CLINICAL IMPACT OF INFECTIONS IN INTENSIVE CARE UNIT: RETROSPECTIVE STUDY

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ABSTRACT

Introduction*: Intensive Care Units (ICUs) infections are a major problem that need to be addressed in a timely and targeted manner.*

Materials and methods*: 238 patients were the total patients of the year 2018, but just 106 patients were enrolled in the study, and then divided in infected and non-infected and then studies on them incidence on morbidity and mortality.*

Conclusion*: From the data obtained it is clear that starting targeted antibiotic therapy early, has positively effects on the patient's outcome.*

Keywords: *Bacteria, Sepsis - Diagnostics, Timeliness, Appropriateness, Antimicrobial stewardship.*

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Introduction

Infections have long been a significant problem for patients admitted to Intensive Care Units: they are associated with a high rate of morbidity, mortality and costs[1-2].

In particular, the departments of critical area are those at the highest risk of hospital infections due to the concurrence of multiple factors such as the often critical conditions of the patient, the frequent use of invasive diagnostic-therapeutic procedures, the simultaneous presence in a limited area of patients highly susceptible to infections and infected patients, the use of immunodepressor drugs, antibiotic pressure with the consequent selection of resistant microorganisms difficult to eradicate [3-4].

The intended purpose is to evaluate the clinical impact caused by late etiological antibiotic therapy in patients with infections hospitalized in the A.O.U. Policlinico "G. Rodolico" of Catania.

Materials and methods

A retrospective cohort observational study was conducted with a closed cohort approach based on the population of patients admitted to the Intensive Care Unit in A.O.U. Policlinico "G. Rodolico" of Catania, between January 2018 and December 2018.

The data were collected from the company archive directly from the relevant medical records, between the entirely months of June and July 2019. The data collection was performed manually and specifically for the study and was conducted by 10 doctors in specialist training in Anesthesia and Resuscitation.

In detail: information was collected regarding any comorbidities and / or risk conditions prior to hospitalization, data relating to the stay in intensive care and finally data relating to the first finding of infection occurred during hospitalization (Tab. 1, Tab. 2).

	Patients		Infected Patients		Non Infected Patients	
	n = 106	%	n = 51	%	n = 55	%
Comorbidities						
Smokers	20	18,9%	12	23,5%	8	14,5%
Ex Smokers	15	14,2%	9	17,6%	6	10,9%
Alcoholics	2	1,9%	2	3,9%		
Addicts	2	1,9%	1	2,0%	1	1,8%
Obese	15	14,2%	10	19,6%	5	9,1%
Diabetics	24	22,6%	15	29,4%	9	16,4%
Respiratory Disease	22	20,8%	13	25,5%	9	16,4%
Cardiovascular Disease	57	53,8%	34	66,7%	23	41,8%
Cerebrovascular Disease	27	25,5%	18	35,3%	9	16,4%
Vasculopathy Disease	13	12,3%	6	11,8%	7	12,7%
Connective Tissue Disease	4	3,8%	1	2,0%	3	5,5%
Cancer	31	29,2%	9	17,6%	22	40,0%
Ulcerative Peptic Disease	1	0,9%			1	1,8%
Liver Disease	5	4,7%	2	3,9%	3	5,5%
Kidney Disease	24	22,6%	12	23,5%	12	21,8%
Transplant	3	2,8%	1	2,0%	2	3,6%
Chemotherapy	6	5,7%			6	10,9%
Radiotherapy						
Surgical Interventions	38	35,8%	20	39,2%	18	32,7%

Tab. 1: Comorbidities before ICU hospitalization.

	Patients		Infected Patients		Non Infected Patients	
	n = 106	%	n = 51	%	n = 55	%
ICU Hospitalization						
Medical Admission	52	49,1%	23	45,1%	29	52,7%
Elective Surgical Admission	29	27,4%	17	33,3%	12	21,8%
Non elective Surgical Admission	15	14,2%	8	15,7%	7	12,7%
Trauma Admission	6	5,7%	4	7,8%	2	3,6%
First ICU Hospitalization	86	81,1%	42	82,4%	44	80,0%
Second ICU Hospitalization	6	5,7%	5	9,8%	1	1,8%
Sedation	95	89,6%	49	96,1%	46	83,6%
Curarization	7	6,6%	5	9,8%	2	3,6%
Inotropic	74	69,8%	44	86,3%	30	54,5%
Mechanical Ventilation	89	84,0%	49	96,1%	40	72,7%
Central Venous Catheter	91	85,8%	49	96,1%	42	76,4%
Parenteral Nutrition	61	57,5%	35	68,6%	26	47,3%
Continuos Renal Replacement Therapy	17	16,0%	13	25,5%	4	7,3%
Surgical Drainage	33	31,1%	18	35,3%	15	27,3%
Spatial Isolation	14	13,2%	14	27,5%		

Tab. 2: Comorbidities before ICU hospitalization.

The endpoint assessed is all-cause mortality during the entire hospital stay.

The population is represented by 238 potentially enrollable patients.

The analysis, however, was restricted to 106 patients because 132 patients were unable to meet the following inclusion criteria:

- non-cardiac surgical patients;
- aged between 1 and 99 years;
- hospitalization in ICU lasting> 24 hours and <90 days;
- availability of medical records.

In detail, 88 (37%) of the potential enrollable patients were discarded because they were hospitalized for a duration of less than 24 hours or longer than 90 days, while 44 (18.5%) patients were "deleted" because the medical record it did not contain all the data we needed or was not available on file (Fig. 1).

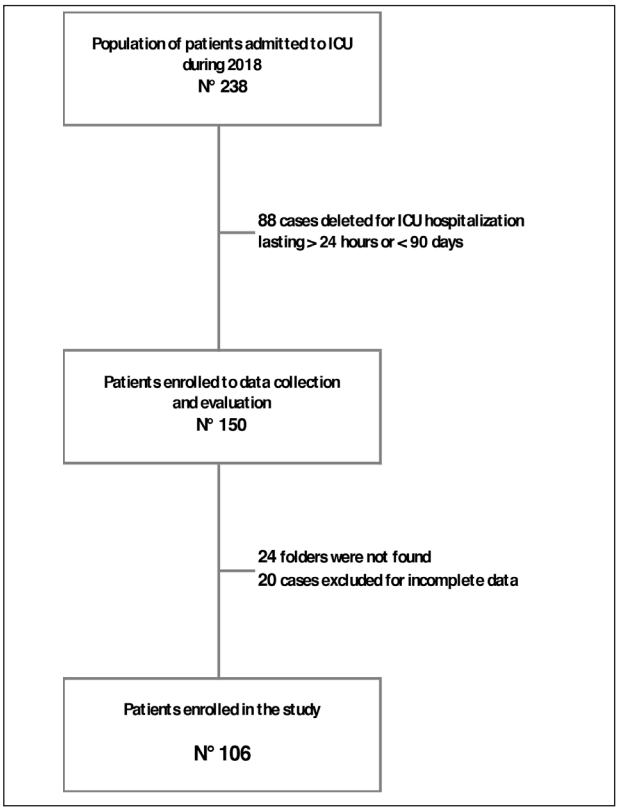

Fig. 1: Flowchart of the sample selection process.

In the 106 patients examined, the male gender is represented by 65 cases (61.3%) with an average age of 62 years; on the other hand, the female gender is represented by 41 cases (38.7%) with an average age of 54 years.

The average general age of the studied population is 59 years, in a range from 4 to 89 years (males 4-89; females 14-88).

Of the total number of patients (n° 106), the sample analyzed, 51 (48.1%) were considered as patients with infection, while the remaining 55 (51.9%) without infection.

The others 50.9% of the patients (n° 54) died and of these 37 cases were diagnosed with infection, while the patients who were discharged are 49.1% (n° 52) and of these cases with diagnosis there were 14. of infection (Tab. 3).

Initially we ascertained the existence of a statistical association between the variables in question (deaths, infections and empirical therapy), so that we can demonstrate a cause-effect relationship between the variables.

The strength of the statistical association between the variables, i.e. quantifying the risk of death

to which patients are diagnosed with infection and with inadequate empirical therapy, was calculated with the Odds Ratio (OR).

Furthermore, we represented the study with a contingency table (double entry) to determine whether the distribution of one variable could depend conditionally on another variable.

Retrospectively, the first two tabulated variables are represented by deceased patients and patients with infection; subsequently, for the subpopulation of patients with infection, the tabulated variables are represented by deceased patients and adequate empirical therapy.

Furthermore, through the Chi-Quadrato Test, we verified the statistical significance (P) of the observed and expected data.

Results

Upon entry into ICU, the average SAPS II Score was 56 and the average SOFA Score was 10.

Between the patients without infection (51.9%), the others 69.1% of the patients were discharged (n° 38), after hospitalization lasting an average of 5.7 days; the remaining 30.9% (n° 17) died after an average hospital stay of 8.7 days (Tab. 3).

	Patients			Infected Patients			Non Infected Patients		
	N°	%	Average Hospitalization Days	N°	%	Average Hospitalization Days	N°	%	Average Hospitalization Days
Discharge	52	49,1%	9,9	14	27,5%	21,4	38	69,1%	5,7
Death	54	50,9%	18,2	37	72,5%	22,5	17	30,9%	8,7
	106		**14,1**	**51**	**48,1%**	**22,2**	**55**	**51,9%**	**6,6**
Death's Probability/Risk					45,1%			-38,2%	
Absolute Risk Reduction (RRA)								**83,3%**	

Tab. 3: Sample distribution for infected and non infected, outcome, average hospitalization days and death's probability/risk.

From above it can be deduced that patients without infection have a probability / risk of death of -38.2% compared to patients diagnosed with an infectious process (Tab. 3).

In the group of patients with infection (48.1%), just 27.5% of cases were discharged, after hospitalization lasting on average 21.5 days; the remaining 72.5%, however, died after an average hospital stay of 22.5 days (Tab. 3).

Consequently, the probability / risk of death is 45.1% higher in patients with infection than in patients without infections (Tab. 3). From the data shown, it emerges that in patients without infections there is an absolute risk reduction (RRA) of 83.3% (Tab. 3).

Still within the group of patients with infection, the adequacy or otherwise of empirical antibiotic therapy was verified through the analysis of antibiograms.

In patients with infection and with adequate empirical antibiotic therapy, the mortality rate (specific cause) is 45.5%; with inadequate empirical antibiotic therapy, the mortality rate (specific cause) reaches 80.0%.

In the hospital where the research was conducted, on average, the time needed to obtain the result of a microbiological test sent by the ICU was 4.4 days, with a range from 1 to 21 days and in 19.6% of cases above average. In deceased infected patients, the average figure for obtaining the result of a microbiological test rises to 5.1 days with 24.3% of the cases above average (Tab. 4).

2	20	39,2%	11	29,7%	9	64,3%
3	12	23,5%	9	24,3%	3	21,4%
4	6	11,8%	5	13,5%	1	7,1%
5	1	2,0%	1	2,7%		
6	1	2,0%	1	2,7%		
7	2	3,9%	2	5,4%		
13	1	2,0%	1	2,7%		
14	2	3,9%	2	5,4%		
15	1	2,0%	1	2,7%		
17	1	2,0%	1	2,7%		
21	1	2,0%	1	2,7%		
	51		**37**		**14**	
Average days	**4,4**		**5,1**		**2,3**	
Above average incidence	**19,6%**		**24,3%**		**28,6%**	

Tab. 4: Waiting for Microbiological results.

Statistical tests have shown that there is an association between deaths, infections and adequate empirical therapy.

Based on the results obtained with the Chi-Quadrato Test, the existence of the positive statistical association with significant differences between the cases with deceased infection and the cases with discharged infection is proven (0.69 vs 0.27 - P <0.01).

The second Chi-Quadrato Test, limited to patients with infection, also confirms the statistical

association with significant differences between the cases treated with adequate empirical therapy who died and the cases treated with adequate empirical therapy who were discharged (0.14 vs 0.43 - P <0.05).

The causality of the aforementioned two associations was subsequently verified and confirmed by the Odds Ratio.

Infected patients are more likely to experience death than those without infections [OR 5.91 - 95% Confidence Interval (2.55 - 13.68)].

However, patients with infections with adequate empirical therapy are less likely to experience death than those with inadequate empirical therapy [OR 0.21 - 95% confidence interval (0.05 - 0.86)].

Discussion

The data demonstrate how important it is starting targeted etiological antibiotic therapy early in patients with infections and in critical conditions.

The patient's outcome improves when microbiological test results are rapidly generated; the improvement consists of an increase in survival and a reduction in hospital stay.

Microbiological diagnostics, therefore, is closely integrated with the clinic[5-6].

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