

Excess Days in Acute Care Measure Score Calculation

For the final risk-adjustment model, we used a hierarchical generalized linear model (HGLM). This consists of a Binomial model specified for days in acute care as a proportion of the number of exposure days (alive days up to 30 days post-discharge) and includes random effects for hospitals. This allowed us to account for the within-hospital correlation of the observed outcome and accommodates the assumption that underlying differences in quality across hospitals lead to systematic differences in outcomes.

Explicitly, let Y_{ij} denote the number of days in acute care experienced by the i -th patient discharged from the j -th hospital, and ω_{ij} is the patient's exposure time (the number of days alive up to 30). Let π_{ij} denote the probability of receiving acute care per day for the i -th patient discharged from the j -th hospital, the Binomial model is as below:

$$Y_{ij} \sim \text{Bin}(\omega_{ij}, \pi_{ij})$$
$$\text{logit}(\pi_{ij}|X_{ij}) = X_{ij}C + v_j$$

where $v_j \sim N(C_0, \sigma^2)$ denotes the hospital-specific random effect for hospital j . X_{ij} is a vector of patient risk factors, and C is the vector of covariate coefficients.

We estimated the model and used the coefficient vectors C and the random effects v_j to calculate the predicted and expected days in acute care for each index admission, respectively. Specifically, the predicted number of days is calculated as:

$$\textbf{Predicted} \quad P_{ij} = \text{logit}^{-1}(X_{ij}C + v_j) * \omega_{ij}$$

And, the expected number of days is calculated as:

$$\textbf{Expected} \quad E_{ij} = \text{logit}^{-1}(X_{ij}C + C_0) * \omega_{ij}$$

where C_0 is the mean of the random effects v_j .

We then calculate the EDAC for each hospital j as:

$$EDAC_j = 100 * \sum(P_{ij} - E_{ij})/m_j$$

where the sum is over all patients at hospital j , and m_j is the number of index admissions at hospital j .

To be consistent with the reporting of the CMS 30-day AMI, HF, and pneumonia readmission measures, we have multiplied the final measure by 100 so that EDAC represents EDAC per 100 discharges.