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RESEARCH ARTICLE

HEMS BENEFITS IN TRANSFERING SEPSIS PATIENTS – NORTH-EAST ROMANIAN EXPERIENCE

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Abstract

Sepsis syndrome is a common and have devastating implications on health care systems worldwide. HEMS provide the most benefit when there is a clear, time-sensitive therapeutic intervention available at the receiving hospitals. With the appearance of early goal- directed therapy, sepsis has become a "time critical" pathology, so the patients and EMS systems can benefit from Helicopter EMS (HEMS) utilization. This article describes the Nord-East Romanian HEMS experience with sepsis patients, from 2014 up to 2016. The endpoint of interest is to find a specific indications for air transfer which can help taking decisions into the medical dispatch in case of sepsis. The most important outcomes are potential benefits for the patients, accessing earlier the highest level of intensive care. The benefits of HEMS missions for the remote area are: the ability to provide timely access to higher level hospital, to facilitate the transport of trauma, cardiac, stroke, and also sepsis patients. HEMS crews have ALS capabilities that bring a different level of care to this category of patients, especially in the remote, less capable of according necessary level of care hospitals. Regional healthcare and EMS system's benefit from HEMS by their capability to extend the advanced level of care throughout a region, minimizing transport times and beginning of advanced medical care, make available direct transport to specialized centers. Presepsin as biomarker, together with clinical findings, could have a high value in helping physicians to take the decision to transfer the patient with sepsis to a higher level hospitals.

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Introduction:-

Helicopter Emergency Medical Services (HEMS) significantly extends patient access to tertiary care facilities, leading to rapid transport of critical cases to hospitals of this type. A recent review of the literature on HEMS has shown a general benefit of 2.7 extra lives saved on 100 HEMS missions. For a specific pathology, the benefit of using HEMS is clear. STEMI (STEMI) -Acute myocardial infarction and trauma cases are representing the clear majority of pathology described in the literature that studies HEMS missions. HEMS have been shown to provide substantial benefits to patients suffering from trauma and acute myocardial infarction, without any doubt.

HEMS seem to provide the greatest benefits when there is a clear, time-sensitive treatment available at the receiving unit. With the emergence of therapy targeted at early goal therapy, sepsis also became a critical pathological entity

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at the time elapsed from diagnosis to initiation of therapy. Unfortunately, little is known about the recommendation of using aerial transfer and efficacy of HEMS in sepsis. There are currently no data on the efficacy of HEMS transport in patients with severe sepsis or septic shock. Physicians in tertiary care institutions are forced to make difficult and expensive decisions on how and when to transport a septic case, without a possible orientation from literature.

We aim to understand the effect on transfer and in-hospital mortality and other important side effects of helicopter transport in patients who develop severe sepsis or septic shock.

The idea of using HEMS to urgently treat patients with serious injuries and illnesses is not a new one. There is a significant number of articles in literature that demonstrate the usefulness of HEMS for the time-saving (and to the benefit of decreasing mortality) in the transport of trauma and acute myocardial infarction. Recent analysis of the national database shows that the use of HEMS in the US is associated with significant time savings. Loss of HEMS availability has been recognized as a potentially important factor that causes increased traumatic mortality in patients presenting with non-Level I centers. In addition to using HEMS for trauma cases, the focus is increasingly on engaging HEMS to speed the care for patients with non-trauma diseases, but time critical disease. The usefulness of HEMS's logistics / speed capabilities to extend the level I coverage of heart and stroke centers over time has been the subject of increased attention, with emphasis on the ability of HEMS to speed up the specific treatment of these diagnoses. The use of air medical resources for the rapid movement of patients in specialized centers is gaining some attention, partly because of the increasing "time is myocardium", "time is brain tissue" and so on. In terms of cardiac transplantation and time saving, the focus is increasingly on the access of patients with acute myocardial infarction to primary PCI as the treatment of choice if it can be reached for 90 minutes from the "first door to balloon".

Sepsis, a long-recognized pathological process, was generally not considered "time critical". This view has changed with the emergence of studies demonstrating an improved outcome associated with outcome-oriented therapy, with the goal of setting the appropriate sepsis therapy within the first six hours. Although many patients with sepsis do not undergo transport, HEMS may, in some cases, provide a useful mechanism for rapidly achieving the goals - appropriate therapy set up in due time.

Material and Methods:-

This study is a retrospective study conducted on a group of 20 patients diagnosed with sepsis, out of a total of 1102 patients that were transferred with Iasi HEMS crew between 01.06.2014-01.06.2016. Iasi city is located in North-East of Romania, and HEMS missions cover 6 counties with a surface of approximately 40.000 Km² and all forms of relief, with a population of approximately 3.600.000 people. HEMS crew is formed by 4 people: 2 pilots, one nurse and one physician specialized in Emergency Medicine-Intensive Care.

The study aims to establish the following: frequency of sepsis patients and transfer decision; mortality during and in first 2 days from transfer; the need to initiate mechanical ventilation, the need for vasoactive agents.

The procedure for HEMS transfer is: physician from primary or secondary level of care center ask for transfer approval in tertiary level of care hospital, and after that will call medical dispatch using National Emergency Phone number (112 in Romania). At this moment, together with physician from medical dispatch they chose how, (aerial or ground), will be the patient transferred.

The study protocol included the following data taken from group of patients: HEMS mission type, clinical and laboratory variables, treatment procedure initiate by HEMS crew, patient evolution after transfer.

Inclusion criteria was: patients with age over 18 years and clinical signs of infection accompanied by the presence of at least two of the following criteria: temperature > 38°C or <36°C, heart rate > 90 / min, respiratory rate > 20 /min and leukocytosis (> 12,000 mm³) or leukopenia (<4000 mm³).

Exclusion Criteria:-

Patients under 18 years of age

The diagnosis of sepsis was made based on the clinical specific and usually signs in conjunction with other investigations, respecting the diagnostic criteria establish in Surviving Sepsis Campaign.

Data collected from patients meeting inclusion criteria were statistically processed using statistical analysis software IBM-SPSS V.23.

Results:-

The 20 patients with sepsis included in the study represent 1,81% from total number of Iasi HEMS crew intervention performed between 01.01.2014-01.06.2016.

Mean age of patient was 54,05 years old, with a standard deviation of 16,567.

Gender distribution was equal, 50% each.

All these 20 missions (100%), were secondary type mission-transfer from a hospital to other hospital.

Mean time for intervention was 75 minutes, with a minimum of 60 minutes and a maximum of 130 minutes. This value imply take-of from base to the case and time back to base, to the tertiary level care center.

The biggest distance covered was 210 km, and the shortest was 70 km.

A percentage of 30 % from these patients were intubated before transfer moment. The HEMS crew initiate oro-tracheal intubation in other 10 %, and in the end 40% from the cases arrive to the high-level hospital intubated, being mechanically ventilated during transport time with helicopter.

A percentage of 40% required vasopressor therapy. This was decided and administered by HEMS crew during and transfer.

The mortality was 5%, 1 patient died in first 24 hours after transfer, developed Cardio-respiratory arrest just before helicopter take-off, this patient respond to cardio-pulmonary resuscitation manoeuvres but died after transfer was finished and another one in interval of time between 24-48 hours from transfer. The survival rate was 90%. None of the patient died during transfer.

Limitations:-

There are some limitations in our study. The sample size was small, and our data are only from a single tertiary care center. Larger multicenter studies will overcome this limitation.

Discussion:-

This paper is trying to overview the low degree of using HEMS in sepsis cases in Romania and to emphasizes the important questions of HEMS possible benefits for sepsis patients and for healthcare systems.

Because of this small number of sepsis transferred patient cases, we did not try to find any statistically correlations, considering from the beginning that this was not enough to obtain some significant statistical data.

What we try to describe and discuss in this paper is the fact that only so few patients diagnosed with sepsis were transfer using HEMS crew advanced medical care capability during 30 months, representing only 1,81 percent from total number of Iasi HEMS crew missions and also the fact that from this 20 critically ill patients, 90 percent's survive to 48 hours from transfer moment.

Sepsis is now considered "time critical " pathology. For sure HEMS may, in some cases, provide a useful mechanism for rapidly achieving the golden goals - appropriate therapy set up in due time, but now we miss some guideline to decide when and in what condition to recommend transfer of sepsis cases to a higher-level hospital. Probably including the patient simple in septic shock category is not enough, we could miss the window of time for transfer, because one of the main restriction of HEMS transfer is that the patient need to be hemodynamical stable during aerial transfer.

Time necessary for air transfer was in all cases shortest compare to time necessary for transfer by land.

We could find help in taking an early decision to transfer the patient using Presepsine, described in literature as having also not only diagnostic value but also prognostic value. Presepsine is described as the only independent variable that can be associated with survival at 28 days or hospitalization in the intensive care ward and prognostic

accuracy is increased compared with procalcitonin and other biomarkers. The correlation between the occurrence of septic shock, presepsin value and need for vasopressor therapy was recently described in the literature.

The combination of traumatic injuries and further development of sepsis and severe sepsis is described in the literature, with a predominance of this pathology in males, with a mortality still high, ranging from 19.5% -23% of cases. Due to the increased severity of this association is explained correlation with the need for advanced airway management and low Glasgow coma score on this category of patients.

Conclusions:-

HEMS crew advance care skill is not used to its full potential in cases of sepsis transfer in Romania.

There are no clear criteria to help physician to take the decision when and by what type of transport to transfer a sepsis cases.

The potential benefits of HEMS must be considered by national health policymakers and others institution which provide HEMS use guidance.

Presepsin early diagnostic value may also have prognostic value over the subsequent evolution of the patient and for decision to transfer sepsis patient to a higher-level center.

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