# Intravenous phenytoin: a retrospective analysis of Bayesian forecasting versus conventional dosing in patients

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**Abstract**

**Background:** In the hospital, medication management for effective antiepileptic therapy with phenytoin (PHT) often needs rapid IV loading and subsequent dose adjustment according to therapeutic drug monitoring (TDM).

**Objective:** To investigate PHT performance in reaching therapeutic target serum concentration rapidly and sustainably, a Bayesian forecasting (BF) regimen was compared to conventional dosing (CD), according to the official summary of product characteristics.

**Setting:** A 500–600 bed acute care teaching hospital in Switzerland, serving as a referral centre for neurology and neurosurgery.

**Method:** In a retrospective, single centre, long-term analysis of hospitalized in- and out-patients, all PHT serum tests from the central hospital laboratory from 1997 to 2007 were assessed. The BF regimen consisted of a guided, body weight-adapted rapid IV PHT loading over 5 days with pre-defined TDM time points. The conventional dosage was performed without written guidance. Assuming non-normally distributed data, non-parametric statistical methods for analysis were applied.

**Main outcome measure:** The extent of target therapeutic PHT serum levels (40–80 µmol/L) was measured and compared between the two regimens. Also, the influence of gender and age was analysed.

**Results:** A total of 6'120 PHT serum levels (2'819 BF and 3'301 conventionally dosed) from 2'589 patients (869 BF and 1'720 conventionally dosed) were evaluated and compared. 63.6 % of the PHT serum levels from the BF group were within the therapeutic range, compared with only 34.0 % in the conventional group ($p < 0.0001$). The mean BF serum level was 52.0 ± 22.1 µmol/L (within target range) (n = 2'819), whereas the mean serum level of the CD was 39.8 ± 28.2 µmol/L (sub-target range) (n = 3'301). In the BF group, men had small but significantly lower PHT serum levels compared to women ($p < 0.0001$). The conventionally dosed group showed no significant gender differences ($p = 0.187$). A comparative sub-analysis of age-related groups (children, adolescents, adults, elderly and seniors) showed significantly lower target levels ($p < 0.0001$) for each group in the conventional dosed group, compared to BF.

**Conclusion:** Comparing the two cohorts, BF with the well-defined dose regimen showed significantly better performance in reaching therapeutic PHT serum levels rapidly and for longer duration.

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