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Background

Worldwide, and especially in European Countries, elderly population is steadily growing [1,2]. This is associated with a sharp rise of age-related diseases, including infectious diseases. In particular, sepsis in the elderly is acquiring increasing importance: incidence, severity and mortality rates are directly proportional to the patients' age [3,4]. A main issue is the early diagnosis of sepsis in old people, since these patients are characterized by a vague clinical presentation and a rapid and often fatal evolution [5,6]. Yet, very few studies have evaluated old people with sepsis at hospital admission.

Aims of our work were therefore to assess diagnostic and prognostic values of some of the most common markers and severity scores taken at the Emergency Department (ED) in a group of elderly patients with sepsis.

Methods

We performed a retrospective single-cohort study of over 300 septic patients (*i.e.* found to have positive blood cultures other than from *S. epidermidis*) admitted at the *Spedali Civili General Hospital* of Brescia, northern Italy, from 2013 to 2015. All the patients passed through the ED before being admitted, where the main clinical and biochemical markers were assessed. Blood cultures were taken at the ED or within 48 hours after the hospitalization. Anamnestic data of renal, hepatic, hematologic, cardiovascular and pulmonary impairment were recorded. Two major severity scoring systems, SIRS and MEWS, were assessed; outcomes were evaluated by mortality rates and length of hospitalization.

We compared the results between patients under 65 (<65y), from 65 to 79 (<80y), and over 80 years of age (≥80y).

Results

A total of 316 septic patients were included: 82 (25.9%) <65y, 121 (38.3%) <80y, and 113 (35.8%) ≥80y. Both mortality (7.3%, 18.3%, and 21.2% respectively [p 0.028]) and blood cultures pathogens (gram-negative bacteria in 57.3%, 56.2%, and 70.8% respectively [p 0.044]) differed significantly between the groups, whereas the length of hospitalization did not (mean 18.8 days [SD 11.8]).

A significant difference with an age-related gradient was found in renal and cardiovascular impairment (p <0.001 for both), while differences in pulmonary impairment were slightly above the level of significance (p 0.053).

Among the vital signs and biochemical markers evaluated at the ED, differences in body temperature, white blood cell count and INR were of clinical value. Of them, body temperature and white blood cell count differed significantly between the three groups [Table 1]. Neither the SIRS nor the MEWS score showed significant differences between age classes [Table 2].

On the contrary, the results of both scores, together with other hallmarks of organ damage (creatinine, total bilirubin, INR) correlated significantly with mortality.

KEY POINTS:

- Septic patients over 80 years of age tend to have more **gram negative** isolates in blood cultures compared to general population.
- Elderly people with sepsis are likely to present at the ED with **no** SIRS- or MEWS-defining **fever** (body temperature <38° C).
- SIRS** and **MEWS** scores are not affected by lower temperature in the diagnosis and severity assessment of elderly patients with sepsis.

Conclusions

- Our cohort study confirms an advanced average age of septic patients, with mortality but not length of hospitalization directly correlated with age.
- The prevalence of gram-negative isolates in patients over 80 years of age reflects different risk factors and possible infection sources, and must be taken into account at hospital admission for starting appropriate diagnostic workup and antibiotic therapy.
- We found that elderly people, compared with general population, present at the ED with a significantly lower body temperature, which is balanced in the assessment of SIRS and MEWS by the other vital signs, markers and comorbidities. This is expected, yet of great value in clinical practice: absence of fever is not enough to lower the guard on sepsis.

Table 1: Differences in major vital signs and biochemical markers between the three age groups. Statistical analysis of clinically significant differences. Values expressed in mean (Standard Deviation) [95% CI]

	TC, °C	SBP, mmHg	HR, bpm	RR, bpm	SatO2	WBC, 10 ³ cells/mm ³	PLT, 10 ³ cells/mm ³	Creatinine, mg/ml	Bilirubin, mg/ml	INR	CRP, mg/ml
Patients <65y	38.4 (1.2) [38.1-38.6]	117 (22.3)	105 (24.4)	19 (4.7)	96 (3.2)	9.5 (7.8) [7.7-11.2]	142 (96.1)	1.56 (1.9)	1.22 (1.4)	1.3 (0.3)	136 (112)
Patients 65-79y	38.1 (1.6) [37.9-38.3]	118 (24.3)	96 (22.6)	20 (5.0)	94 (5.5)	12.1 (8.4) [10.6-13.7]	172 (118.5)	1.54 (1.2)	1.52 (1.8)	1.6 (1.0)	123 (108.7)
Patients ≥80y	37.8 (1.2) [37.6-38.1]	119 (25.0)	94 (18.7)	21 (4.9)	94 (4.0)	12.9 (7.5) [11.5-14.3]	182 (99.7)	1.61 (1.1)	1.77 (2.4)	1.7 (1.3)	117 (98.5)
p value	p1: 0.010 p2: 0.009					p1: 0.009 p2: 0.009				n.s	

p1: Analysis of variance; p2: Post hoc analysis between patients <65 and ≥80 years

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Table 2: Differences in severity scoring systems between the three age groups. Values expressed in absolute number (percentage)

	Patients <65y	Patients 65-79y	Patients ≥80y	p value
SIRS score ^a Positive	61 (74.4%)	72 (59.5%)	68 (60.7%)	n.s.
MEWS score ^b Low (<4)	40 (53.3%)	67 (56.8%)	69 (65.1%)	
MEWS score Medium (4-6)	22 (29.3%)	29 (24.6%)	22 (20.8%)	n.s.
MEWS score High (>6)	13 (17.3%)	22 (18.6%)	15 (14.1%)	

^aSIRS score considered: TC, HR, RR, WBC

^bMEWS score considered: TC, SBP, HR, RR, AVPU scale (level of consciousness)

For both scores, when respiratory rate was not available, oxygen saturation was used as reported in previous publications

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