GLASGOW 7 SURVEILLANCE PROGRAM: EPIDEMIOLOGY AND OUTCOME IN ARGENTINEAN INTENSIVE CARE UNITS

Pseudonymous: Glasgow

Introduction

Organ transplantation was one of the great successes of the past century. Developments in anesthesia, immunology and intensive care mean that selected patients can have a transplant with a good chance of surviving and returning to a good quality of life.

The main problem in this process is organ supply. What can be done to improve organ donation?

The answer to this question was the cornerstone for the development of the Procuration Federal Program by the National Institute Coordinator Center for Organ Procurement of Argentina (INCUCAI). Organ Procuration Coordinators were named in selected Hospitals from different states of the country, which should have Neurosurgery Wards and Intensive Care Units (ICUs). Due to this there was an improvement in brain death detection and organ procuration, but it was still below the international standards. Since September 1st 2003 as part of the Procuration Federal Program, a Quality Guarantee Program in the Donation Transplantation Process surveillance all possible organ donors identified as having a Glasgow Coma Scale (GCS) score of 7 or below.

The aim of this study is to present the epidemiological data and outcome, beyond brain death diagnosis to have the picture of coma patients in Argentinean ICUs.

Material and method

Study design: Prospective, observational, cohort study

Setting: 90 hospitals covering the complete states of the country, all of them have Neurosurgery Wards and ICU.

Inclusion criteria: All patients admitted to ICUs with a GCS of 7 or below, with a structural coma.

Exclusion criteria: Coma due to metabolic etiology, drug intoxication or secondary to medical illness (i.e. sepsis, shock, anesthesia, etc)

Data collection: INCUCAI placed regional and hospital Organ Procuration Coordinators who gather the data. Each month all the coordinators send an electronic data sheet which contains the following items: name, gender, age, document, coma etiology (divided in trauma, stroke, anoxic encephalopathy, brain tumors and others), date of coma development and date of events (cardiac arrest, brain death, discharge or derivation) and all the organ transplantation process. This data is only collected and processed by one of the authors (JLB).

A MEDLINE search was performed (www.pubmed.gov), with the following queries:

1-(“coma” OR (Glasgow” AND “scale” AND “7”)) AND “ICU” AND “admission”

2- “Glasgow” AND “coma” AND “scale” AND “7” AND “surveillance”

3- “Glasgow” AND “coma” AND “scale” AND “7” AND etiology

Results

From September 1st 2003 to December 31st 2004, 5561 patients were enrolled in 90 hospitals in the whole country, 65% were males, mean age for adults was 50±+19 and for children 5±4.

In Graphic 1 demographic aspects of Argentina and Program Hospital distribution are exposed. The complete country was under surveillance.

In Graphic 2 the etiology and outcome, both general and sex and age differentiated are shown. Stroke (43%) is the leading admission coma etiology in Argentinean ICU followed by head injury (32%), anoxic encephalopathy (9%), brain tumors (4%) and miscellaneous (11%) identified as other causes.

In table 1 each etiology sub category outcomes are exposed. For the complete group survival rate was 28% and death 72%, 32% due to brain death and 40% due to cardiac arrest. This means that 56% of patients died from cardiac arrest and 46% from brain death.

According to etiology head injury due to gunshots wounds (GSW) and hemorrhagic stroke (subarachnoid hemorrhage and intracerebral hematoma) patients are the less like to survive (12% and 17%).

In Graphics 3 to 5 the outcomes according etiology, age and sex are shown. Male patients between 20 to 29 yo with GSW had the highest brain death diagnosis and the anoxic encephalopathy group, regardless age and sex were the ones with the highest cardiac arrest as outcome diagnosis.

As for the organism of Buenos Aires City we could establish that structural coma patients accounted for 9% of ICU admissions (range 3% to 18%), 12% of ICU deaths (range 4% to 24%) and 3% of Hospital deaths (range 1% to 5%).
MELINE search retrieved 16 articles; from which only one of them (1) was similar to our research but focused only in brain death.

Discussion
The approach of INCUCAI that made possible this surveillance program is based on the "Spanish Model" of organ donation (2-3). As the Spanish one, the Argentinean Procuration Federal Program consists of a transplant coordination network of 3 levels: national, regional, and hospital. The first 2 levels nominated by and paid for by the national and regional authorities are real interfaces between the political and the professional levels. The third level, hospital coordinators are medical doctors, working preferably on a part-time basis, and located inside the hospital. They are functionally linked with the regional and national coordinators. Most hospital coordinators are critical care physicians.
Continuous brain death audit is performed by a transplant coordinator. INCUCAI acts as a support agency in charge of organ sharing, transport, waiting list management, transplant registries, statistics, general and specialized information, and action that can improve the whole process of organ donation and transplantation.
As part of it, Quality Guarantee Program in the Donation Transplantation Process went one step behind the "Spanish Model" and surveyed all patients with a structural cause of coma that were admitted to participating hospitals, acting as a proactive donor detection program.
This allowed us to identify that structural coma patients accounted for 9% of ICU admissions (range 3% to 18%), 12% of ICU deaths (range 4% to 24%) and 3% of Hospital deaths (range 1% to 5%). Senoucci et al (1), also including metabolic causes of coma, arrived to similar conclusions: 11.8% of ICU patients, 11.7% of the deaths occurring in ICUs, and 3.3% of Hospital deaths.
Analyzing outcomes, in the same paper, patients alive at ICU discharge represented 37%, brain death account for 19% of deaths and cardiac arrest for 81%. In our series numbers, according each category, were: 28%, 32% and 40%.
Relationship between severe brain damage and brain death is a quality indicator, mainly due to the fact that GCS 7 patients are possible organ donors, as we stated previously. In Senucci´s paper this liaison favor cardiac arrest (81% vs. 19%) while in ours was almost even (56% vs. 44%). To improve organ donation all the patients who die in spite of neuro-intensive treatment should be prevented from circulatory arrest to permit declaration of brain death.
In our literature review we found two prospective studies evolving potential donors in Australia (4) and South Africa (5), in both cases withdrawal of support was the main cause of death. Same findings were appreciated in retrospective papers (6-8) with data from England and US.
Analysis of "Spanish Model" application in Italy (8-10) was performed on Glasgow 3 patient basis, achieving identification of brain death increased from 36% to 55%
Surprisingly spontaneous intracerebral hemorrhage (ICH) was the leading cause of coma admission to ICUs. It has a peak on 50 to 59 yo, with one of the highest mortality rates beyond GSW. This is very important to take into account because some critics of the "Spanish Model" (12) sustain that the high Spanish organ donation rates are largely attributable to increase the use of older donors. On the other hand this should warn sanitary authorities because it is a preventable cause of death and disability in young older related to uncontrolled arterial hypertension.
Head injury not related to GSW had a survival rate of 43%, the greatest of all causes of coma. Two centers from country had survival rates comparable to the international ones (30% and 38%). This is another public health challenge because it is another preventable cause of death. A program based on Basso's approach (13) is under current analysis for national implementation.
Subarachnoid hemorrhage showed a very low survival rate, close to the natural history of the disease as was described by Weir BK (14-15) in the 80s. An explanation for this situation could be found in the lack of resources for early diagnosis and treatment in the vast majority of public hospitals in the country. Again, this knowledge could be used to implement proactive programs to diminish mortality and sequel.
Anoxic encephalopatie showed the highest rate in cardiac arrest, which makes sense as that, is cause and consequence.
Brain tumors had also a low survival rate, below 23%, with a very high rate of cardiac arrest (41%) probably due to withdrawal of support.

Miscellaneous or others causes column had the option to be specified in the sheets that that could be identified, infectious diseases (meningitis and encephalitis) appeared to be the predominant. For new data collection it could be a single item.

Conclusion

This paper answered the question on coma etiology and outcome in Argentinean ICUs.

Stroke, mainly hemorrhagic one, is the leading cause, followed by head injury, anoxic encephalopathy, brain tumors and other causes. Coma patients had a high mortality rate (72%), with 56% of them dying due to cardiac arrest and 44% due to brain death.

This lasting relationship is a quality indicator of ICUs proceedings, reflecting a lack of maintenance either of ventilator or hemodynamic support because one must assume that most of patients should die from brain death.

This proactive probable organ donor program could help us in achieving one of the major goals in this shortage of donor's era and could also help critical care physicians mission regarding their obligations to the patient, his family and the society. This means that they should do their best to treat the Neurocritical patient, if treatment fails they should give the family the organ donation option and should bring the procured organs in the best condition for people in the waiting list.

References

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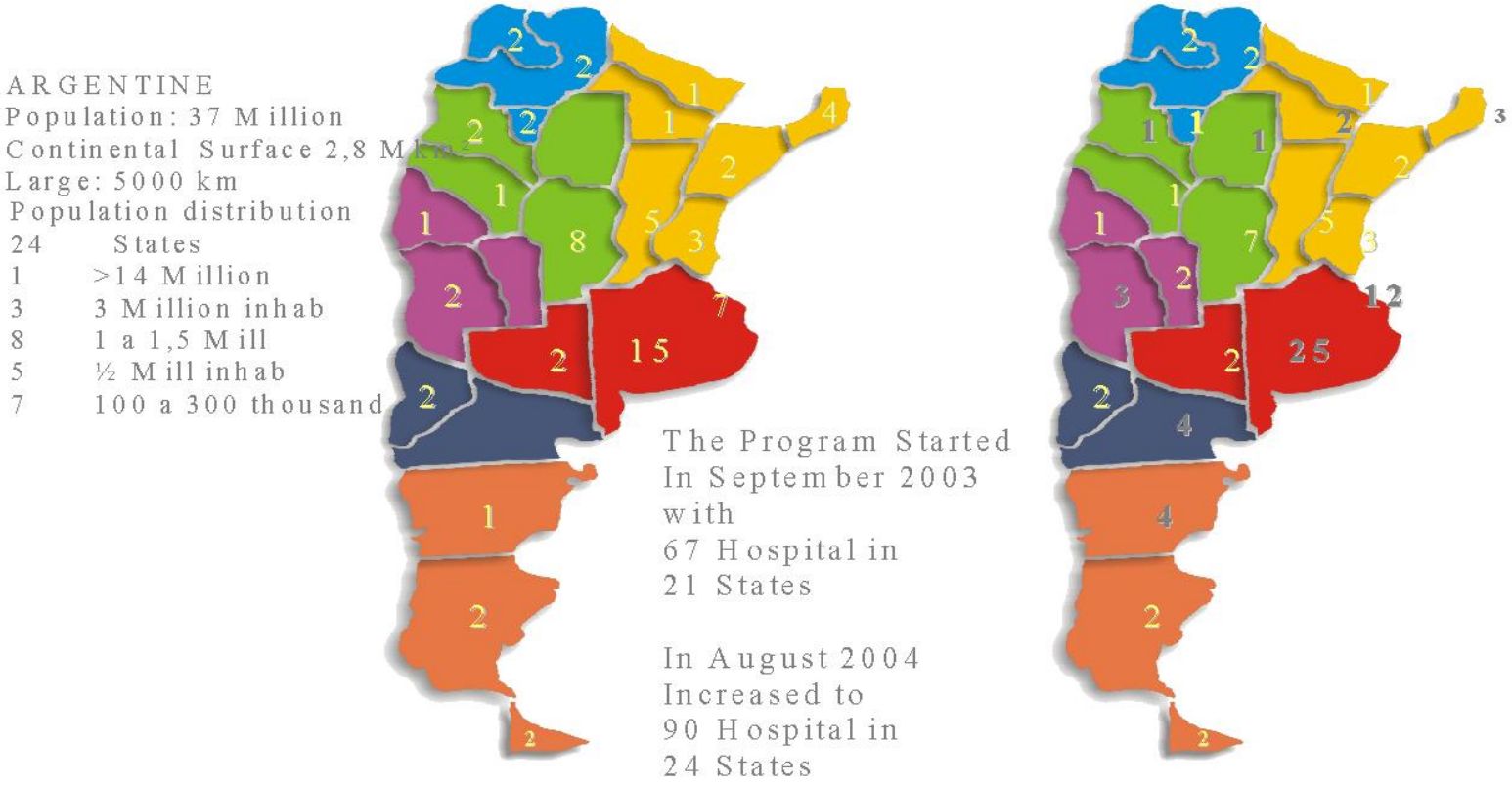
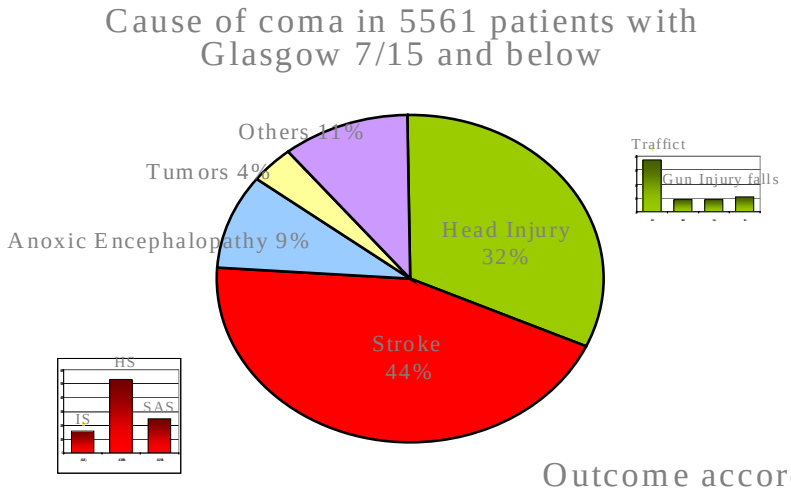
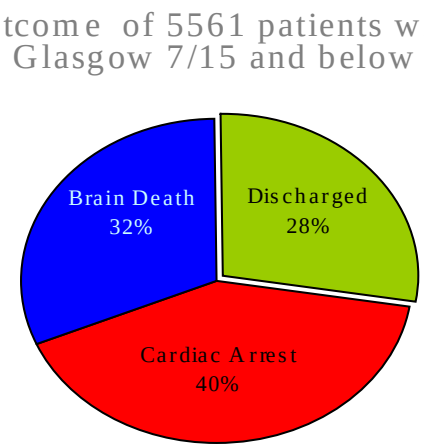
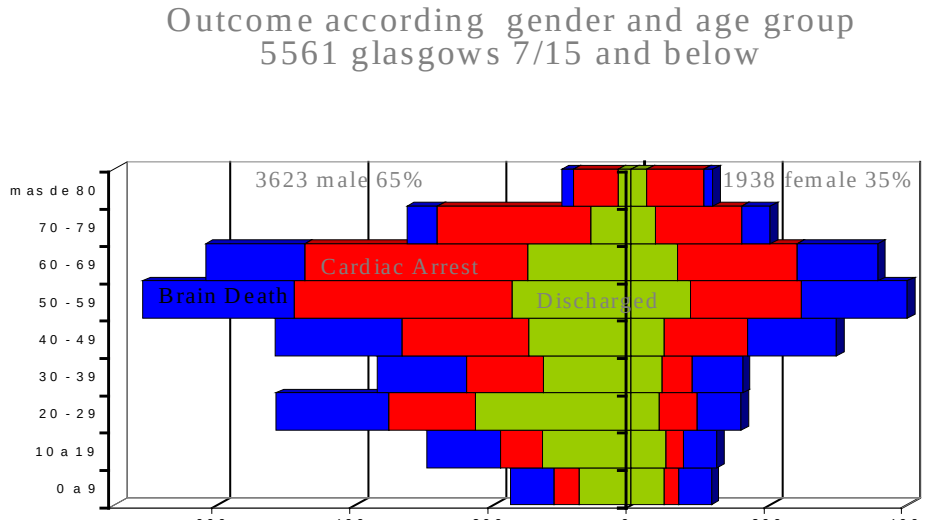
Graphics



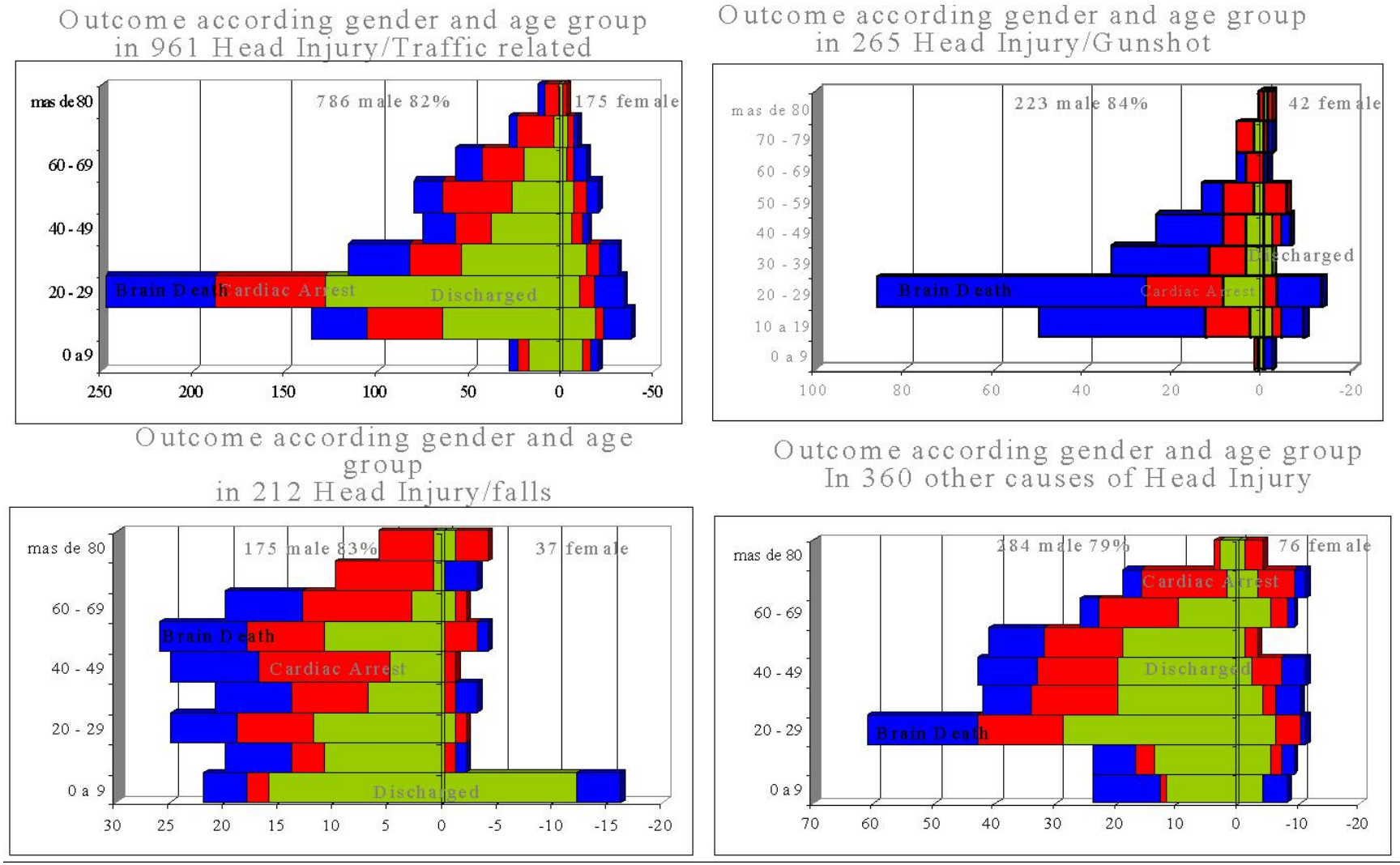
Graphic 1- Demographic data and Program Hospital location.



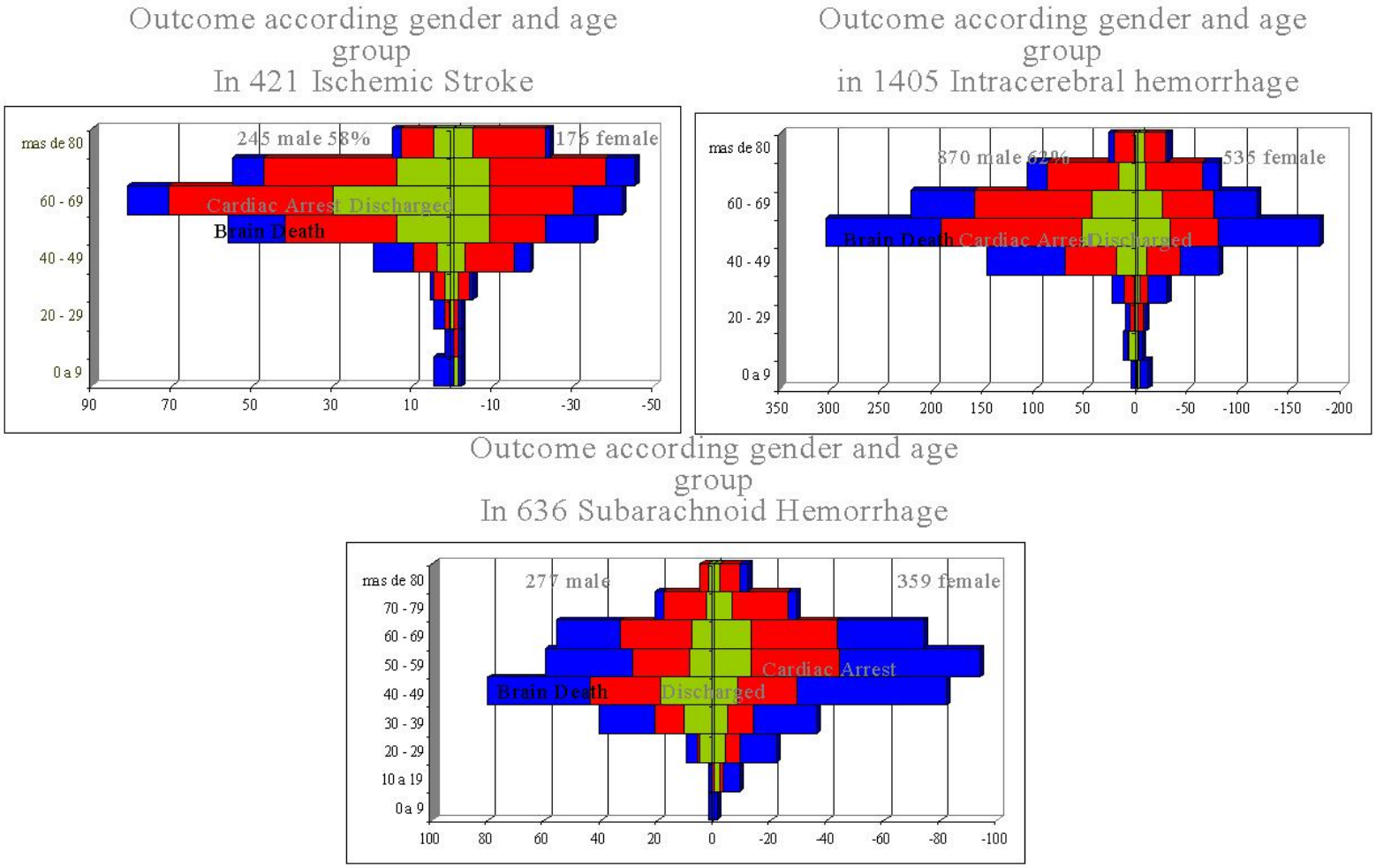




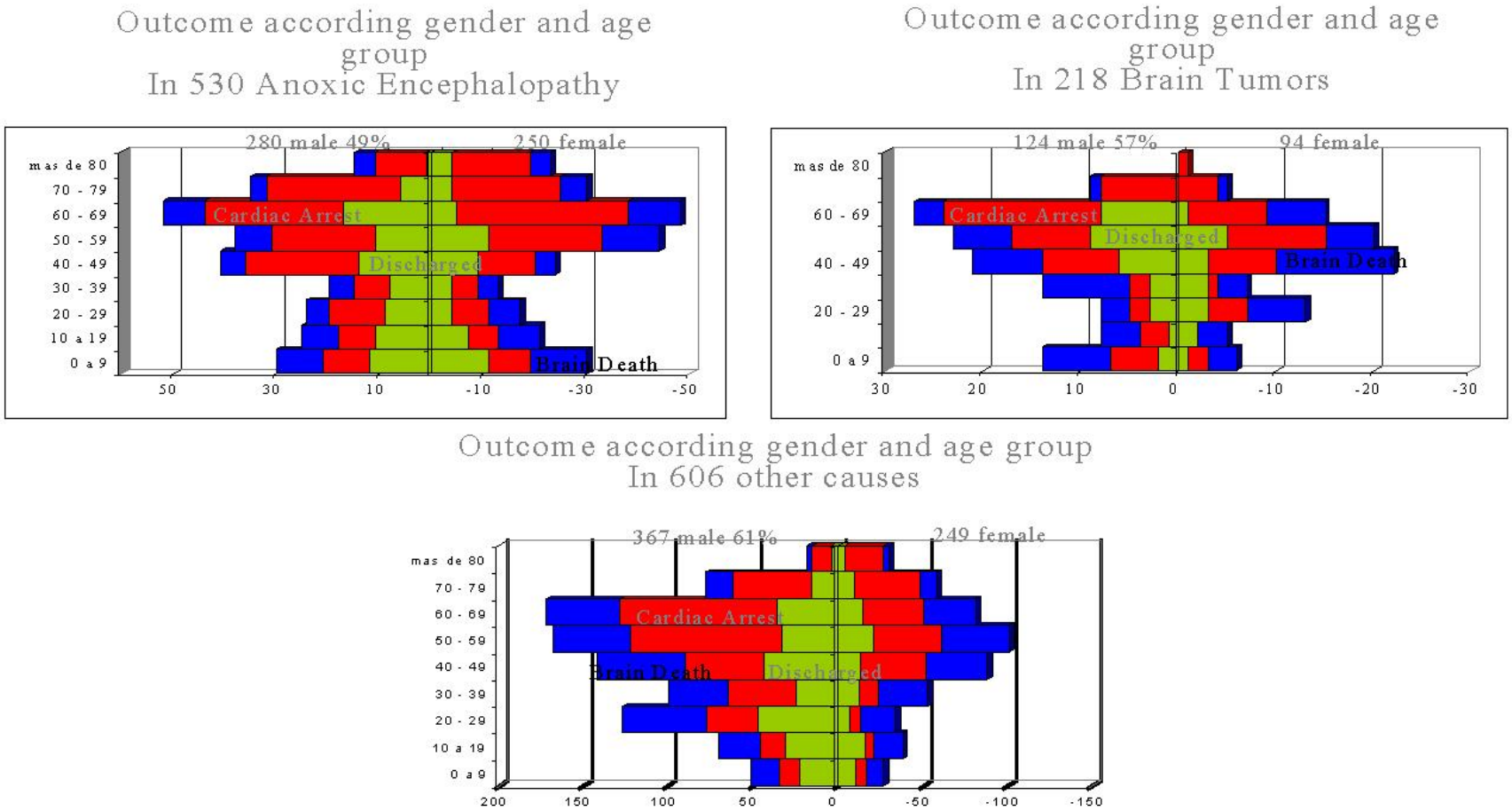
Graphic 2- Etiology and outcome of the complete set, according to age and sex.



Graphic 3- Outcome of each Head Injury category according gender and age.



Graphic 4- Outcome according gender and age for each stroke subtype.



Graphic 5- Outcome according gender and age of the lasting categories.

Tables

Etiology	Discharged (%)	Cardiac Arrest (%)	Brain Death (%)
Head injury traffic related	429 (44%)	286 (30%)	246 (26%)
Head injury gunshot wounds	32 (12%)	71 (27%)	162 (61%)
Head injury falls	82 (39%)	73 (34%)	57 (27%)
Head injury others	160 (45%)	113 (31%)	87 (24%)
Ischemic stroke	107 (25%)	219 (52%)	95 (23%)
Intracerebral hemorrhage	239 (17%)	634 (45%)	532 (38%)
Subarachnoid hemorrhage	110 (17%)	224 (35%)	302 (48%)
Anoxic Encephalopathy	148 (28%)	267 (50%)	115 (22%)
Brain tumors / Miscellaneous	50 (23%) / 188 (31%)	89 (41%) /310 (51%)	79 (36%)/108 (18%)
Total	1543 (28%)	2254 (40%)	1764 (32%)

Table 1 – Outcome according each subtype of etiology, expressed in absolute numbers and percentage.