Comparative study on the prognosis of critical ill patients transferred from another island compared to those patients transferred from emergency department to intensive care unit

Luciano Santana-Cabrera, Manuel Sánchez-Palacios, Cristina Rodríguez Escot, Alina Uriarte Rodríguez, Erika Zborovszky, Juan Ocampo Pérez

ABSTRACT

Objective: To compare outcomes of critically ill patients transferred from another island compared to those patients with direct admission from Emergency Department to intensive care unit (ICU).

Patients and Methods: Retrospective study of prospectively collected data during 8 years. The population studied was all critical adult patients transferred from another island to our hospital and those directly admitted from the Emergency Department. Variables were age, sex, clinical diagnosis (coronary, medical, surgical, or trauma), acute physiology and chronic health evaluation (APACHE) II score at admission, ICU days of stay, days of mechanical ventilation and ICU mortality.

Results: During the period of study, 3,115 patients coming from Emergency Department (Group 1) were admitted to our ICU and 138 were transferred from another island (Group 2). No significant statistically differences were found between both groups neither age, sex, APACHE II, ICU days, days of mechanical ventilation, and mortality rate (17.5% versus 20.3%, \( P = 0.43 \)). The multivariate analysis showed that age, APACHE II score, ICU days of stay, type of patient, and days of mechanical ventilation were independent variables associated with mortality.

Conclusions: No differences were found in the global prognosis of the admitted patients transferred from another island compared to those who were admitted directly from the Emergency Department. There is no impact on mortality in transferring a patient in our study population.

Key Words: Accessibility, critically ill, health services, intensive care, prognosis

INTRODUCTION

Many authors have been interested in studying the impact on patient interhospital transport prognosis and mortality in order to give a satisfactory treatment which cannot be given in a nearby hospital.\(^1\)\(^-\)\(^3\) Some studies reported not only a worse morbidity and mortality in patients who need to be transferred to another hospital but also an increase in economical expenses.\(^4\)\(^-\)\(^5\)

Although transferring patients is unavoidable for the health system, the impact of transport on the prognosis will depend on the type of patient and their environment. Furthermore, we must do an especial clinical evaluation of patients who would benefit not being transferred, taking into account the severity of disease and short-term forecast. Transport of patients exerts not only an increasing in economical expenses but also false expectations in patients and patients’ families.
Our hospital is a referral center for Fuerteventura Hospital, which is placed on another island, 100 km from our hospital. Patients are transported using the helicopter way. Depending on the weather, the duration time of flight is approximately 40–90 minutes.

The purpose of this study is to analyze the prognosis of those critically ill patients transferred from another island to our intensive care unit (ICU) being compared to those patients admitted directly from the Emergency Department.

**RESULTS**

During the study period, 3,115 patients admitted to ICU came from the Emergency Department (Group 1) and 138 patients were transferred from another island (Group 2).

Clinical findings are shown in Table 1. Comparing both groups, we did not find any differences regarding age, sex, admission APACHE II score, ICU days of stay, and days of mechanical ventilation. There were no differences in mortality (17.5% versus 20.3%, $P = 0.43$).

Concerning clinical diagnosis at admission, most patients in Group 1 were medical and coronary (G1: 82.9%; G2: 61.5%); and on the other hand, most percentage of patients in Group 2 were surgical or trauma patients (G1: 17.2%; G2: 38.5%).

When we compared patients who died in both groups, there were no statistically significant differences regarding age, sex, APACHE II score at admission, mean stay, and days of mechanical ventilation [Table 2].

**PATIENTS AND METHODS**

After being approved by Hospital Ethical Committee and following strengthening the reporting of observational studies in epidemiology (STROBE) statement guidelines for reporting observational studies, a retrospective observational study of prospectively collected data was done. We compared critical ill adults patients transferred from another island to our ICU with those of similar patients admitted from the Emergency Department.

Our ICU has 24 beds. We give attention not only to medical and coronary patients but also surgical and trauma patients. The study period was 8 years. We excluded patients that came from emergencies from another department and patients who came from another hospital in our city.

Patients transferred from another island to our hospital were those with coronary artery disease that require coronary catheterization, traumatic injured patients with necessity of neurosurgery or vascular intervention, and any medical or surgical patients who needed critical care. They are being transferred to our ICU in order to give proper clinical support in absence of available beds in their original hospital ICU. Before transporting patients, they were stabilized either in the ICU or in the Emergency Department.

The data sought were patient age, sex, clinical diagnosis (coronary, medical, surgical, or trauma), acute physiology and chronic health evaluation (APACHE) II score at admission, ICU days of stay, days of mechanical ventilation, and ICU mortality.

For statistical analysis, we used Mann-Whitney or Student’s T tests to compare continuous variables and Chi-square or Fisher’s tests to compare percentages. $P < 0.05$ was considered statistically significant. Data are expressed as mean ± standard deviation (SD). The relationship between mortality and other variables was also studied using multivariable logistic regression analysis and binary logistic regression test. The results were expressed as odds ratio, 95% confidence interval, and $P \leq 0.05$ was considered significant.
After multivariate analysis [Table 3], we found that age, APACHE II score, ICU days of stay, type of patient, and days of mechanical ventilation were predictors of mortality ($P < 0.0001$).

### DISCUSSION

In our country, health system is organized following a geographic strategy in order to give the same sanitary assistance to all population, no matter the place where patients live. Opposite to this philosophy, a number of surrounding Medical Centers located in different geographical areas (surrounding Isles) have the necessity to transfer to our hospital patients who need some surgical intervention or invasive procedures. Important reasons for transferring to our reference hospital from others are the necessity of neurosurgery intervention or any vascular surgery and cardiac therapeutic and diagnostic techniques (coronary angiography and revascularization).

Transport of critically ill patients has additional potential risks. It should be carried out in an appropriate time with adequate conditions. Furthermore, it should be done by specialized trained staff to provide adequate care during transport. Badia et al., concludes that APACHE II or Simplified Acute Physiology Score (SAPS) are important hospital mortality predictors in those patients who need transport during long distances. For this reason, it is important to adapt sanitary resources for this kind of patients, optimizing transport. They also recommend a complete clinical evaluation and unnecessary time delays to prevent possible complications.

In our study we compared mortality between patients who were transferred immediately to ICU from Emergency Department with those who were transported from another isle. Although our study has important limitations as they are the small sample studied, time during initial stabilization, or if they were stabilized in the ICU or in the Emergency Department, we did not find any differences in mortality.

Recent published studies analyzed the relation between ICU admission delay and mortality. These studies have found a clear association between transport delay and increased mortality, suggesting transferring these critically ill patients to the ICU as soon as possible. Also it is important to take into account that during the delaying time, patient has to receive a proper care according to their clinical state. The prognosis will also depend on the type of patient. Falabouris et al. found a higher mortality in those patients with multiple trauma, those with respiratory infection, intracranial hemorrhage, brain trauma injury, and cardiac arrest; and contrary to this found lower hospital mortality in transferred patients with drug overdose or chronic obstructive pulmonary disease.

Other important consideration is that all transported patients came from the same hospital with a permanent on duty ICU physician. It is recognized that clinical outcome depends on each hospital and their resources. So we couldn’t generalize mortality results if we don’t analyze the type of transported population and hospital resources where patient received initial attention. We cannot forget the effects on evolution of the population characteristics and their initial ICU care or post-ICU.

We must also consider that in order to diminish rate of readmissions and mortality, a hospital must transfer patients to another hospital not only quickly but also clinically stable. This is important for planning hospital resources.

Future investigations are necessary to confirm these results and also it is very important to identify high-risk patients before being transferred to another hospital.

### CONCLUSION

Critically ill patients transported from another isle to our ICU had the same mortality as those patients who were admitted directly from Emergency Department.

### REFERENCES

1. Rosenberg AL, Hofer TP, Strachan C, Watts GM, Hayward RA. Accepting critically ill transfer patients: Adverse effect on a referral center’s outcome and benchmark measures. Ann Intern Med 2003;138:882–90.

2. Combes A, Layt GE, Trouillet IL, Chastre J, Gibert C. Adverse effect on a referral intensive care unit’s performance of accepting patients transferred from another intensive care unit. Crit Care Med 2005;33:705–10.

3. Gregory CJ, Nasrollahzadeh F, Dharmar M, Parsapour K, Marcin JP. Comparison of critically ill and injured children transferred from referring hospitals versus in-house admissions. Pediatrics 2008;121:906–11.

4. Chalfin DB, Trzecki S, Likourezos A, Baumann BM, Dellinger RP. DELAY-ED study group. Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. Crit Care Med 2007;35:1477–83.

5. Seferian EG, Afsaa B, Gajic O, Keegan MT, Hubmayr RD. Mayo Epidemiology and Translational Research in Intensive Care. Comparison of community and referral intensive care unit patients in a tertiary medical center: Evidence for referral bias in the critically ill. Crit Care Med 2008;36:2779-86.
6. Badia M, Armendáriz JJ, Vilanova C, Sarmiento O, Serviá L, Trujillano J. Long distance interhospital transport. Accuracy of severity scoring system. Med Intensiva 2009;33:217-23.
7. Castella X, Gilabert J, Torner F, Torres C. Mortality prediction models in intensive care: Acute physiology and chronic health evaluation II and mortality prediction model compared. Crit Care Med 1991;19:191-7.
8. Flabouris A, Hart GK, George C. Outcomes of patients admitted to tertiary intensive care units after interhospital transfer: Comparison with patients admitted from emergency departments. Crit Care Resusc 2008;10:97-105.
9. Durairaj L, Will JG, Torner JC, Doebbeling BN. Prognostic factors for mortality following interhospital transfers to the medical intensive care unit of a tertiary referral center. Crit Care Med 2003;31:1981-6.
10. Duke GJ, Green JV. Outcome of critically ill patients undergoing interhospital transfer. Med J Aust 2001;174:122-5.
11. Hill AD, Vingilis E, Martin CM, Hartford K, Speechley KN. Interhospital transfer of critically ill patients: Demographic and outcomes comparison with nontransferred intensive care unit patients. J Crit Care 2007;22:290-5.
12. Tunnell RD, Millar BW, Smith GB. The effect of lead time bias on severity of illness scoring, mortality prediction and standardised mortality ratio in intensive care: A pilot study. Anaesthesia 1998;53:1045-33.
13. Rosenberg AL, Hofer TP, Hayward RA, Strachan C, Watts CM. Who bounces back? Physiologic and other predictors of intensive care unit readmission. Crit Care Med 2001;29:511-8.
14. Golestanian E, Scruggs JE, Gangnon RE, Mak RP, Wood KE. Effect of interhospital transfer on resource utilization and outcomes at a tertiary care referral center. Crit Care Med 2007;35:1470-6.

Cite this article as: Santana-Cabrera L, Sánchez-Palacios M, Escot CR, Rodríguez AU, Zborovszky E, Pérez JO. Comparative study on the prognosis of critical ill patients transferred from another island compared to those patients transferred from emergency department to intensive care unit. Int J Crit Illn Inj Sci 2015;5:85-8.

Source of Support: Nil, Conflict of Interest: None declared.