Prevalence and in-hospital outcome of patients with sepsis in an internal medicine ward

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Abstract

Objectives. Sepsis is a “life-threatening organ dysfunction caused by a dysregulated host response to infection”, which is identified by a ≥2 point increase from patient baseline in the Sequential Organ Failure Assessment score (SOFAs). The prevalence and outcome of patients with sepsis has been mainly assessed in ICU patients, while few data are available for patients admitted to internal medicine wards. Our purpose was to evaluate the prevalence and the clinical outcome of patients with sepsis in an internal medicine ward.

Design. This is a single-center retrospective observational study evaluating all patients admitted over a 2-month period (October and November 2015) in the internal medicine ward of the San Giovanni di Dio Hospital in Florence. Patients with clinical and/or instrumental signs of bacterial infection were evaluated with SOFAs and divided into patients with and without sepsis.

Results. 635 patients were evaluated, and 279 of them (43.9%) were diagnosed with a bacterial infection. The diagnosis of sepsis was made in 93 patients (14.6%). In-hospital mortality and transfer to ICU were observed in 16% of patients with sepsis and in 2.5% of patients without sepsis (p<0.0001). A SOFAs value ≤2 had a negative predictive value of 97.5%, and increasing values of SOFAs were associated with a worse prognosis.

Conclusions. The results suggest that: a) a high proportion of patients hospitalized in an internal medicine ward are affected by sepsis; b) these patients are burdened with high in-hospital mortality or transfer to ICU; and c) SOFA score has a high prognostic power.

Key words: sepsis, internal medicine ward, Sepsis 3, SOFAs, bacterial infection, in-hospital mortality

Introduction

An international expert consensus process in 2016 proposed a new definition of sepsis, commonly termed “Sepsis 3”(1). According to this definition, sepsis is a “life-threatening organ dysfunction caused by a dysregulated host response to infection”, which is identified by a ≥2 point increase from patient baseline in the Sequential (sepsis related) Organ Failure Assessment score (SOFAs). Patients with sepsis have a high mortality rate of over 10% and need prompt and intensive care. Most studies on sepsis are based on data from intensive care unit (ICU) patients (2), while there are few data on the prevalence and outcome of patients with sepsis hospitalized in the internal medicine wards (3-4). Particularly, only few studies have evaluated patients with sepsis diagnosed according to the new definition (5). This study was designed to retrospectively evaluate the prevalence and in-hospital outcome of patients with sepsis hospitalized in an internal medicine ward and identified on the basis of the new “Sepsis 3” criteria.

Patients and methods

We conducted a single-center retrospective observational cohort study evaluating all patients admitted over a two-month period (October and November 2015) in the internal medicine ward of the San Giovanni di Dio Hospital in Florence. The criteria for enrollment in the study were: a) clinical and/or laboratory and instrumental signs of bacterial infection within 48 hours of admission, and b) systemic antibiotic therapy started within 48 hours of admission.

The main objectives of the study were the evaluation of:

– the prevalence of patients with the diagnostic criteria of sepsis (SOFAs score ≥2 points from baseline)
– the clinical outcome (in-hospital mortality or transfer to ICU) of patients with sepsis compared to patients with infection without sepsis criteria.

This study was approved by the Department of Internal Medicine and by the Hospital management.

Due to the retrospective and observational nature of the study, no individual written informed consent was needed for reviewing the patients’ electronic health record for the purpose of this research.
Clinical setting

The study was conducted at the internal medicine ward of the San Giovanni di Dio Hospital, Florence, Italy, an acute care hospital of medium size (296 beds). The internal medicine ward consists of 78 beds and annually treats about 3,800 inpatients, most (92% in 2018) admitted from the general emergency department of the hospital. The ward is equipped with a full electronic clinical records system (ARGOS software, Dedalus, Italy).

Data collection

The data were collected from two trained medical students, supervised by 2 unit expert physicians. The following data were collected for each patient who met the enrollment criteria: age, gender, infection sites, SOFA score, transfer to the ICU and hospital mortality.

To calculate the SOFA score, for each explored parameter, the value that showed the greatest alteration during the first 48 hours after hospitalization was used. SOFA scores were corrected for baseline values, if available.

Statistical analysis

Statistical analysis was performed using the Student’s t test for continuous data and the Chi-square test or exact Fisher test for categorical data, as appropriate. Differences were considered significant for a value of \( p < 0.05 \). The analyses were carried out using Med-Calc® version 12.3.0 (MedCalc Software; Mariakerke, Belgium).

Conflict of interest

The authors declare that they have no conflicts of interest.

Statement of human and animal rights

The authors declare that all procedures performed in this study are in accordance with ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

During the study period, 635 patients were admitted to the internal medicine ward. Among these, 279 subjects (43.9%) met the enrollment criteria and were included in the study. Based on data available in electronic medical records, it was possible to retrospectively calculate the SOFAs in 254 of the 279 patients enrolled (91%). Ninety three of 254 patients (36.6%) had a SOFA score \( \geq 2 \), and were included in the sepsis group. The remaining 161 patients with a SOFA score \(< 2\) made up the group of patients with infection without sepsis. Figure 1 shows a schematic summary of these results.

The overall prevalence of patients hospitalized with sepsis was 14.6% (93/635). The group of patients with infection without sepsis was not significantly different from the group of patients with sepsis as regards age, gender and site of infection (Tab. 1).

Table 2 shows the number of patients who were transferred to ICU or died during hospital stay. Mortality rate was significantly lower in patients with infection without sepsis than in septic patients (2.5% vs 15.1%; \( p < 0.0005 \)). The combined end-points of mortality or transfer to ICU were observed in 15 patients with sepsis and in 4 patients without sepsis (16.1% vs 2.5%; \( p < 0.0001 \)).

Increasing SOFA values were associated with an increase in the mortality rate. Mortality was particularly high (above 20%) for SOFA scores equal to or greater than 4 (Tab. 3).

Table 1. Characteristics of patients

<table>
<thead>
<tr>
<th></th>
<th>Age (mean ± SD)</th>
<th>Gender (M/F)</th>
<th>Airways</th>
<th>Urinary tract</th>
<th>Abdomen</th>
<th>Skin and soft tissues</th>
<th>Other or undetermined sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with infection without sepsis (n=161)</td>
<td>78.7±11.8</td>
<td>85/76</td>
<td>65</td>
<td>36</td>
<td>28</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Patients with sepsis (n=93)</td>
<td>78.8±11.6</td>
<td>53/40</td>
<td>45</td>
<td>19</td>
<td>17</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>P</td>
<td>0.13</td>
<td>0.52</td>
<td>0.21</td>
<td>0.72</td>
<td>0.86</td>
<td>0.067</td>
<td>0.98</td>
</tr>
</tbody>
</table>

Fig. 1. Schematic summary of the results
A SOFA score value < 2 had a negative predictive value of 97.5% for the combined outcome of mortality or transfer to ICU.

Discussion

The main objectives of this retrospective observational study were to evaluate the prevalence and the clinical outcome of patients with sepsis in a single center of internal medicine.

Prevalence

During the study period, over 40% of all hospitalized patients had a possible bacterial infection treated with antibiotics and, applying the Sepsis 3 criteria, approximately 36% of such patients had a diagnosis of sepsis. Hence, we found an overall prevalence of patients with sepsis equal to 14.6%, a very high rate considering the large number of patients annually admitted to our internal medicine department. Based on these data, we should treat around 450 septic patients per year out of a total of 3,800 hospitalized.

This result indicates that a large number of patients with sepsis are hospitalized outside the ICU, confirming the data by Esteban et al. who found that about 68% of sepsis patients were hospitalized in the ordinary hospital ward (6). This scenario requires an evolution in the organization of the internal medicine wards, to ensure adequate medical and nursing care intensity for patients with sepsis. In addition, internal medicine doctors and nurses should acquire adequate knowledge and skills to treat such complex patients.

Outcome

Our data confirm that the proposed criteria for the new classification of sepsis (infection associated with SOFA score \( \geq \) 2), are useful in an internal medicine unit to select patients with infection and high mortality rate. In the present study, patients with sepsis had a hospital mortality of over 15%, significantly higher than that of patients hospitalized for infection without sepsis criteria (2.5%). Furthermore, we observed that the increase in SOFAs values is associated with an increase in mortality: patients with a SOFAs of 4-5 had an in-hospital mortality of 23% and those with 5-6 of 50%. A similar correlation between the SOFAs values and mortality has been reported in ICU patients (7).

It should be emphasized that our data indicate that a SOFAs <2 has a high negative predictive power (97.5%) for mortality or ICU transfer. Similar data are reported in ICU patients without organ failure (7).

These results suggest the importance of calculating the SOFAs in all patients admitted to internal medicine due to an infection: with this score we are able to identify the subgroup of patients with the worst prognosis, who need prompt and intensive therapeutic interventions.

The calculation of the SOFAs is not very rapid and straightforward, as it involves the collection of six different scores, one for each organ or system assessed (respiratory, cardiovascular, hepatic, coagulative, renal and neurological). Therefore, other simpler scores have been suggested and evaluated, such as qSOFA, MEWS, presence of SIRS and, recently, simplified SOFA. However, none of these has convincingly demonstrated to be better than or equal to the SOFA score in identifying patients with sepsis (8-10). The SOFA score is therefore currently recommended for both clinical activity and clinical trials (11). Recently, the early change of SOFA score has been suggested as a prognostic marker of 28-day sepsis mortality (12).

Limitations of the study

The study has some weaknesses. First, it is a single-center study with a relatively low number of patients. Second, the retrospective design does not ensure that the data is collected correctly and completely and about 10% of patients were excluded due to the inability to calculate the SOFA score. Based on these issues, this study should be considered as a pilot one, and the results should be confirmed by a larger multicenter study with prospective design.
Conclusion

The results of this single-center study suggest that patients with sepsis, identified with the new “Sepsis 3” criteria (infection and SOFAs ≥ 2), are frequently hospitalized in an internal medicine ward, making up 14.6% of all hospitalized patients. These patients are burdened with high in-hospital mortality, and the SOFAs was found to have a high prognostic value even in a medical ward setting.

Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

References