Appendix 1:

Biochemistry values of a **4 year-old** Domestic shorthair cat with a Body Condition Score **(BCS) of 4**/9:

Creatinine (mg/dL)	Blood Urea Nitrogen (BUN) (mg/dL)	Albumin (g/dL)	Total calcium (mg/dL)	Potassium (mmol/L)	Chloride (mmol/L)	GGT (U/L)	Cholesterol (mg/dL)
RI: 0.4-1.6	RI: 18-38	RI: 2.8-4.1	RI: 8.8-10.2	RI: 3.6-5.3	RI: 109-126	RI: 0-3	RI: 66-160
14	249	3	11.6	2.8	105	0	189

The MARS model can be used to obtain the predicted ionized calcium. Each hinge function is calculated first. Hinge functions are under the form: $h(x - t)$ or $h(t - x)$. If $(x - t)$ or $(t - x)$ is 0 or negative, the hinge function equals 0. If $(x - t)$ or $(t - x)$ is positive, the hinge function equals $(x - t)$ or $(t - x)$, respectively. The coefficients are then applied to each hinge function. Predicted ionized calcium is finally obtained by summing all the products of the hinge functions and their coefficient and the intercept of the model:

Hinge function of the predictors	Value of the hinge function	Coefficient	Product of the hinge function and its coefficient
(Intercept)	-	1.32146983	1.32146983
h (6.8 – creatinine)	h(6.8 – **14**) = 0	-0.01343127	0 * (-0.01343127) = 0
h (creatinine – 6.8)	h(**14** – 6.8) = 7.2	-0.01683551	7.2 * (-0.01683551) = -0.121
h (82 – BUN)	h(82 – **249**) = 0	0.00126050	0 * 0.00126050 = 0
h (albumin – 2.7)	h(**3** – 2.7) = 0.3	-0.06398259	0.3 * (-0.06398259) = -0.019
h (11 – total calcium)	h(11 – **11.6**) = 0	-0.06373329	0 * (-0.06373329) = 0
h (total calcium – 11)	h(**11.6** – 11) = 0.6	0.09763819	0.6 * 0.09763819 = 0.058
h (Potassium – 5.6)	h(**2.8** – 5.6) = 0	0.03565030	0 * 0.03565030 = 0
h (115 – chloride)	h(115 – **105**) = 10	-0.00476348	10 * (-0.00476348) = -0.048
h (3 – GGT)	h(3 – **0**) = 3	0.00999586	3 * 0.00999586 = 0.029
h (76 - cholesterol)	h(76 – **189**) = 0	-0.00990447	0 * (-0.00990447) = 0
h (age – 16)	h(**4** – 16) = 0	0.00946669	0 * 0.00946669 = 0
h (4.5 – BCS)	h(4.5 – **4**) = 0.5	0.01128579	0.5 * 0.01128579 = 0.005
		piCa ± 2*regression standard error	**1.23 mmol/L [1.12 – 1.34]**

Bolded values in the 'Value of the hinge function' column represents patient's values. piCa: predicted ionized calcium. Regression standard error = 0.0536.

Although total calcium was consistent with hypercalcemia (tCa =11.6 mg/dL; RR: 8.8 – 10.2), predicted ionized calcium classified the patient as normocalcemic (piCa = 1.23 mmol/L; RR: 1.14 – 1.33). However, the clinician should consider the slight possibility that the ionized calcium could be in the low normal or high normal range based on the prediction interval (1.12 – 1.34 mmol/L). Measured ionized calcium also classified this patient as normocalcemic (iCa = 1.18 mmol/L, RR: 1.14 – 1.33).

Table S1. Reference intervals of biochemical parameters identified as predictors in the MARS model at the University of Illinois Veterinary Teaching Hospital (2 analyzers: Hitachi 917 Automatic and Olympus AU680) and the Royal Veterinary College Queen Mother Hospital for Animals.

Variable	University of Illinois Veterinary Teaching Hospital (Hitashi 917 Automatic)	University of Illinois Veterinary Teaching Hospital (Olympus AU680)	Royal Veterinary College Queen Mother Hospital for Animals (Beckman coulter AU50800)
Total calcium (mg/dL)	8.4-10.8	8.8 – 10.2	8.2 – 11.8
Chloride (mmol/L)	112-124	109 – 126	100 – 124
Albumin (g/dL)	2.7-3.8	2.8 – 4.1	2.5 – 4.5
Cholesterol (mg/dL)	63-130	66 – 160	85 – 155
Creatinine (mg/dL)	0-1.5	0.4 – 1.6	0.2 – 2.0
BUN (mg/dL)	14-34	18 – 38	7 – 28*
GGT (U/L)	0-3	0 – 3	NA
Potassium (mmol/L)	3.8-5.4	3.6 – 5.3	3.5 – 5.5

*Converted from Urea (mmol/L) by dividing by converting factor .357.