J. Jacob Rodríguez[a,*], M. Arranz Betegón[b], J. Zorrilla Riveiro[c]

[a] *Servicio de Urgencias, Hospital Universitari de Bellvitge, IDIBELL, Universitat de Barcelona, L'Hospitalet de Llobregat, Barcelona, Spain*
[b] *Servicio de Urgencias, Hospital de Viladecans, Barcelona, Spain*
[c] *Servicio de Urgencias, Xarxa Assistencial de Manresa, Fundació Althaia, Manresa, Barcelona, Spain*

* Corresponding author.
E-mail address: jjacob@bellvitgehospital.cat (J. Jacob Rodríguez).

Usefulness of the PIRO system to predict mortality in patients with severe infection in the emergency department

Utilidad del sistema PIRO para predecir mortalidad en el paciente con infección grave en el servicio de urgencias

Dear Editor:

The management of patients with infectious processes admitted to Spanish emergency rooms (ER) represented 15% of all daily care provided before the start of the COVID-19 pandemic.[1] Also, the severity of infectious processes at their clinical presentation (patients with sepsis, relevant comorbidities, neutropenia, elderly patients with suspected bacteremia, that is, what is known as severe infection), and the 30-day short-term mortality rate have also increased over the last decade.[1]

We carefully read the article recently published by Caramello et al.,[2] and we wish to congratulate the authors over their results and comments they make revealing the difficulties and limitations of the PIRO system (predisposition, infection, response, organ failure)[3] used at the ER as a mortality risk stratification tool and to see the need for ICU admission on a routine daily basis. At the ER, both suspicion and diagnosis of severe infection or sepsis is essential. However, it is also necessary to estimate the prognosis of the patient. To this date, this is often done using the quick Sepsis-related Organ Failure Assessment (qSOFA) score.[4]

We used the database of a recent study conducted at our ER[5] with a similar profile of patients to that used by Caramello et al.[2] to see the predictive capabilities regarding mortality and ICU admission of the PIRO system that obtained better results compared to those analyzed by Howell et al.[3] and compared to the qSOFA score and the 5MPB-Toledo model to predict bacteremia. Therefore, we have reproduced both the inclusion criteria and the methodology published by the authors.[2] Our series included 1263 patients aged >18 years from July 1 2018 through August 1 2019 who met the criteria of sepsis from whom hemocultures were obtained. A total of 57% of these patients were men with a mean age of 59 ± 19 years. The overall mortality rate within the first 24 h was 1.5% while the 30-day mortality rate was 9.8%. The hemocultures of 18% of these patients tested positive while 9% had to be admitted to the ICU. The rate of dead patients according to the PIRO categories was scores <5 (4%); scores from 5 to 9 (12%); scores from 10 to 14 (21%); scores from 15 to 20 (43%), and scores >20 (73%). In our sample, the area under the ROC curve of the PIRO system, the qSOFA score, and the 5MPB-Toledo model score regarding the 30-day mortality rate were 0.753 (95%CI, 0.689–0.817), 0.741 (95%CI, 0.678–0.805), and 0.732 (95%CI, 0.668–0.796), respectively. Regarding the ICU admission, the scores were 0.598 (95%CI, 0.546–0.650), 0.612 (95%CI, 0.560–0.664), and 0.587 (95%CI, 0.535–0.639), respectively. The study was evaluated and approved by the Complejo Hospitalario Universitario de Toledo (Spain) clinical research ethics committee (reference No.: 2019/398).

With these data added to the results obtained from the authors, we believe that the limitations of the PIRO system are enough for us to not back up its use compared to the qSOFA score or even the 5MPB-Toledo model that also predicts the presence of bacteremia.

Authors' contribution

The authors declared that they have designed, developed, and drafted this manuscript.

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Conflicts of interest

None reported.

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R. Rubio Díaz[a], A. Julián-Jiménez[a,b,*]

[a] *Servicio de Urgencias, Complejo Hospitalario Universitario de Toledo, Toledo, Spain*
[b] *Universidad de Castilla La Mancha, Toledo, Spain*

* Corresponding author.
E-mail address: agustinj@sescam.jccm.es
(A. Julián-Jiménez).

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Reply to ''Usefulness of the PIRO system to predict mortality in patients with severe infection in the emergency department''

Respuesta a ''Utilidad del sistema PIRO para predecir mortalidad en el paciente con infección grave en el servicio de urgencias''

Dear Editor,

We read with great interest the letter to the Editor ''Usefulness of the PIRO system to predict mortality in patients with severe infection in the emergency department'' by Dr. Rubio Diaz and Dr. Julián-Jiménez. We congratulate the authors who performed a replication study of ''Validation of the Predisposition Infection Response Organ (PIRO) dysfunction score for the prognostic stratification of patients with sepsis in the Emergency Department''[1] in a big cohort of septic patients from a Spanish Emergency Department (ED). The authors used the PIRO method (by Howell et al.[2]) at the admittance in their ED to predict 30 days mortality and ICU admittance and observed a 30 days mortality rate in their sample that is similar to the original study[1] and to other PIRO validation studies performed in the ED,[2] in hospital wards[3,4] and in the ICU.[3]

Recently Cardoso et al. that validated the original PIRO score in a large cohort of septic patients at admittance in general ward and in ICU[5] obtaining similar results. In my opinion the prognostic role of PIRO for mortality is confirmed by all these studies and it allow to recommend for its use in ED, High Dependency Units and ICU settings aiming to stratify patients with sepsis by the risk of a poor outcome. This categorization is useful to guide clinical management, performing slightly better than the easier qSOFA; however, this complex and comprehensive prognostic staging system is also useful to categorize patients in trials, creating homogeneous populations to evaluate treatment effectiveness without biases and to compare results of different studies.

Both Caramello et al. and Diaz et al. studies showed a reduced performance of PIRO in predicting ICU admissions, that was outperformed by SOFA in the first and by qSOFA and 5MPB-Toledo score in the second. Considering the complexity of obtaining the PIRO calculation in the ED the authors are against its use in the ED to predict ICU admission. Nevertheless, although valuable for its simplicity, in our study qSOFA showed a poor performance and many authors suggest improving qSOFA effectiveness by associating lactates[6] or inflammation markers[7] levels.

Indeed, the usefulness of PIRO to predict ICU admission is lower than SOFA, but this result could be biased by the fact that the clinical decision to admit in ICU is often based on the severity of organ disfunction, strictly related to the SOFA score and described by the ''O'' component only. On the contrary, PIRO includes a more comprehensive evaluation of prognostic factors, pertaining to the individual patient (Predisposition, assessing complexity and frailty), the pathogen (Infection and infection site) and the immune response (Response). It is possible that PIRO stage III and IV could include many older and frail patients who are not eligible for invasive management. The Predisposition, Infection and Response factors, on the contrary, strongly affect morbidity, mortality, hospital length of stay and functional decline after the acute septic event, thus PIRO could perform better in evaluating those outcomes.

I was really interested in reading about the 5MPB-Toledo score, previously validated to predict bacteriaemia.[8] It includes comorbid conditions (by Charlson comorbidity index), infection markers (procalcitonin) immune response (rise in leucocyte count) and severity (temperature and respiratory rate), like a quick version of PIRO. It could be interesting to evaluate if the variables included in the Toledo score are the strongest predictors of mortality among those included in PIRO. I wonder if this tool could be internationally validated for mortality and ICU admission by further studies, better defining the diagnostic and prognostic importance of this score.

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