PredMGICU User Guidance

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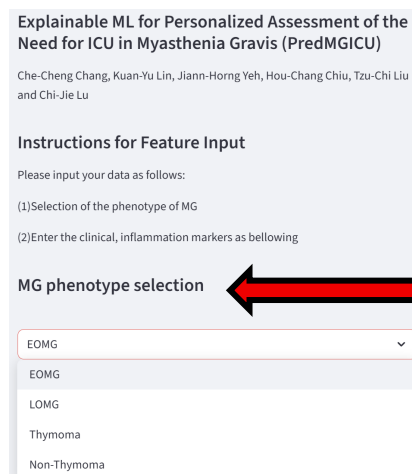
Introduction:

PredMGICU is a web-based calculator designed for predicting intensive care unit (ICU) admission risk in hospitalized patients with Myasthenia Gravis (MG) based on our study: "Explainable Machine Learning Model for Personalized Assessment of the Need for Intensive Care in Patients with Myasthenia Gravis Based on Phenotype and Systemic Inflammation Markers". The platform integrates clinical variables with systemic inflammation markers through an explainable machine learning (ML) approach using SHapley Additive exPlanations (SHAP) analysis. Built on our XGBoost-SHAP model database, the platform provides personalized risk assessments with phenotype-specific analysis capabilities to support precision medicine approaches in MG management.

About the calculator:

The main page introduces the main features of PredMGICU on the left column. The left column includes the following in sequence:

1. **Application Header:** System title and Authors: "Explainable ML for Personalized Assessment of the Need for ICU in MG (PredMGICU)", authored by Che-Cheng Chang, Kuan-Yu Lin, Jiann-Horng Yeh, Hou-Chang Chiu, Tzu-Chi Liu and Chi-Jie Lu.

2. **Simplified instruction for Features Input:** Please enter the data as follows: (1) Selection of the phenotype of MG, and (2) Enter the clinical, inflammation markers as bellowing.

3. **MG Phenotype Stratification:** Users must first select stratification options for MG phenotypes, which include: (1) Thymoma status: thymoma-associated vs. non-thymoma MG. (2) Age at onset: early-onset MG (EOMG, <50 years) vs. late-onset MG (LOMG, ≥50 years).
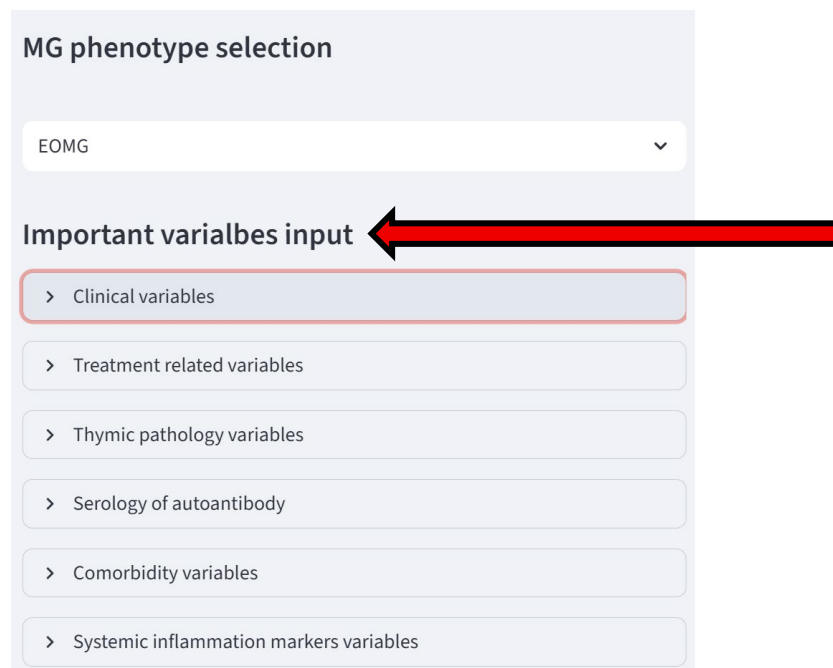
4. **Clinical variables Input Section:** The calculator requires input of clinical variables based on our studies that organized into the following categories:

(1) Clinical variables:

☐ **Age at Onset:** Enter the age at which MG symptoms first manifested. This field is not required if the patient has already been categorized as early-onset MG (EOMG, <50 years) or late-onset MG (LOMG, ≥50 years).

☐ **Disease Duration:** Enter duration in months since MG onset

☐ **Body Mass Index (BMI):** Enter value in kg/m²

(2) Immunosuppressants Variables:

☐ **Prednisolone daily dose before admission (mg):** Enter current dose in mg/day

☐ **Immunosuppressant at admission:** including Azathioprine, Calcineurin, Mycophenolate, Quinine or None of above

(3) Thymic pathology variables

☐ **Thymoma Status:** Present/Absent selection

☐ **Thymic Hyperplasia:** Present/Absent selection

☐ **Thymectomy:** Yes/No selection

(4) Serology of MG related autoantibody

☐ **Anti-AChR:** Yes/No selection

☐ **Anti-MuSK:** Yes/No selection

☐ **dSN:** Yes/No selection

(5) Comorbidity variables

☐ **Infection at admission (Yes/No)**

☐ **Thyroid Disease (Yes/No)**

- ☐ **Diabetes (Yes/No)**
- ☐ **Hypertension (Yes/No)**
- ☐ **Autoimmune disease (Yes/No)**
- ☐ **Atherosclerotic Cardiovascular Disease (ASCVD) (Yes/No)**
- ☐ **Chronic Pulmonary Disease (Yes/No)**
- ☐ **Good's Syndrome (Yes/No)**

(6) Systemic Inflammation Markers variables:

- ☐ **NLR (Neutrophil-to-Lymphocyte Ratio):** Enter calculated ratio
- ☐ **PLR (Platelet-to-Lymphocyte Ratio):** Enter calculated ratio
- ☐ **LMR (Lymphocyte-to-Monocyte Ratio):** Enter calculated ratio
- ☐ **SII (Systemic Immune-Inflammation Index):** Enter calculated index

5. **Start analysis:** To start, click the 'Analysis' button located in the bottom left corner to Prediction of ICU admission in MG. Initiate variable analysis and diagnosis screening. For a detailed user guide, click on the left-side tab to access and read comprehensive instructions."

Prediction result: The prediction results are displayed in interactive visualizations on the right side, featuring:

- o **ICU Risk Prediction:** Positive or negative ICU admission
- o **SHAP Waterfall Plot:** Personalized local explanations showing how each clinical feature contributes to the individual patient's ICU risk. The SHAP waterfall plot displays the base value (expected ICU risk across the training population) and shows how each patient's specific clinical features push the prediction above or below this baseline. Red bars indicate factors increasing ICU risk, while blue bars represent protective factors, with SHAP values arranged in descending order of absolute impact.
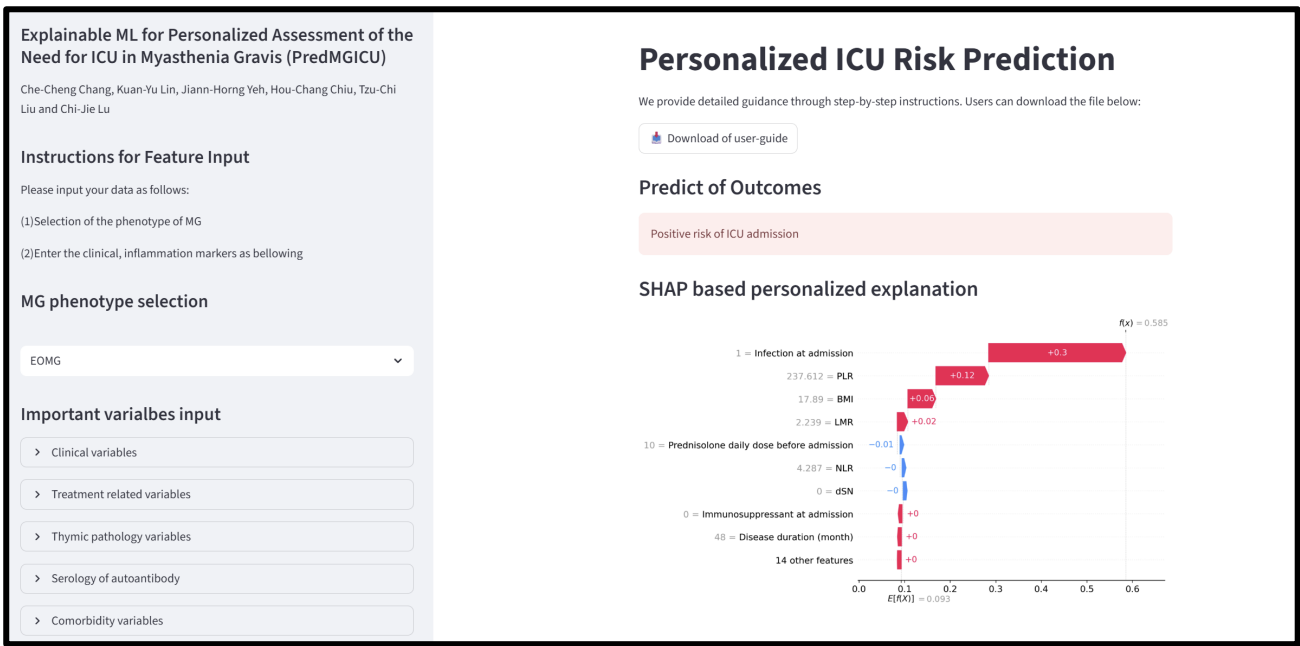
Clinical Decision Support:

The system provides actionable insights for clinical decision-making by highlighting modifiable risk factors and enabling early management strategies. The personalized SHAP explanations help clinicians understand which specific patient characteristics drive the ICU risk prediction, supporting evidence-based treatment adjustments and resource allocation decisions in MG management.