE II of 10.22.

Length of stay is one of the indicators used to measure the performance of intensive care units. The pathologies responsible for prolonged stay are often multiple and interrelated in the same patient, making it difficult to interpret the imputability of a particular factor.

Several authors have studied the specific prognostic factors for a particular pathology [11,12,17]. In our study, neurosurgical pathology, whether traumatic or not, was the main cause of prolonged stay 35%.

Neurosurgical patients often present with more severe pathologies and benefit from more prolonged and specialised procedures. As a result, they require longer periods of monitoring, unlike other post-operative patients who have shorter lengths of stay [14].

From all the studies it can be deduced that neurosurgical pathology, whether traumatic or not, remains a major cause of long stays, whatever the efforts made or the economic or personal resources deployed. Similarly, the incidence of long stays in neurosurgical patients is all the greater if the damage is more severe (low GCS, mass effect on the CT scan, presence of HTIC, etc.). Some demographic factors, namely age and sex, have also been incriminated, but this association can be

explained by the frequency of comorbidities and the complexity of patients at an advanced age on the one hand and the frequency of traumatic pathology in males on the other [13,18–20].

In our study, despite the long length of stay, the mortality rate was 58%. In the literature, regardless of the study, mortality rates in intensive care and in hospital for this specific patient population are found to be significantly higher, varying from 15 to 44% for mortality in intensive care and from 25 to 49% for in-hospital mortality [21].

In our study, nosocomial infection was considered to be an almost "inevitable" complication of prolonged stay, and we recorded a rate of 58% of nosocomial infections complicating prolonged stay. This remains a very high rate [22-24].

5. CONCLUSION

Intensive care patients are a heterogeneous group with severe illnesses most often associated with several comorbidities, which means that the length of stay varies from one patient to another. This study provided a detailed assessment of the length of stay in the surgical intensive care unit.

The rate of prolonged stay (>10 days) in this department is of the order of 8.03%, and is influenced essentially by the neurosurgical and traumatic reasons for admission, as well as the APACH severity score.

The incidence of prolonged stays remains relatively high in our study, and this has a significant economic impact. A great deal of effort needs to be made to reduce the length of stay, in particular by setting up weaning or post-intensive care units, especially for neurosurgical patients, to enable specific care to be continued in an environment that is kept safe, while preserving the capacity of intensive care units and reducing the economic impact of a prolonged stay.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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