

Evaluation of the Utilization of Total Phenytoin Levels in Patients with Hypoalbuminemia and Renal Dysfunction at a Single-Center Academic Medical Center

Elizabeth Ferengul, PharmD, Haley Smith, PharmD, BCPS, BCCCP, Danielle Ricks, PharmD, BCPS, Rose Dastoori, PharmD, BCPS, BCCCP, Clare Olin, PharmD, BCPS, Jennifer Hartenstein, PharmD



Abstract

This is a single-center, retrospective chart review study. Eligible patients were ≥ 18 years who had a phenytoin level drawn at OLOL and required the use of the correction equation. Phenytoin levels were excluded if they were collected >2 hours before the next phenytoin dose or an albumin level was not drawn within 72 hours of the level. Phenytoin levels were collected from the EMR and corrected using the Winter-Tozer equation below. Corrected levels <10 mcg/mL and >20 mcg/mL require a dose change.

If CrCl <20 ml/min \rightarrow Corrected Total Phenytoin = (total phenytoin) / [(0.2*albumin) + 0.1]

If CrCl >20 ml/min \rightarrow Corrected Total Phenytoin = (total phenytoin) / [(0.275*albumin) + 0.1]

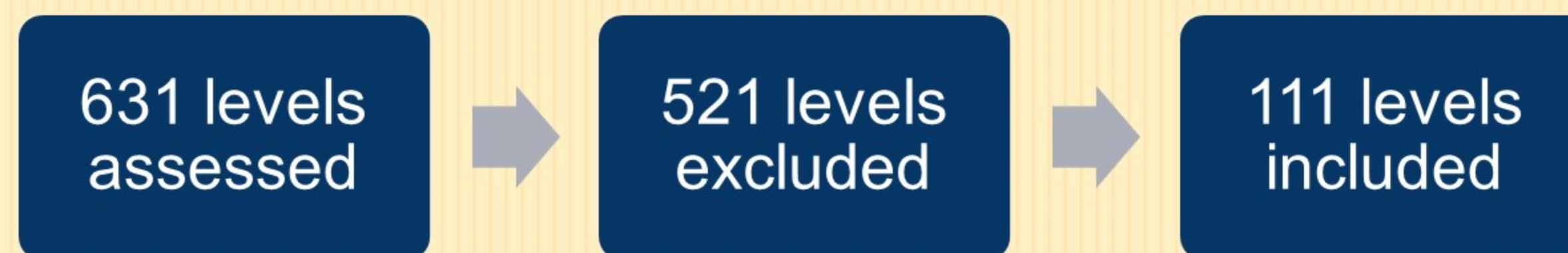
Objective

Primary:
To determine whether phenytoin doses are adjusted in patients with hypoalbuminemia and renal dysfunction

Secondary

- To determine if patients with high corrected phenytoin levels experienced side effects
- Percent of time a dose was changed when the corrected level was therapeutic
- Percent of time the dose was not changed when the corrected level was subtherapeutic or supratherapeutic

Methods



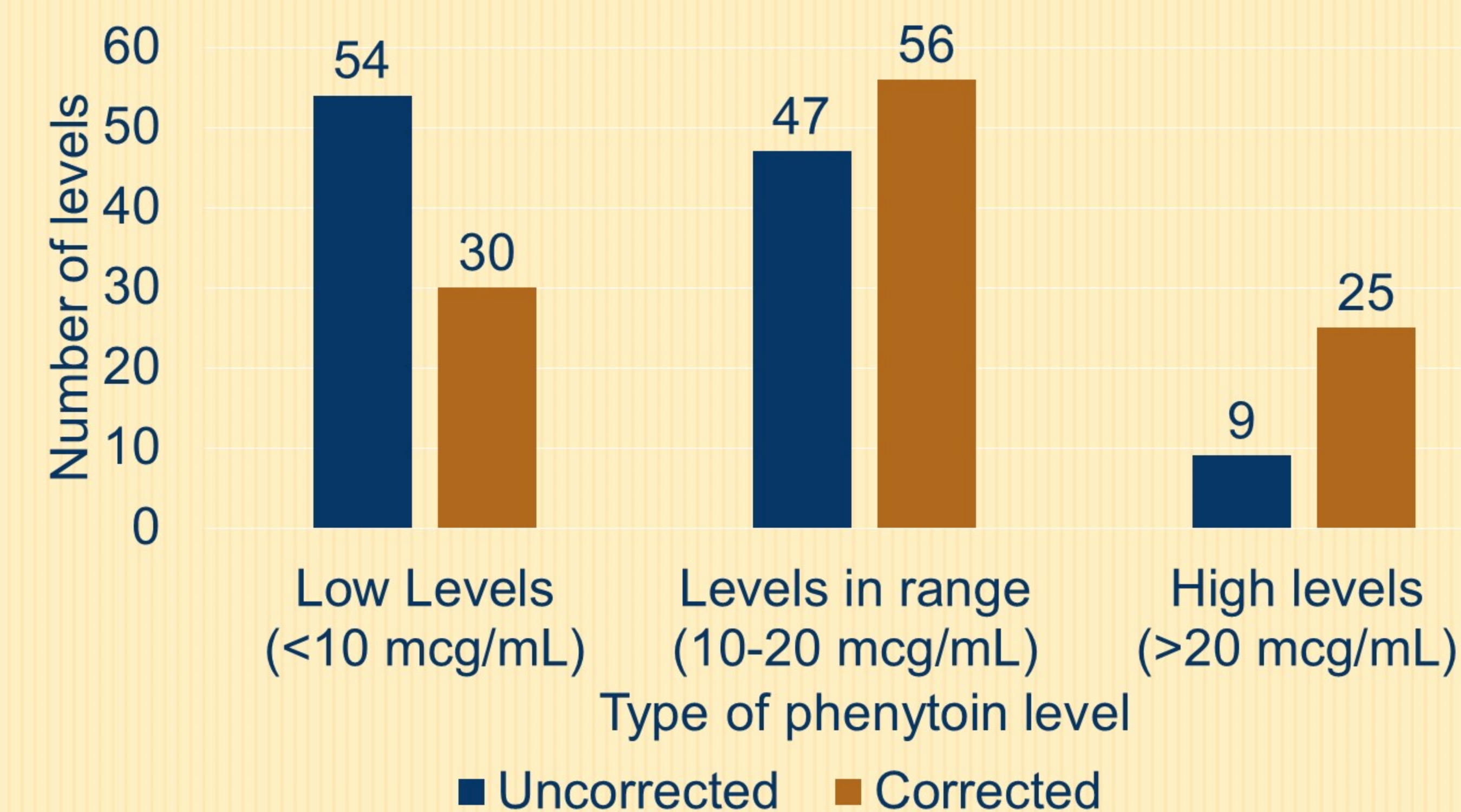
Reasons for exclusion	
Albumin level ≥ 3.2 mcg/mL and CrCl ≥ 20 ml/min	224
Level was obtained ≥ 2 hours prior to the next dose	162
Phenytoin level was undetectable	90
No albumin level within 72 hours of phenytoin level	45

Demographics	Data (n=111)
Age years, (range)	47 (18-92)
Male, n (%)	66 (60)
Albumin level g/dL, (range)	2.4 (1.3-3.2)
Creatinine mg/dL, (range)	1.15 (0.38-4.57)
CrCl ml/min, (range)	220.57 (15.23-321.96)

- Steps of data collection are as follows
- Assess each phenytoin level separately based on inclusion and exclusion criteria
 - Determine if the dose was adjusted based on the phenytoin level
 - Calculate the corrected total phenytoin level
 - Assess if the corrected level requires a dose adjustment
 - Determine if a dose was adjustment is indicated and documented

Results

	Total number of corrected levels	Number of doses continued	Number of doses adjusted	Dose Increased	Dose Decreased	Dose Discontinued
Low levels (<10 mcg/mL)	30	22 (73%)	8 (26%)	5	2	1
Levels in range (10-20 mcg/mL)	56	48 (84%)	8 (14%)	4	1	3
High levels (>20 mcg/mL)	25	20 (80%)	5 (20%)	0	3	2



48% of Phenytoin levels were not adjusted correctly

Side effects, n (%)	Number of patients (n=55)
Coma	15 (27)
Tremors	10 (18)
Nystagmus	3 (5)
Slurred Speech	3 (5)
Ataxia	2 (3)

Discussion and Conclusion

- 48% of phenytoin levels are not adjusted based on the corrected equation value
- 80% of high levels were not adjusted

Reference

- Kiang TK, Ensom MH. A Comprehensive Review on the Predictive Performance of the Sheiner-Tozer and Derivative Equations for the Correction of Phenytoin Concentrations. Ann Pharmacother. 2016 Apr;50(4):311-25. doi: 10.1177/1060028016628166. Epub 2016 Jan 29. PMID: 26825643.