Commentary

Quick sequential organ failure assessment: big databases *vs*. intelligent doctors

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In everyday clinical practice, sepsis has always been considered as a "bad infection" accompanied by some form of associated organ dysfunction (1). In recent years, the importance of identifying sepsis early so that it can be treated promptly has increasingly been highlighted. In this context, we need to look for variables that could be used as early indicators of sepsis on the regular floor, before a patient becomes ill enough to require intensive care. The big question to consider when determining the value of such "indicators" is, "what is their sensitivity?". If the sensitivity is too low, some patients may be missed, but if too high, too many patients may be "flagged" as possibly having sepsis, making practical implementation impossible. In particular, targeting "infection" is inappropriate, because only a minority of patients with infection will become septic and some septic patients may not have an obvious infection (2).

To identify possible clinical sepsis indicators, Seymour *et al*. (3) recently reviewed a database of 1.3 million electronic health records over a three-year period [2010–2012] in 12 hospitals in Pennsylvania to identify patients with suspected infection and assess the risk of death according to the presence of various criteria. The authors then confirmed their initial observations in four datasets of more than 700,000 patients hospitalized in 165 institutions. Impressive? Not really. In this era of "Big Data", we will soon have such large databases available that any database of less than five million people will be considered as quite small! More importantly, these kinds of dataset analyses only confirm what doctors already know. After all, the sequential organ failure assessment (SOFA) score was developed simply by a group of experts in a closed meeting without using large sets of data, and validated only later (4).

Seymour *et al*. (3) found that in the validation cohort of 7,932 patients with suspected or documented infection (with a mortality rate of 16%), the SOFA score was the best prognostic indicator—not a surprising observation. SOFA performed better than the systemic inflammatory response syndrome (SIRS) criteria, but this is not surprising either, because the SIRS criteria primarily reflect the presence of infection and not its severity. After all, don't we usually recognize an infection on the basis of fever, some associated tachycardia, and altered leukocytosis? It is therefore to be expected that the presence of the SIRS criteria would be associated with a worse outcome and that the greater the number of SIRS criteria, the higher would be the mortality rate (5,6). Nevertheless, SIRS is too sensitive to be useful, and almost 50% of all patients on the hospital floor meet the criteria at one time or another (7).

What is important is that all hospital staff should be encouraged to keep in mind the six major types of organ dysfunction when at a patient's bedside (*Table 1*). Is this really so complicated? Some people seem to think so, and this is a reason why the quick SOFA (qSOFA)—including only tachypnea, hypotension, and altered mentation—was developed. In other words, the qSOFA does not take into account other possible signs of organ dysfunction, including a low platelet count, oliguria or increased creatinine concentration, increase in bilirubin concentration or some degree of hypoxemia (a low SpO_2 measured by pulse oximetry). But, if the qSOFA was developed because it was considered that remembering the variables for all six organs was too difficult, it is possible that the three qSOFA elements may also be forgotten—to help, we sometimes use the mnemonic THAM (tachypnea; hypotension; altered mentation). In fact, in the study by Seymour *et al*. (3), the

Table 1 The six major types of organ dysfunction

Organ system	Indicative variables
Cardiovascular	Unexplained hypotension
Respiratory	Unexplained hypoxemia; tachypnea
Neurological	Altered mental status
Renal	New onset of oliguria; increase in creatinine
Hematological	Low platelet count; disseminated intravascular coagulopathy (DIC)
Hepatic	Unexplained rise in bilirubin concentration

predictive value of the qSOFA was little better than that of the SIRS criteria [area under the receiver operating characteristic (ROC) curve of 0.66 *vs.* 0.64], whereas the SOFA score had an area of 0.74. It is important to specify that it is not necessary to know the full details of the SOFA score; these are useful only for scientific publications. It is rather the checklist of the six organs that is important for everyday bedside use.

An obvious advantage of the qSOFA is that it does not require any biological tests. In the future, remote monitoring technology will be used to automatically recognize the various clinical elements, with respiratory rate, heart rate, SpO_2 and cutaneous temperature recorded continuously at the bedside, and regular blood pressure measurements made automatically. Mathematical models that integrate these variables over time will be used to create intelligent alarm systems capable of automatically calling for help by alerting a rapid response team. Before this occurs, however, nurses remain the key members of personnel for recognizing these important alterations (8,9). Indeed, nurses are more often at the bedside and can quickly recognize the indicators of possible sepsis and call for a doctor.

In summary, this approach is actually largely simple commonsense. We are not sure that big databases like those analyzed by Seymour *et al.* (3) are any better than intelligent, experienced doctors who would have easily reached the same conclusions.

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Footnote

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