Electrolytes imbalances

K Potassium		
3.4 – 5.5 mmol/L		
Problem	**Hyperkalemia**	Hypokalemia
Causes	- Acidosis - **NA/K ATPase** dysfunction : Beta blockers , Digoxin , ↓ Insulin - Massive **Cell breakdown** - Impaired **renal** function : low GFR - ↓ **Aldosterone** : Addison disease - Dehydration	- Alkalosis - GI losses: Diarrhea , vomiting , Laxatives - Renal losses: diuretic - Insufficient dietary intake - ↑ **Aldosterone :** hyperaldosteronism - Rapid transcellular shift : Insulin therapy , beta2 agonist (Epinephrine)
Clinical features	Arrhythmias ECG changes **progress** through → tall, peaked T waves → QRS widening → PR interval prolongation → loss of P waves → **a sine wave pattern.**	Arrhythmias ECG change: Flattening of T waves ,U waves appear if severe.
Treatment	- Reduce Cardiac muscle irritability with IV Ca gluconate membrane stabilizer(only if EKG changes) - Push K into cells : insulin, Sodium bicarbonate , beta agonist - Remove the K load : loop diuretics(furosemide) , dialysis	- Stop the loss : treat underlying causes - Replace lost K with K (Should not be administered at rate greater than 10-20 mmol/hr , if greater it will lead to thrombophlebitis)

Calcium Ca

8.5 to 10.5 mg/dL

Problem	Hypercalcemia	Hypocalcemia
Causes	- ↑ intestinal absorption : ↑ intake of Ca , vitamin D - ↑ Renal reabsorption : **Thiazide** diuretics - ↑ bone resorption : immobilization, metastasis - ↑ PTH : hyperparathyroidism , malignancy - ↑ Vitamin D	- ↓ intestinal absorption : ↓ intake - ↓ renal reabsorption : **loop** diuretics - ↓ PtH : hypoparathyroidism - ↓ Vitamin D : renal failure - Bone remodeling: Hungry bone syndrome " post parathyroidectomy"
Clinical features	- Cardiac : shortened QT interval - Neuromuscular : muscle weakness - **STONES**: Nephrocalcinosis , Nephrogenic diabetes inspidus , dehydration - Bones : bones pain - GIT : Abdominal pain , N/V , pancreatitis, peptic ulcer	- Cardiac : Prolonged QT interval - Neuromuscular : Paresthesia , spasm "tetany" , Chvostek sign , Trousseau sign. - Neuropsychiatric: Seizure
Treatment	give fluid for hydration then look for the cause : either PTH dependent , or PTH independent.	replacing Ca either orally or IV , then treat the underlying causes.

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