

## SUPPLEMENTARY FILE A1

### LEGEND OF VARIABLES

<b>Variable</b>	<b>Definition</b>
Electrolyte (hypo = 1, hyper = 2)	
Ca	Calcium
Mg	Magnesium
PO	Phosphorus
Comorbidities	
sexe	Sex (female = 1, male = 0)
c_CAD	Coronary artery disease
c_HF	Heart failure
c_PAD	Peripheral artery disease
c_stroke	Stroke or TIA
c_DEM	Major neurocognitive disorder
c_COPD	Chronic obstructive pulmonary disease
c_Rhum	Rheumatismal disease (e.g., rheumatoid arthritis, polymyalgia rheumatica) or connective tissue disorder (e.g., Lupus, Sjogren syndrome, erythrodermia, other connectivitis)
c_ULCUS	Peptic ulcer disease
c_HEPmild	Mild hepatic disease (includes chronic hepatitis)
c_HEPsev	Moderate or severe hepatic disease (includes portal hypertension)
c_Db	Diabetes type 1 or 2
c_PLEGIA	Hemiplegia, paraplegia
c_HIV	HIV, AIDS
c_NEO	Neoplasia
c_MET	Solid metastatic tumor
c_ENDO	Endocrinian disease: (e.g., Hypo/ hyperthyroidia, hypo/hyperparathyroidia, adrenal insufficiency, Cushing disease, Addison disease, multiple endocrinian neoplasias (MEN), pheochromocytoma) Diabetes mellitus not included
c_GRANUL	Granulomatous disease (e.g., Tuberculosis, histoplasmosis, sarcoidosis, berylliosis, coccidioidomycosis)
c_MALNUT	Chronic malnutrition, malabsorption syndrome
C_CONSTIP	Chronic constipation
CKD	Chronic kidney disease/chronic kidney injury
Medication	
rx1_furosem	Furosemide
rx2_thiazid	Thiazid diuretic

rx3_otherdiur	Other diuretics: potassium sparing (e.g., spironolactone, eplerone, amiloride, triamterene) and acetazolamide
rx4_digoxin	Digoxin (lanoxin)
rx5_PPI	Proton pump inhibitor
rx6_antiH	Antiacids (tums, maalox, diovol)
rx7_lithium	Lithium
rx8_anticonv	Anticonvulsivant (lyrica, gabapentin, benzodiazepines not included)
rx9_osteoptx	Antiosteoporotic tx (Biphosphonates, synthetic PTH (Forteo), Denosumab (prolia), calcitonin)
rx10_calcium	Calcium
rx11_oothermineral	Other mineral supplements
rx12_vitD	Vitamin D
rx13_oothervit	Other vitamin supplement
rx14_laxative	Laxatifs (Lax-a-day, relaxa, etc.) (excludes colace and sennokot)
rx15_chimio	Antineoplastic treatment (e.g., chemotherapy, plaquenil, letrozole)
rx16_immunomod	Immunomodulators and anti-reject treatment (e.g., cyclosporine, tacrolimus, sirolimus)
rx17_corticoid	Corticosteroid (> 30 days/year or in past 15 days)
rx18_theophyl	Theophyllin
rx19_phosbind	Phosphate-binders (Renvela)
rx20_calcimim	Calcimimétiques (Sensipar)
roh	Known alcoholism or 3 or more drinks/day

## Signs and symptoms

### Neurological

seizure	Seizure (on history or on presentation)
weakness	Weakness (focal or generalized)
paresthesias	Paresthesias
tremor	Tremor or parkinsonism (pill rolling)
altered_mental_status	Altered mental status (coma, confusion, disorientation, excessive somnolence, GCS<15)
headache	Headache
gait_disturbance	Gait disturbance (Ataxia, limping, cerebellar signs)
memory_loss	Mnesic symptom
tetany	Tetany, trismus
hypotonia	Hypotonia
osteotendinousreflex_dc	Diminution of osteotendinous reflexes (1+ and less on 4)
osteotendinousreflex_inc	Increase of osteotendinous reflexes (2+ and more on 4)
chvostek	Chvostek sign
trousseau	Trousseau sign

### Gastrointestinal

abdominal_pain	Abdominal pain
nauseas	Nauseas or vomiting
anorexia	Anorexia or diminution of appetite
constipation	Constipation
dysphagia	Dysphagia
ileus	Ileus or loss of peristaltism

#### Cardiovasculaire

palpitations	Palpitations or arrhythmias
syncope	Syncope or presyncope
poor_peripheral_perfusion	Poor peripheral perfusion (e.g., capillary refill > 2 seconds, cutaneous fold, dry mucosis)
HF	Heart failure signs (e.g., Jugular distension, positive hepatojugular reflux, crepitus on auscultation, leg swelling)
Inc_WOB	Increased work of breathing (dyspnea, accessory muscle use, respiratory noises, tachypnea, cyanosis) or O2 requirements

#### Musculoskeletal

msk_painNS	Non specific musculoskeletal pain, muscle cramp or spasms
bone_pain	Bone pain
osseous_deform	Osseous deformation
fracture	Fracture

#### Nephrologic

polyuria	Polyuria
nycturia	Nycturia
polydipsia	Polydipsia

#### Miscellaneous

weight_loss	Weight loss
blurry_vision	Blurry vision
depression	Depressive symptoms
cutaneous_xerosis	Cutaneous xerosis
pigmentation_change	Hyperpigmentation of the skin

#### Clinical

hc1	heart rate at triage
sbp1	systolic blood pressure at triage
dpb1	diastolic blood pressure at triage

#### Paraclinical

ca1	Initial calcium serum level
-----	-----------------------------

mg1	Initial magnesium serum level
po1	Initial phosphorus serum level
creat	Creatinin
gluco	Blood glucose level
Na	Sodium
K	Potassium
Cl	Chlorus
albu	Albumin
pH	blood pH
HCO3-	Bicarbonates level
TSH	TSH

#### ECG

ecg	Sinus rythm
ecg2	Sinus bradycardia
ecg3	Sinus tachycardia
ecg4	Small QRS tachycardia (< 120 ms)
ecg5	Large QRS tachycardia (> 120 ms)
ecg6	First degree AV block
ecg7	2nd or 3rd degree AV block
ecg8	Large QRS( > 120 ms)
ecg9	Long PR (> 200 ms)
ecg10	Long QTc( > 440 ms in men, > 460 ms in women)
ecg11	Short QTc (< 360 ms in men, < 370 ms in women)
ecg12	Diffuse ST segment elevation
ecg13	Pacemaker rythm

#### Treatment

tx

- 0 No intervention
- 1 Therapeutic intervention by ED physician in the ED (including referral to family physician or specialist)
- 2 Therapeutic intervention by a consulting physician while in the ED or within 24 hours of hospitalisation

SUPPLEMENTARY FILE A2

REFERENCE RANGE FOR ELECTROLYTE SERUM LEVEL TESTING

<b>Electrolyte</b>	<b>Reference range (<math>\mu\text{mol/L}</math>)</b>
<b>Calcium</b>	2,15 – 2,60
<b>Magnesium</b>	0,70 – 0,98
<b>Phosphorus</b>	0,80 – 1,45

SUPPLEMENTARY FILE A3  
LOGISTIC REGRESSION MODELS FOR RISK FACTORS OF ELECTROLYTE  
ABNORMALITY

**Final stepwise logistic model – Hypocalcemia**

Factors entered in model: ROH, CKD, c\_COPD, c\_Db, c\_PAD, c\_Neo, c\_Endo, rx1\_furosem, rx3\_otherdiur, rx5\_PPI, rx11\_othermineral, rx15\_chimio, rx17\_corticoid, rx19\_phosbind, Seizure, Abdominal\_pain, poor\_peripheral\_perfusion, inc\_WOB, HF, PO, Mg, Sex, ecg10, Age\_yr

Response Profile		
Ordered value	ca	Total frequency
1	1	128
2	0	715

*Probability modeled is ca='1'.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
ROH	1	5.7926	0.0161
CKD	1	8.4414	0.0037
Abdominal_pain	1	7.4045	0.0065
po	2	14.3403	0.0008
mg	2	22.1457	<.0001
rx15_chimio	1	7.8776	0.0050
rx3_otherdiur	1	5.8485	0.0156
inc_WOB	1	11.1945	0.0008
ECG10_NEW	2	11.1105	0.0039

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limit	
ROH 1 vs 0	1.964	1.134	3.404
CKD 1 vs 0	1.972	1.247	3.117
Abdominal_pain 1 vs 0	1.940	1.204	3.126
po 1 vs 0	1.887	1.075	3.311
po 2 vs 0	3.003	1.598	5.644
mg 1 vs 0	2.627	1.636	4.217
mg 2 vs 0	0.271	0.083	0.887
rx15_chimio 1 vs 0	2.293	1.284	4.092
rx3_otherdiur 1 vs 0	3.243	1.250	8.414
inc_WOB 1 vs 0	3.316	1.643	6.692
ECG10_NEW 1 vs 0	2.021	1.249	3.268
ECG10_NEW UNKNOWN vs 0	0.903	0.532	1.532

## Final stepwise logistic model – Hypercalcemia

Factors entered in model: c\_NEO, c\_MET, c\_ENDO, rx1\_furosem, rx12\_vitD, rx13\_othervit, rx16\_immunomod, Hallucinations, Altered\_mental\_status, weight\_loss, bone\_pain, Mg, PO, sex, Age\_yr

Response Profile		
Ordered value	ca	Total frequency
1	2	35
2	0	763

*Probability modeled is ca='2'.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Hallucinations	1	4.8770	0.0272
po	2	10.2379	0.0060
rx1_furosem	1	4.6418	0.0312
rx12_vitD	1	13.8420	0.0002
bone_pain	1	11.1254	0.0009

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limit	
Hallucinations 1 vs 0	3.907	1.166	13.092
po 1 vs 0	1.625	0.570	4.638
po 2 vs 0	4.566	1.791	11.638
rx1_furosem 1 vs 0	0.107	0.014	0.818
rx12_vitD 1 vs 0	4.101	1.950	8.627
bone_pain 1 vs 0	5.681	2.047	15.767

## Final stepwise logistic model – Hypomagnesemia

Factors entered in model: c\_COPD, c\_DB, c\_NEO, c\_ENDO, c\_RHUM, c\_MET, rx5\_PPI, rx10\_calcium, rx11\_othermineral, rx12\_vitD, rx13\_othervit, rx14\_laxative, rx15\_chimio, rx16\_immunomod, rx17\_corticoid, poor\_peripheral\_perfusion, CKD, Seizure, Paresthesias, Nauseas, Ca, PO, Sex, Age\_yr

Response Profile		
Ordered Value	mg	Total frequency
1	1	155
2	0	725

*Probability modeled is mg='1'.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Nauseas	1	7.2419	0.0071
ca	2	13.7765	0.0010
po	2	6.5710	0.0374
c_DB	1	25.0577	<.0001
rx10_calcium	1	6.3932	0.0115
rx17_corticoid	1	8.6505	0.0033

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limit	
Nauseas 1 vs 0	1.774	1.168	2.693
ca 1 vs 0	2.335	1.481	3.682
ca 2 vs 0	1.689	0.690	4.132
po 1 vs 0	1.816	1.102	2.992
po 2 vs 0	0.785	0.390	1.579
c_DB 1 vs 0	2.682	1.823	3.947
rx10_calcium 1 vs 0	1.641	1.118	2.408
rx17_corticoid 1 vs 0	2.202	1.301	3.725



## Final stepwise logistic model – Hypermagnesemia

Factors entered in model: c\_PAD, c\_COPD, c\_DB, c\_NEO, c\_ENDO, c\_stroke, CKD, rx1\_furosem, rx3\_otherdiur, rx10\_calcium, rx11\_othermineral, rx12\_vitD, rx14\_laxative, rx19\_phosbind, poor\_peripheral\_perfusion, Seizure, Altered\_mental\_status, HF, inc\_WOB, Ca, Sex,

Response Profile		
Ordered Value	mg	Total Frequency
1	2	48
2	0	678

*Probability modeled is mg='2'.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
CKD	1	12.8094	0.0003
ca	2	9.0003	0.0111
rx1_furosem	1	7.7259	0.0054
poor_peripheral_perfusion	1	8.4509	0.0036
po1	1	25.3747	<.0001

Odds Ratio Estimates				
Effect		Point Estimate	95% Wald Confidence Limits	
CKD 1 vs 0		3.771	1.823	7.802
ca 1 vs 0		0.153	0.043	0.543
ca 2 vs 0		1.488	0.355	6.235
rx1_furosem 1 vs 0		2.993	1.382	6.483
poor_peripheral_perfusion 1 vs 0		4.012	1.572	10.234
po1		3.683	2.218	6.117

## Final stepwise logistic model – Hypophosphatemia

Factors entered in model: c\_CAD, c\_PAD, c\_COPD, c\_HEPmild, c\_DB, c\_NEO, c\_ENDO, rx1\_furosem, rx5\_PPI, rx15\_chimio, Weakness, Seizure, Abdominal\_pain, poor\_peripheral\_perfusion, HF, Ca, Mg, Sex, Age\_yr

Response Profile		
Ordered Value	po	Total Frequency
1	1	109
2	0	738

*Probability modeled is po='1'.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Seizure	1	12.3996	0.0004
ca	2	13.8826	0.0010
mg	2	9.7105	0.0078
sex	1	5.8349	0.0157

Odds Ratio Estimates				
Effect		Point Estimate	95% Wald Confidence Limits	
Seizure	1 vs 0	3.991	1.847	8.623
ca	1 vs 0	2.534	1.510	4.250
ca	2 vs 0	2.303	0.831	6.381
mg	1 vs 0	1.966	1.205	3.206
mg	2 vs 0	0.232	0.031	1.761
sex	1 vs 0	0.594	0.389	0.906

## Final stepwise logistic model – Hyperphosphatemia

Factors entered in model: c\_CAD, c\_PAD, c\_COPD, c\_DB, c\_ENDO, c\_stroke, CKD, rx1\_furosem, rx3\_otherdiur, rx5\_PPI, rx10\_calcium, rx11\_oothermineral, rx12\_vitD, rx19\_phosbind, Weakness, Seizure, Abdominal\_pain, Altered\_mental\_status, poor\_peripheral\_perfusion, HF, inc\_WOB, Nauseas, Palpitations, Paresthesias, Ca, Mg, Sex, Age\_yr

Response Profile		
Ordered Value	po	Total Frequency
1	2	80
2	0	690

*Probability modeled is po='2'.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Abdominal_pain	1	4.5367	0.0332
ca	2	12.6984	0.0017
mg	2	15.8151	0.0004
c_PAD	1	4.9505	0.0261
CKD	1	20.1999	<.0001
rx19_phosbind	1	6.5318	0.0106
Age_yr	1	9.4269	0.0021

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
Abdominal_pain 1 vs 0	1.897	1.052	3.419
ca 1 vs 0	2.386	1.247	4.567
ca 2 vs 0	4.185	1.533	11.425
mg 1 vs 0	1.008	0.486	2.093
mg 2 vs 0	4.477	2.117	9.464
c_PAD 1 vs 0	2.249	1.101	4.593
CKD 1 vs 0	4.124	2.223	7.651
rx19_phosbind 1 vs 0	4.788	1.441	15.912
Age_yr	0.977	0.963	0.992

SUPPLEMENTARY FILE A4

LOGISTIC REGRESSION MODEL FOR RISK FACTORS OF THERAPEUTIC INTERVENTION FOR ANY CALCIUM, MAGNESIUM OR PHOSPHORUS ABNORMALITY

**Final stepwise logistic model**

Factors entered in model: c\_PAD, c\_COPD, c\_DB, c\_MET, CKD, rx3\_otherdiur, rx10\_calcium, rx12\_vitD, rx19\_phosbind, rx20\_calcimim, Anorexia, Altered\_mental\_status, Nauseas, poor\_peripheral\_perfusion, Abdominal\_pain, ECG3\_NEW, sex, Age\_yr,

Response Profile		
Ordered Value	Tx_Dicho	Total Frequency
1	1	84
2	0	855

*Probability modeled is Tx\_Dicho=1.*

Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
Age_yr	1	7.6377	0.0057
Nauseas	1	5.9702	0.0145
c_COPD	1	5.1889	0.0227
rx10_calcium	1	13.5125	0.0002
poor_peripheral_perfusion	1	7.5446	0.0060
ECG3_NEW	2	12.1006	0.0024
rx20_calcimim	1	6.8256	0.0090

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
Age_yr	0.981	0.968	0.995
Nauseas 1 vs 0	1.915	1.137	3.224
c_COPD 1 vs 0	1.998	1.101	3.624
rx10_calcium 1 vs 0	2.656	1.578	4.470
poor_peripheral_perfusion 1 vs 0	2.542	1.306	4.946
ECG3_NEW 1 vs 0	2.020	1.007	4.052
ECG3_NEW UNKNOWN vs 0	0.520	0.291	0.929
rx20_calcimim 1 vs 0	10.826	1.813	64.644