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LETTER TO THE EDITOR

Development and validation of a prognostic model for predicting flares in generalized pustular psoriasis

Dear Editor,

Generalized pustular psoriasis (GPP) is a rare autoinflammatory skin disease, characterized by recurrent flares of neutrophil-filled sterile pustules.[1] During a flare, the pustules merge into clusters and are accompanied by intense pain, significantly impacting the daily activities and overall physical well-being of GPP patients.[1] If left untreated, GPP flares can progress into life-threatening complications such as heart failure, kidney failure or sepsis.[2] The unpredictability of GPP flare presents an obstacle to effective long-term management and leads to considerable clinical, financial and psychological strain for patients.[3,4] Our previous studies and a recent clinical trial showed that flares are highly prevalent among GPP patients, underscoring the significant importance of predicting and preventing GPP flares.[5,6] Therefore, we conducted this study to elucidate the risk factors of GPP flare, and construct a predictive model grounded in the clinical characteristics of patients to forecast the occurrence of GPP flares.

We established a retrospective cohort of hospitalized GPP patients during 2010–2022 from Xijing Hospital (230 patients, model development) and Tangdu Hospital (34 patients, model validation). The flare information, smoking and alcohol consumption history, as well as treatment options of patients were obtained via telephone interview based on clinical questionnaire. The remaining demographic, clinical, comorbidities and laboratory data were obtained from patients' admission records. Then we developed a predictive model through logistic regression based on this cohort (Figure 1). Multiple imputation was used to fill missing values. The study design and reporting were conducted strictly in accordance with the TRIPOD statement.[7]

GPP flare was defined as the acute onset of erythema with pustules lasting for more than 1 week.[1] Subsequently, we conducted a literature review and categorized GPP based on flare frequency, and patients who experienced ≥1 flare annually were classified as the frequent group: otherwise they were classified as the occasional group. In this study, 230 of the 404 GPP patients were successfully contacted and their clinical information was used in the model development (Figure 1). In multivariate logistic analysis, the history of psoriasis vulgaris (PV) (adjusted odds ratio [OR] = 0.43, 95% CI = 0.20–0.92), risky alcohol use (adjusted OR = 4.90, 95% CI = 1.24–19.31), temperature at fever (adjusted OR = 1.48, 95% CI = 1.07–2.04) and albumin (adjusted OR = 1.08, 95% CI = 1.02–1.16) (Figure 1) were found to be significantly associated with GPP flare. For model development, continuous variables (temperature at fever and albumin) were transformed into binary variables. A predictive model was developed incorporating these four features and delineated as a nomogram for practical application (Figure 2). The predictive model achieved an area under the receiver operating characteristic (ROC) curve of 0.737 (95% CI = 0.668–0.812) with sensitivity of 59.2% and specificity of 74.6% in internal training cohort, and 0.773 (95% CI = 0.571–0.976) in external validation cohort with sensitivity of 72.0% and specificity of 77.8%.

Our model facilitates the immediate evaluation of patients' risk for flares utilizing clinical characteristics recorded at initial admission. It is constituted by four clinical variables: patient history of psoriasis vulgaris and alcohol consumption history, both of which can be retrieved from medical records, alongside albumin levels and temperature, which are standard measurements post-admission. This renders the model both straightforward and expedient in a clinical setting. Nonetheless, the model is subject to certain limitations, including recall bias caused by retrospective collection of patient information and slightly lower sensitivity.

Our model, which is based on a retrospective cohort, has shown encouraging results through rigorous internal and external validation processes. Consequently, we are optimistic that our model will provide critical insights into GPP flare patterns and act as an instrumental tool in the prevention of such episodes.

FUNDING INFORMATION

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CONFLICT OF INTEREST STATEMENT

The authors have declared that no conflict of interest exists.

DATA AVAILABILITY STATEMENT

Due to the confidentiality agreements in place to protect the privacy of individual participants in this study, the underlying data cannot be made publicly available. However, the data may be provided upon a reasonable request directed to the corresponding author.

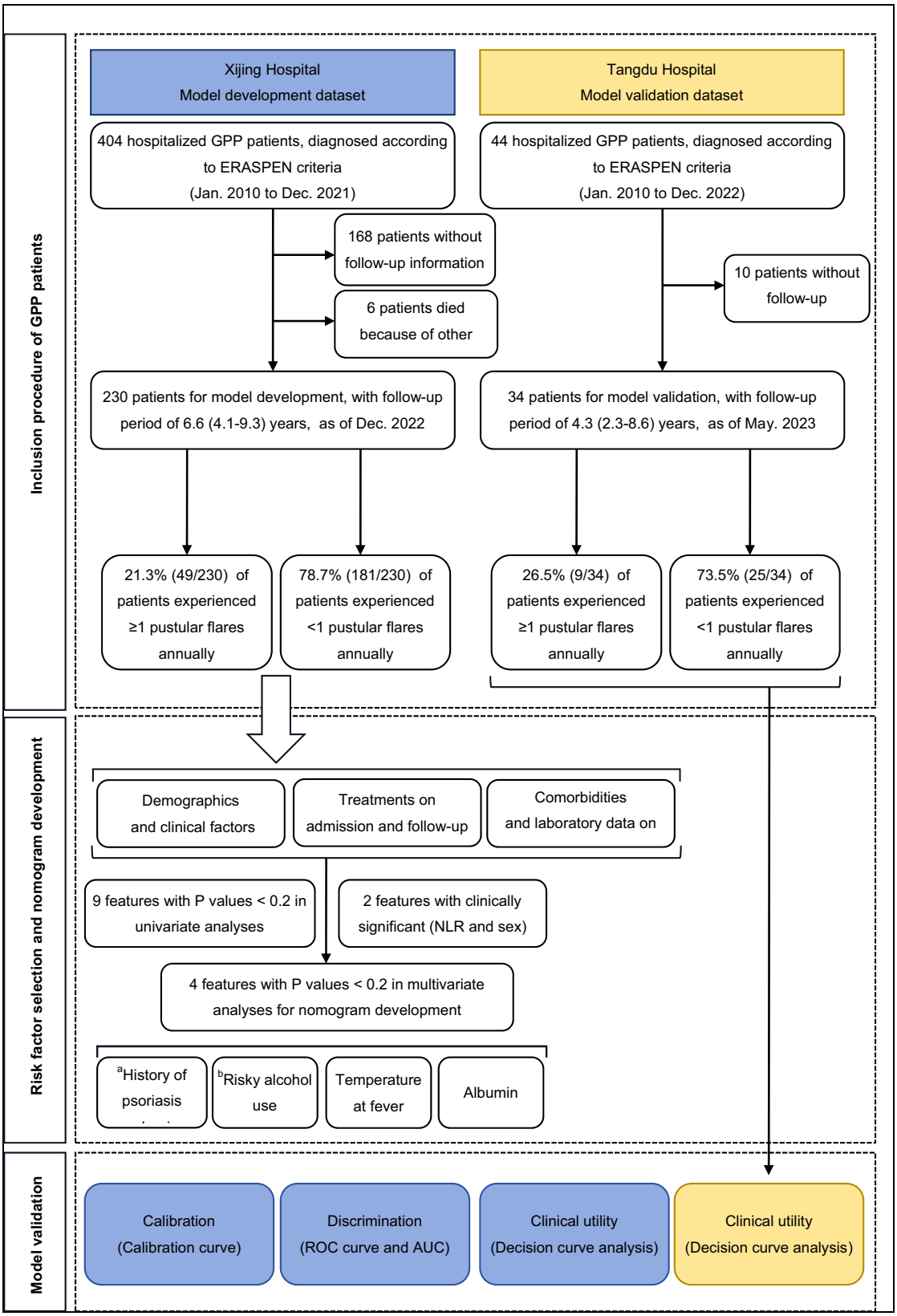

FIGURE 1 The development and validation procedure of a prognostic model for predicting flares in generalized pustular psoriasis. [a]Those who had been diagnosed with psoriasis vulgaris (PV) or had typical skin lesions of PV (well demarcated, salmon-pink plaques covered in silvery scales in white skin or grey plaques in black skin) more than 6 months prior to GPP diagnosis were classified as patients with history of PV. [b]Risky alcohol use was defined as consuming more than three drinks on any day or more than seven standard drinks per week (a standard drink is 12 oz of beer, 8 to 9 oz of malt liquor, 5 oz of wine or 1.5 oz of distilled spirits). AUC, area under the receiver operating characteristic curve; GPP, generalized pustular psoriasis; NLR, neutrophil lymphocyte ratio; ROC curve, receiver operating characteristic curve.

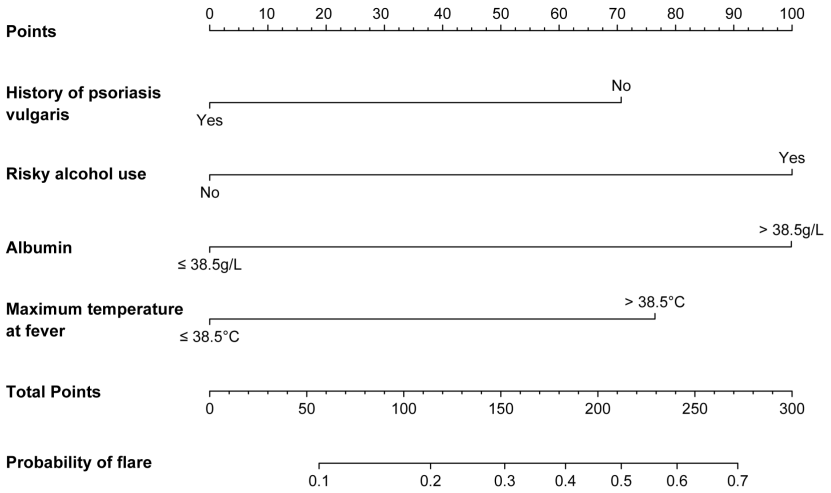

FIGURE 2 The nomogram of generalized pustular psoriasis flare prediction. The logistic regression equation for the nomogram development was logit(p) = −1.995 − 0.997 * (history of psoriasis vulgaris) + 1.411 * (risky alcohol use) + 1.079 * (temperature at fever >38.5°C) + 1.409 * (albumin >38.5 g/L). Each predictor feature is represented by a line segment of varying length, with longer segments indicating greater predictive significance. For instance, in the case of a GPP patient who experiences a flare but without a history of PV, exhibits risky alcohol use, and has an albumin level >38.5 g/L while maintaining a maximum fever temperature ≤38.5°C. Then, according to the nomogram, this patient has a total of 270 points (70 + 100 + 100 + 0). There is a 70% probability that this patient will experience a flare within 1 year.

ETHICS STATEMENT

This study was approved by the ethics committees of Xijing Hospital (KY20222202-X-1), and informed consent was obtained from all subjects enrolled in the study.

Zhongrui Xu[1]
Yanhua Liu[1]
Jingliang Zhang[2]
Tianyu Cao[3]
Jingyi Ma[1]
Junfeng Hao[1]
Huanhuan Qu[1]
Chen Yu[1]
Erle Dang[1]
Gang Wang[1]
Shuai Shao[1]

[1]*Department of Dermatology, Xijing Hospital, Fourth Military Medical University, Xi'an, China*
[2]*Department of Urology, Xijing Hospital, Fourth Military Medical University, Xi'an, China*
[3]*Department of Dermatology, Tangdu Hospital, Fourth Military Medical University, Xi'an, China*

Correspondence
Gang Wang and Shuai Shao, Department of Dermatology, Xijing Hospital, Fourth Military Medical University, Xi'an, China.
Email: xjwgang@fmmu.edu.cn and shaos@fmmu.edu.cn

Zhongrui Xu, Yanhua Liu and Jingliang Zhang contributed equally to this work.

ORCID

Zhongrui Xu https://orcid.org/0000-0002-7403-9851
Yanhua Liu https://orcid.org/0000-0001-5585-3586
Erle Dang https://orcid.org/0000-0003-4761-6673
Gang Wang https://orcid.org/0000-0002-5842-8080
Shuai Shao https://orcid.org/0000-0003-0699-1864

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