CASE STUDY #1

A 55 year old female with lung cancer was admitted to your unit. She c/o increasing fatigue, SOB with activity, and decreased ability to perform mental functions. She has been drinking more fluids in response to increased thirst but is not urinating as much. She has gained over 5 lbs the past week despite decreased appetite and abdominal cramping. Lab values show: K+ 3.5, Na+ 126, Cl- 90, serum osmolality 260 mOsm/L, and urine osmolality 450 mOsm/L.

1. What do you suspect is going on with this client?
   
   SIADH (syndrome of inappropriate antidiuretic hormone) r/t oat cell carcinoma resulting in hypervolemia & hyponatremia

2. Underline the signs and symptoms associated with this condition.
   
   increased fatigue and thirst but decreased urination, SOB with activity, and decreased ability to perform mental functions, 5+ lb. weight gain, decreased appetite and abdominal cramping.

3. If untreated, what additional signs and symptoms would you expect to see?
   
   neuro s/s: headache, convulsions, coma
   Nausea, vomiting
   Fluid overload: increased BP & CVP, possible CHF, pulmonary edema

4. What treatment modalities would you expect the physician to consider?
   
   Goal: restore normal fluid volume and osmolality
   May include: fluid restriction; if needed, hypertonic saline IV, diuretic (furosemide with K+ replacement or urea)

5. What are your primary nursing responsibilities to this client?
   
   Safety
   Anticipate, assess and intervene appropriately
CASE STUDY #2

A 65 year old female is admitted to your unit complaining of nausea, vomiting and diarrhea for 3 days. Her history is unremarkable except hypertension for which she takes hydrochlorothiazide. She relates feeling exhausted and having leg cramps which interfere with her sleeping. Notable assessment findings include T. 38.6 C, AP 102 and irregular, B.P. 90/50; absent bowel tones, poor muscle tone and skin turgor.

Laboratory data includes K+ 2.9 mEq/L, Na+ 137 mEq/L, Cl- 97 mEq/L, and WBC 20,000/ul.

ECG shows cardiac arrhythmias (frequent PVCs)

Physician’s orders include:

- IV D50.9%NaCl with 20 mEq KCl/L to infuse at 90cc/hr.
- 40 mEq of KCl IV over the next 2 hours
- K+ level 30 minutes after 40 mEq IV KCl has infused
- Bedrest: May use bathroom
- NPO

1. What fluid and/or electrolyte disturbances does this client have?
   hypokalemia, hypovolemia

2. Which electrolyte disturbance is of most concern with this client?
   Hypokalemia

3. Underline the signs and symptoms that can result from this electrolyte disturbance.
   exhausted, leg cramps, AP 102 and irregular, absent bowel tones, poor muscle tone and skin turgor

4. What do you suspect as the cause(s) of this electrolyte disturbance?
   Vomiting, K+ wasting diuretic therapy, and no K+ replacement

5. What type of solution is D5NS with 20mEq KCl/L?
   Hypertonic

6. Would you question any of these orders? Why?
   Yes. Hypertonic IV solution when hypovolemia is isotonic; too much K+ to be administered over 2 hours; does not specify how much fluid to dilute K+ in
7. List safe administer principles for IV potassium
   - check drug information/books prior to administration for complete information)
   - Never give IV push!!!
   - dilute with appropriate amount of recommended fluid
   - don't give IV K+ >10-20meq/hr. Or >30-40meq/L
   - add K+ to nonhanging containers & invert well to mix;
   - assess IV site frequently: peripheral prone to irritation/chemical phlebitis so may need ice bag, mild sedation, or slower rate (check with Dr.);
   - continuous cardiac monitor if >10-20meq/hr.
   - assess for hyperkalemia s/s with IV K+ administration & immediately notify Dr. if present

Over the next several days the patient receives antibiotics (Vancomycin). The diuretic is changed to Spironolactone and she continues to receive the same maintenance IV plus 40 mEq po potassium daily. Her nausea, vomiting, leg cramps, and irregular heart rate resolved. Temp and BP are now within normal limits. However, for the past 24 hours, her urine output has been declining and is currently at <20 cc./hr. The patient now c/o abdominal cramping, numbness/tingling sensations in her extremities. She is irritable and has been experiencing diarrhea. In addition she has developed some pulse slowing and irregularity. Lab values indicate BUN 60, Creatinine 2.1, K+ 5.8, Na 140, Cl 98. ECG shows abnormalities (↑QRS, ↓ST, a few premature beats).

1. What fluid or electrolyte disturbance is of concern now for this patient?
   Hyperkalemia

2. Underline the signs/symptoms associated with this disturbance.
   Her urine output has steadily declined to <20 cc./hr. And she is irritable, c/o abdominal cramping, diarrhea and numbness/tingling sensations in her extremities, pulse slowing and irregularity.

3. What do you suspect as the cause for this disturbance?
   Decreased urine output (?renal failure), potassium sparing diuretic plus potassium replacement

4. What are the treatment options for this situation?
   Limit K+ sources, change diuretic
   Permanent: cation exchange resin, eg., Kayexalate (sodium polystyrene sulfate), dialysis
temporary: IV glucose (eg., 50% dextrose) & insulin, IV NaHCO3
IV calcium (gluconate or chloride)

5. What can happen if this disturbance is not treated and worsens?
Can lead to cardiac arrest and death

6 What are your primary nursing responsibilities for this client?
Keep client safe
Administer meds correctly
Ongoing observation/assessment with appropriate follow up
Be alert for potentially fatal cardiac arrhythmias, etc.

CASE STUDY #3

A 50 year old female with renal disease was admitted to the hospital following a seizure.

1. What fluid, electrolyte and/or acid-base disturbances would you suspect with this patient?
   • Calcium
   • Magnesium
   • Phosphorus
   • Potassium
   • Sodium
   • Fluid
   • Acid-Base

Hyper-phosphatemia, -kalemia, -magnesemia (maybe); hypo -calcemia, -natremia (or isonatremia); hypervolemia, also metabolic acidosis.

The patient developed tetany shortly after being admitted. It was determined that both the seizure and tetany were a result of electrolyte imbalance(s).

1. What other associated signs and symptoms would you expect?
   Those associated with the underlying renal failure (see info on renal failure) and those associated with various electrolyte disturbances. Significant hyperkalemia can cause arrhythmias which can then lead to hypoxia and seizures. Other s/s of hyperkalemia include weakness, numbness, tingling, muscle cramps, nausea plus ↑ GI motility (abdominal cramps & diarrhea). With both a hyperphosphatemia and hypocalcemia, s/s of ↑ NM excitability
(paresthesias, circumoral numbness & tingling, + Chvostek’s & Trousseau’s, tetany, etc.); in addition problems with the bones, etc.; fluid overload s/s including rapid bounding pulse, hypertension, possible dyspnea & rales, distended neck veins, etc.; s/s of metabolic acidosis can include

2. What medical interventions would you expect?
   After ensuring ABCs, then treatment of underlying cause (in this case, most probably the renal failure); dialysis for acute, severe electrolyte & acid-base disturbances (confirmed with labs). Other treatments for these electrolyte and acid base abnormalities may include kayexalate (for hyperkalemia), calcium gluconate after hi Ph levels treated (hyperkalemia & hypocalcemia), NaHCO3 (for hyperkalemia & metabolic acidosis), insulin & glucose (for hyperkalemia); phosphorus binding antacids: Al or Ca antacids or gels, not Mg (for hyperphosphatemia); low Ph, Mg and K diet; possibly Ca supplements; fluid management; possibly NaHCO3 for metabolic acidosis

3. What would be your nursing responsibilities for this client?
   Ensure ABCs, protect client from injury (e.g., seizure precautions, interventions for sensory perceptual alterations), monitor VS, I&O, heart rhythm, assessment findings/clinical manifestations, labs & report changes to physician. Administer meds appropriately and safely and monitor effects of therapy.

CASE STUDY #3

A 30 year old male was admitted following a motor vehicle crash. He had a forehead bruise and laceration, was slumped over the steering wheel and had an open wound of the right upper leg. He was obtunded but aroused to his name. He was hypotensive at the scene and was transported to an acute care facility with oxygen, spine and right leg immobilization and IV normal saline infusion.

1. What injuries would you suspect with this client?
   Possible head, spine, chest, abdominal and leg injuries; possible internal or external bleeding.

2. What fluids, electrolytes and/or acid base disturbances would you suspect?
   Fluid volume deficit, problems with electrolytes and acid base balance r/t the injuries. Possible ↑ serum electrolytes r/t tissue damage & hypovolemia;
possible respiratory &/or metabolic acidosis if breathing and consequently anaerobic metabolism. May be shock as well as other electrolyte, acid base disturbances as well.

The patient was admitted and emergency surgery where his spleen was removed. He received multiple blood transfusions and was transferred to the unit after awakening. Orders included O2 via nasal cannula at 5 L/min., hourly v.s. and neuro checks until stable, spine precautions, IV of D5W0.45NS at 100 cc/hr.

1. What electrolyte and acid base disturbances does the nurse need to be alert for when a client receives multiple blood transfusions?
   Hypocalcemia (r/t low ionized serum Ca++ because it binds with citrate in transfused blood)

2. What other nursing responsibilities will the nurse need to implement for this client?
   Ensure ABCs, spine immobilization, postop care including vigilance for possible internal bleeding and consequent hypovolemic shock; monitor client closely, including neuro & CMS checks, VS, I&O, assessment findings, labs, pain. Administer meds & other therapies appropriately and safely & monitor client's response to treatment. Note: the client may have multiple fluid, electrolyte and acid base abnormalities throughout the course of hospitalization so the nurse needs to be alert for indications of these disturbances.

The patient’s vital signs remain stable and the neurological status improves. Xrays show a fracture at T1 and right femur fracture. Cervical spine and femur fixation is planned in several days along with so spinal immobilization and precautions continue. The physician orders continuous NG suction related to persistent nausea/vomiting and absent bowel tones.

1. What fluid, electrolyte and acid base disturbances is the nurse alert to when the client receives NG suction?
   Without adequate replacement, the client with NG suction is losing fluids rich in sodium, potassium, and hydrogen (HCl), also magnesium, calcium, phosphorus. Consequently, the client is at risk for hyponatremia, kalemia, magnesemia, phosphatemia. In addition, the client is at risk for a fluid volume deficit and metabolic alkalosis.

2. What would be the treatments for these disorders?
Needless to say, treatment of the underlying condition necessitating continuous NG suction. Also, in this case, IV fluid replacement and of the major electrolytes lost, based on lab results. Also, remember if an NG tube must be irrigated, to utilize normal saline, not water.

The patient’s heart rate decreases to the low 50s–high 40s and he becomes somewhat hypotensive with a systolic BP in the 90s.

1. What could be causing these changes? And why?
   Spinal shock causes a maldistribution of blood flow due to vasodilatation

2. Does it need to be treated?
   Only if symptomatic and then with meds to increase HR (e.g., Atropine) and/or raise BP (vasopressors)

Jessie Hammond, 9/5/05