Linear Mixed-Effects Model Analysis of Repeated-Measures Outcomes

To evaluate the effects of comprehensive nursing intervention on patients' anxiety (HAMA), depression (HAMD), sleep quality (PSQI), and pain (VAS) over time, linear mixed-effects models (LMM) were fitted for the repeated-measures data.

Model Specification

Fixed effects: Group (comprehensive nursing vs. control), time (7 days, 14 days, discharge, 1 month), and the group × time interaction were included as fixed effects to assess differences in the trajectories of each outcome between the two groups over time. Baseline values were not additionally adjusted, as the baseline measurement at 7 days was already incorporated into the model as part of the time variable.

Random effects: Patient-specific random intercepts were included to account for between-subject variability in baseline levels and to adjust for within-subject correlations across repeated measurements.

Covariance structure: A compound symmetry (CS) covariance structure was specified for the repeated-measures residuals, assuming constant correlations between measurements at different time points.

Estimation method: Model parameters were estimated using restricted maximum likelihood (REML), with denominator degrees of freedom approximated using the Satterthwaite method.

Missing-data handling: The dataset was complete, with all 142 patients completing follow-up at all time points; therefore, no imputation methods for missing data were applied.