Diabetic Ketoacidosis (DKA)

Diana Humphries, 45 years old

Primary Concept
Fluid and Electrolyte Balance
Interrelated Concepts (In order of emphasis)
1. Acid-Base Balance 2. Glucose Regulation 3. Infection 4. Pain 5. Clinical Judgment 6. Patient Education 7. Communication 8. Collaboration

Diabetic Ketoacidosis (DKA)

History of Present Problem:

Diana Humphries is a 45-year-old woman with chronic kidney disease stage III and diabetes mellitus type1 who checks her blood sugar daily, or whenever she feels like it. She has been feeling increasingly nauseated the past 12 hours. She has had a harsh, productive cough of yellow sputum the past three days. She checked her blood glucose before going to bed last night and it was 382, but then she fell asleep early and missed her bedtime dose of glargine (Lantus) insulin. When she awoke this morning, she had generalized abdominal pain and continued to feel nauseated and had a large emesis. Her glucometer was unable to read her blood glucose because it was too high. She took 10 units of lispro (Humalog) insulin this morning. Her nausea has increased all morning and she has been unable to eat or keep anything down despite having an increased thirst and appetite. She also has had increased frequency of urination. When her lunchtime glucometer gave no reading because it was too high and out of range, she called 9-1-1 to be evaluated in the emergency department (ED).

Personal/Social History:

Diana has been inconsistently compliant with her medical/diabetic regimen due to her struggles with anxiety and depression that have worsened since her mother died three months ago. She considers 200 a good blood sugar reading. She is divorced with no children and has been homeless and has lived in a shelter off and on the past month. She is on Social Security disability because of complications related to diabetes. At one point during the intake interview, she expressed to the nurse, “I’m going to die anyway, why does all this matter?”

What data from the histories is RELEVANT and has clinical significance to the nurse?

RELEVANT Data from Present Problem:	**Clinical Significance:**
- Chronic kidney disease stage III and diabetes mellitus type 1 - Extremely nauseated the past 12 hours - Harsh productive cough with yellow sputum the last three days - Blood glucose last night was 382 - Fell asleep early and missed bedtime dose of glargine insulin - In the morning, generalized abdominal pain, continued nauseated and large emesis - Glucometer was unable to read due to how high it was - Nausea continues to increase, unable to keep anything down - Call 9-1-1 for evaluation for her glucose level	**-Pt’s health is deteriorating with no sign of improvement** **-Pt is non-compliant with her DM1 management** **-Pt is still alert and called for help from 9-1-1** **-Pt is dehydrated, unable to keep anything down**
RELEVANT Data from Social History:	**Clinical Significance:**
-Pt not compliant with regimen due to anxiety and depression **-Pt mother passed away 3 months ago, divorced with no kids** **-Pt is homeless, living in shelters** **-Pt is living on limited income**	**-Pt is depressed with no support** **-Pt does not prioritize her health** **-Pt needs resources to help with basic living needs**

What is the RELATIONSHIP of your patient's past medical history (PMH) and current meds?
(Which medication treats which condition? Draw lines to connect)

PMH:	Home Meds:	Pharm. Classification:	Expected Outcome:
• Chronic Kidney disease stage III (diabetic nephropathy) • Anemia • Diabetes mellitus type 1 since age 12 (10) (11) • Diabetic retinopathy • Neuropathy in lower legs (6) • Hyperlipidemia (9) • Hypertension (2), (7) • Coronary artery disease • (7) (1) Gastroesophageal reflux disease (GERD) (8) • Anxiety (3) (5) • Depression (4)	1. Aspirin 81mg PO daily 2 .Lisinopril 10 mg PO daily 3. Lorazepam 1mg PO bid prn 4. Citalopram 40 PO mg daily 5. Zolpidem 10 mg PO at HS prn 6. Gabapentin 300 mg PO bid 7. Labetalol 200 mg PO bid 8. Omeprazole 20 mg PO daily 9 .Simvastatin 40 mg PO HS 10. Glargine insulin 50 units SQ at HS 11. Lispro insulin SQ sliding scale AC and HS	1. NSAID and salicylates 2. ACE inhibitor 3. Antianxiety 4. SSRI 5. Sedative hypnotics 6. Anticonvulsant 7. non-cardio selective beta blocker 8. PPI 9. Statin 10. insulin long acting 11. fast-acing insulin	1. reduce risk of stroke/ heart attack 2. control increase of BP for pt at risk management including DM 3. management of anxiety and stress 4. decrease the risk of chronic depression 5. treat insomnia, aid in ability to fall asleep 6. decrease restless/pain on lower extremities 7. to treat CAD and decrease blood sugar 8. decrease acid reflux 9. decrease bad cholesterol and increase good cholesterol 10. treat DM1 11. pt will maintain adequate levels of blood sugar during the night time

What medications treat which conditions?

Draw a line to identify what illness is being managed by what medication?
-see numbers above to correlate what number is for which condition
-there are no medications to treat history of anemia

One disease process often influences the development of other illnesses. Based on your knowledge of pathophysiology, (if applicable), which disease likely developed FIRST that created a "domino effect" in his/her life?

- **Circle what PMH problem started FIRST: DM1 at 12 years old, anxiety, hyperlipidemia**
- **Underline what PMH problem(s) FOLLOWED as dominoes : diabetic nephropathy, hypertension, CAD, anemia, depression. Diabetic retinopathy**

Patient Care Begins

Current VS:	P-Q-R-S-T Pain Assessment (5th VS):

T: 101.6 F/38.7 C (oral)	**P**rovoking/Palliative:	Coughing and deep breathing/Not coughing
P: 114 (regular)	**Q**uality:	Sharp
R: 24 (regular/deep)	**R**egion/Radiation:	Right chest
BP: 102/66	**S**everity:	5/10
O2 sat: 90% Room air	**T**iming:	Intermittent

What VS data is RELEVANT and must be recognized as clinically significant by the nurse?

RELEVANT VS Data:	**Clinical Significance:**
-increased temp **-increased pulse rate** **-increased RR** **-depressed BP** **-pain assessment:** **sharpe right chest pain** **rating 5/10 intermittent**	**-infection as evidence by increased temperature and decreased oxygen exchange** **-tachycardia and tachypnea due to increase blood glucose** **-pt is hyperventilating** **-low BP due to dehydration** **-pain inhibits a normal breathing pattern**

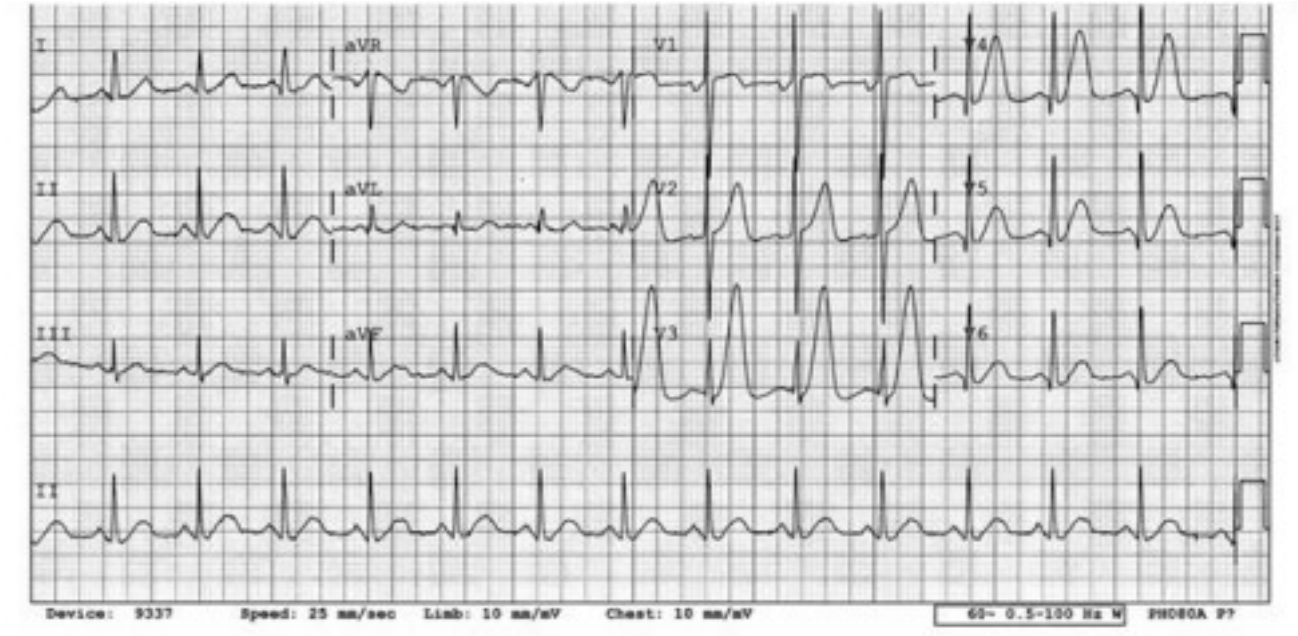
Current Assessment:	
GENERAL APPEARANCE:	Appears anxious and uncomfortable, body tense, occasional grimacing
RESP:	Breath sounds clear with coarse crackles in RLL , nonlabored respiratory effort, harsh productive cough with thick yellow phlegm visualized
CARDIAC:	Pink, warm & dry, no edema, heart sounds regular–S1S2, pulses strong, equal with palpation at radial/pedal/post-tibial landmarks
NEURO:	Alert & oriented to person, place, time, and situation (x4)
GI:	Abdomen soft/non-tender, bowel sounds audible per auscultation in all 4 quadrants, nausea is persistent
GU:	Frequency of urination, urine clear in color, denies painful or burning when voids
SKIN:	Skin integrity intact, lips dry, oral mucosa dry–tacky

What assessment data is RELEVANT and must be recognized as clinically significant by the nurse?

RELEVANT Assessment Data:	**Clinical Significance:**

-Pt anxious, uncomfortable, tense, occasional grimacing **-breath sounds clear with coarse crackles, and harsh productive cough with yellow sputum** **-A&Ox4** **-no abdominal pain, nausea still persistent** **-no presence of UTI, frequent urination** **-skin integrity intact but dry lips and oral mucosa**	**-Pt is in pain** **-Pt may have pneumonia** **-Pt able to understand and cooperate during visit** **-Nausea still persistent due to DKA** **-Pt losing more fluids through urination** **-Pt is showing signs of dehydration**

12 Lead EKG:



Interpretation:

Pt heart rate is 140

Clinical Significance:

Showing signs of tachycardia

Radiology Reports: Chest x-ray

What diagnostic results are RELEVANT that must be recognized as clinically significant to the nurse?

RELEVANT Results:	**Clinical Significance:**

Right lower lobe infiltrate.	Signs of a lung infection; pneumonia

Lab Results:

What lab results are RELEVANT and must be recognized as clinically significant by the nurse?

Complete Blood Count (CBC):	**Current:**	**High/Low/WNL?**	**Prior:**
WBC (4.5–11.0 mm 3)	15.2	increased	9.8
Hgb (12–16 g/dL)	11.8	Decreased	11.2
Platelets (150–450x 103/µl)	155	Normal trending down	162
Neutrophil % (42–72)	92	Increased	70
Band forms (3–5%)	3	Normal trending increased	1

What lab results are RELEVANT and must be recognized as clinically significant by the nurse?

RELEVANT Lab(s):	**Clinical Significance:**	**TREND: Improve/Worsening/Stable:**
-WBC and neutrophils **-Hgb** **- platelets and band form within normal limits**	**-pt showing signs of infection** **-pt's levels are low but slowly increasing** **-bands increase due to the production of WBC to fight infection**	**-worsening** **-improving** **-worsening due to fighting infection**

Basic Metabolic Panel (BMP):	**Current:**	**High/Low/WNL?**	**Prior:**
Sodium (135–145 mEq/L)	122	Decrease	138
Potassium (3.5–5.0 mEq/L)	6.4	Increase	4.2
CO2 (Bicarb) (21–31 mmol/L)	11	Decrease	25
Glucose (70–110 mg/dL)	729	Increased	168
BUN (7–25 mg/dl)	56	Increased	42
Creatinine (0.6–1.2 mg/dL)	2.4	Increased	1.9
GFR (>60 mL/min)	20	Decreased	38

Misc. Labs:			
Lactate (0.5–2.2 mmol/L)	2.8	Increased	n/a

What lab results are RELEVANT and must be recognized as clinically significant by the nurse?

RELEVANT Lab(s):	**Clinical Significance:**	**TREND: Improve/Worsening/Stable:**
-Na decreased	**-Pt is losing fluids, dehydrated; electrolyte imbalance related to DKA**	**-worsening**
-K increased	**-hyperkalemia**	**-worsening**
-CO2 decreased	**-metabolic acidosis**	**-worsening**
-glucose increased	**-DKA crisis**	**-worsening**
-BUN, Creatine & GFR	**-kidney failure**	
-Lactate	**-potential sepsis/shock**	

Urine Analysis (UA):	**Current:**	**WNL/Abnormal?**
Color (yellow)	Clear	WNL
Clarity (clear)	Cloudy	ABNORMAL
Specific Gravity (1.015–1.030)	1.005	ABNORMAL
Protein (neg)	Positive	ABNORMAL
Glucose (neg)	>1000	ABNORMAL
Ketones (neg)	Large	ABNORMAL
Bilirubin (neg)	Negative	WNL
Blood (neg)	Negative	WNL
Nitrite (neg)	Negative	WNL
LET (Leukocyte Esterase) (neg)	Negative	WNL
MICRO		
RBCs (<5)	1	WNL
WBCs (<5)	2	WNL
Bacteria (neg)	Negative	WNL

Epithelial (neg)	Negative	WNL

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What lab results are RELEVANT and must be recognized as clinically significant by the nurse?

RELEVANT Lab(s):	Clinical Significance:
-cloudy urine **-ketones in urine** **-protein & glucose present** **-specific gravity**	**-dehydration, protein on it** **-positive DKA** **-kidney failure** **-DKA sign glycosuria** **-low due to pt frequent urination/ kidney failure**

Lab Planning: Creating a Plan of Care with a PRIORITY Lab:

Lab:	Normal Value:	Clinical Significance:	Nursing Assessments/Interventions Required:
Creatinine **Value:** **2.4**	**Critical Value: increased**	**Kidney failure**	**-monitor and document I&O, labs** **-notify the provider** **-teach the pt the importance of following the plan of care**

Lab:	Normal Value:	Clinical Significance:	Nursing Assessments/Interventions Required:

Potassium **Value:** **6.4**	**Critical Value: increased**	**Hyperkalemia, possible cardiac arrest**	**-use of diuretics to get rid of excess K** **-fluid therapy to balance electrolytes**

Clinical Reasoning Begins…

1. ***What is the primary problem that your patient is most likely presenting with?***
   -DKA, fluid and electrolyte imbalance and pneumonia

2. What is the underlying cause/pathophysiology of this primary problem?

-Pt is non-compliant with plan of care. Pt is not on a insulin regimen, depressed and at risk for suicide indicating she will die soon.

Collaborative Care: Medical Management

Care Provider Orders:	**Rationale:**	**Expected Outcome:**
Blood glucose stat	-monitor BG levels	-levels will remain within normal limits
12 lead EKG	-monitor heart dysrhythmias due to DKA	-heart rhythm will be within normal limits
Place on cardiac monitor	-monitor for any abnormalities of the heart	-Pt will be aided if any problems of the heart arrive
Establish IV and initiate NS 0.9% bolus of 1000 mL	-pt with hyponatremia due to fluid loss	-Na normal range -Pt is no longer nauseated or vomiting, electrolytes are balanced
Ondansetron 4 mg IV push every 4 hours for nausea	-prevent nausea and vomiting	-pt's pain will improve
Hydromorphone 0.5 mg every 4 hours for pain	-medication will aid in the recovery of normal breathing patterns and less pain	

PRIORITY Setting: Which Orders Do You Implement First and Why?

Care Provider Orders:	Order of Priority:	Rationale:
1.Blood glucose stat 2.12 lead EKG 3.Place on cardiac monitor 4.Establish IV and initiate NS 0.9% bolus of 1000 mL 5.Ondansetron 4 mg IV push *6.*Hydromorphone 0.5 prn every 4 hours for pain	4 2 3 1 6 5	IV fluids needed for fluids and drug therapy Monitor cardiac rhythms Monitor blood sugar levels to see any improvement Pt needs to decrease pain levels Pt is nauseated and vomiting

The physician has just noted the concerning labs of:

- Potassium: 6.4
- Glucose: 729
- UA: + ketones
- CO2: 11
- Chest x-ray consistent with pneumonia (RLL infiltrate) and orders the following:

Care Provider Orders:	Rationale:	Expected Outcome:
Regular insulin 10 units IV push stat	-decrease glucose levels	-glucose levels become within normal limits
Sodium Bicarbonate (50 mL)1 amp IV push stat	-due to metabolic acidosis	-HCO2 will become within normal limits
Calcium Chloride 1 gm IV	-aids in the treatment of hyperkalemia	-prevent cardiac arrest and decrease K levels
Regular insulin IV drip rate per DKA protocol	-decrease glucose levels constantly	-glucose will be within normal limits
Ciprofloxacin 400mg/250 mL IVPB after blood/urine/sputum	-fight infection; kill the bacteria	-Pt will combat infection in body (free of pneumonia and infiltrate in lungs)

cultures obtained		

Medication Dosage Calculation:

Medication/Dose:	Mechanism of Action:	Volume/time frame to Safely Administer:	Nursing Assessment/Considerations:
Ondansetron 4 mg IV push (4mg/2 mL vial)	*.block the motion of nausea and vomiting*	**IV Push: Volume every 15 sec? Slow over minutes**	**Administer drug slowly over 2-5 minutes**

Medication/Dose:	Mechanism of Action:	Hourly Rate IVPB:	Nursing Assessment/Considerations:
Ciprofloxacin 400mg/250 mL IVPB	Inhibits bacteria's DNA replication; effective on gram-positive bacteria; also may cause low blood suagr	**Hourly rate IVPB: 250 mL/ hr**	**Monitor blood glucose levels, dairy products delay drug absorption**

Collaborative Care: Nursing

3. What nursing priority(ies) will guide your plan of care? *(if more than one-list in order of PRIORITY)*

4. What interventions will you initiate based on this priority?

Nursing Priority:	Nursing Interventions:			
		-vital signs -glucose level -electrolyte imbalances	**-initiate oxygen therapy; monitor pulse ox, position the pt in high fowler's position to improve respirations, use incentive spirometer -encourage fluid therapy, ensure all lines are patent, monitor I&O -administer insulin, monitor**	

	glucose to ensure levels are decreasing, monitor for symptoms of DKA	

Expected Outcome: patient's vital signs will be within normal limits, glucose levels will be within normal limits, pt will become well hydrated

5. What body system(s) will you assess most thoroughly based on the primary/priority concern?
Respiratory: impaired gas exchange, cardiac: dysrhythmias

6. What is the worst possible/most likely complication to anticipate? Untreated or the worsening of DKA, increased levels of glucose can lead to death

7. What nursing assessments will identify this complication EARLY if it develops? Monitor respiratory rate, heart rate, glucose and physical appearance

8. What nursing interventions will you initiate if this complication develops? Call for help, inform the provider what is going on, initiate CPR

9. What psychosocial needs will this patient and/or family likely have that will need to be addressed?
The patient is alone and needs a source of support to get her through each day. Teachings on implications of insulin regimen is required as well.

10. How can the nurse address these psychosocial needs? The nurse can educate the patient on different resources to prevent being alone. The nurse can refer the patient to social work to collaborate with support groups. The nurse can educate the patient on glucose levels and insulin to ensure further complications do not arise.

Evaluation: Two Hours Later…

All primary care provider orders have been administered by the nurse. The regular insulin IV drip rate is currently at 3.4 units/hour. The physician orders a repeat BMP and 12 lead EKG. The following clinical data is included in your most recent evaluation:

Basic Metabolic Panel (BMP:)	**Current:**	**High/Low/WNL?**	**Prior:**

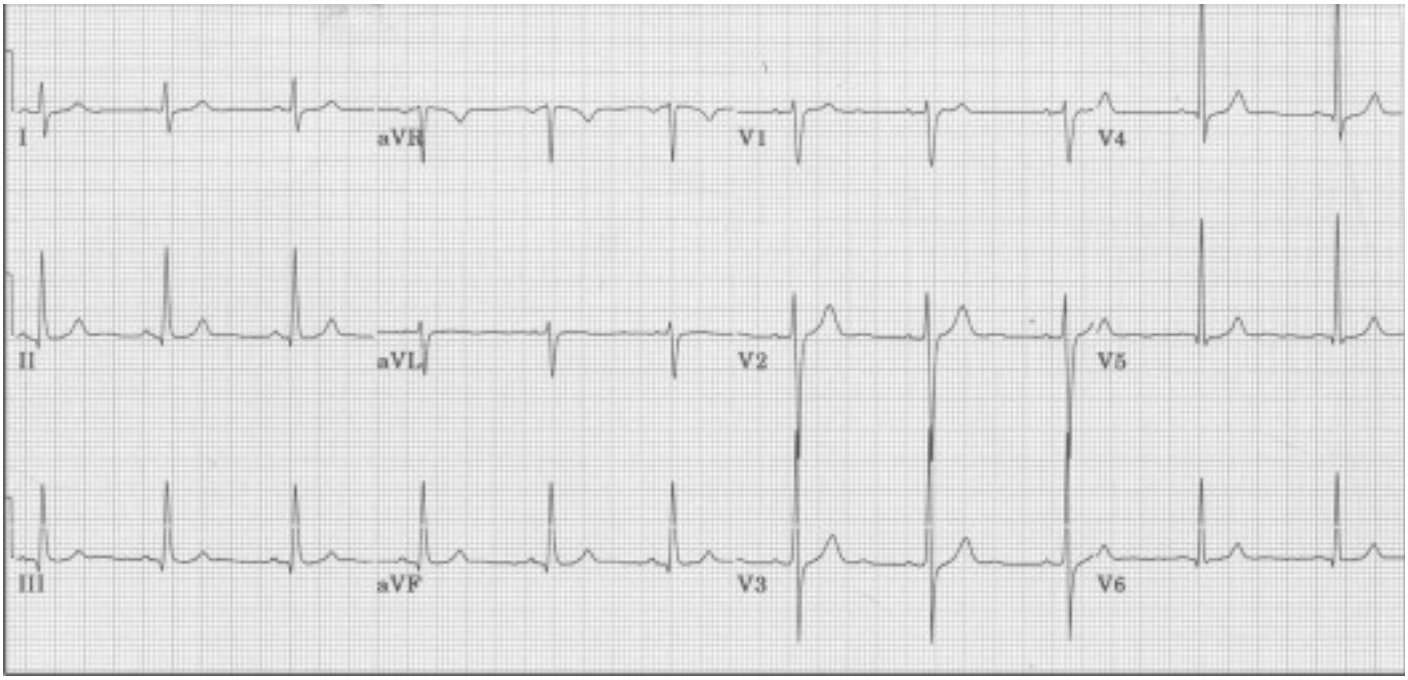
Sodium (135–145 mEq/L)	125	Low	122
Potassium (3.5–5.0 mEq/L)	5.1	High	6.4
Chloride (95–105 mEq/L)	106	High	98
CO2 (Bicarb) (21–31 mmol/L)	18	Low	11
Glucose (70–110 mg/dL)	578	High	729
Calcium (8.4–10.2 mg/dL)	8.6	WNL	8.4
BUN (7– 25 mg/dl)	50	High	56
Creatinine (0.6–1.2 mg/dL)	2.2	High	2.4
GFR (>60 mL/min)	24	WNL	20

What lab results are RELEVANT and must be recognized as clinically significant by the nurse?

RELEVANT Lab(s):	**Clinical Significance:**	**TREND: Improve/Worsening/Stable:**
Na K Cl CO2 Glucose Ca BUN, Creati	**-hyponatremia= fluid deficit** **-hyperkalemia= cardiac issues** **-reaction to IV push** **-decrease in metabolic acidosis** **-related to DKA** **-electrolyte imbalance** **-dehydration, kidney function**	**-improving** **-improving** **-stabling; trending upward** **-improving** **-improving** **-stable** **-improving**

ne, GFR Na K Cl CO2 Glucose Ca BUN, Creatine, GFR **-Na** **-K** **-Cl** **-CO2** **-Glucose** **-Ca** **-BUN, Cr, GFR**		

12 Lead EKG:



Interpretation:
Heart rate is 110
Clinical Significance:
Heart rate trending down; still a bit tachycardic

Current VS:	**Most Recent:**	**Current WILDA:**	
T: 100.2 F/37.9 C (oral)	**T:** 101.6 F/38.7 C (oral)	**W**ords:	sharp
P: 88 **(**regular)	**P:** 114 **(**regular)	**I**ntensity:	2/10
R: 20 (regular)	**R** 24 (regular)	**L**ocation:	Right chest
BP: 124/70	**BP:** 102/66	**D**uration:	Intermittent
O2 sat: 94% 2 liters n/c	**O2 sat:** 95% 2 liters n/c	**A**ggravate: **A**lleviate:	Coughing and deep breathing Not coughing and breathing shallow

Current Assessment:	
GENERAL APPEARANCE:	Resting comfortably, appears in no acute distress
RESP:	Breath sounds clear coarse crackles RLL, nonlabored respiratory effort

CARDIAC:	Pink, warm & dry, no edema, heart sounds regular with no abnormal beats, pulses strong, equal with palpation at radial/pedal/post-tibial landmarks
NEURO:	Alert & oriented to person, place, time, and situation (x4)
GI:	Abdomen soft/non-tender, bowel sounds audible per auscultation in all 4 quadrants, no nausea or abdominal pain
GU:	Urine clear and yellow. 250 mL the past 8 hours
SKIN:	Skin integrity intact, lips dry, but oral mucosa is moist

1. What clinical data is RELEVANT that must be recognized as clinically significant?

RELEVANT VS Data:	**Clinical Significance:**
All vital signs are showing signs of improvement	**Pt hyperkalemia, decreasing glucose levels and DKA are stabilizing**
RELEVANT Assessment Data:	**Clinical Significance:**
All improving	**Pneumonia symptoms improving; along with other signs of infection. Pt kidneys are returning to normal state, not retaining fluid. Pt abdominal pain has subsided and nauseated. Physical appearance shows patient no longer in high pain.**

2. Has the status improved or not as expected to this point?
Yes

3. Does your nursing priority or plan of care need to be modified in any way after this evaluation assessment

No, the plan is working well

4. Based on your current evaluation, what are your nursing priorities and plan of care? Keep monitoring the

patient and follow orders.

Effective and concise handoffs are essential to excellent care and if not done well can adversely impact the care of this patient. You have done an excellent job to this point, now finish strong and give the following SBAR report to the nurse who will be caring for this patient in ICU:

Situation:
Name/age: Diana Humphries, Female, 45 y/o **BRIEF summary of primary problem: Pt has chronic kidney disease stage 3, DM1, came to the ER complaining of emesis, nausea, abdominal pain, frequent urination and concern about high glucose levels as they were unable to read due to how high they are. Pt was coughing up yellow thick sputum. Assessment of the pt showed noncompliance with DM1 management due to depression, living arrangements and lack of education of glucose as evidence by pt thinking 200 is a good level. Pt stated she does not care to get better because she will die soon. No social history performed on patient. Labs and tests identified DKA, fluid and electrolyte imbalance, pneumonia.** **Day of admission/post-op #: 1**
Background:
Primary problem/diagnosis: DKA, pneumonia, fluid, and electrolyte imbalance **RELEVANT past medical history: Pt with DM1 since the age of 12. Pt was chronic kidney stage 3.** **RELEVANT background data: Pt is depressed, homeless. Expressing no reason to live or follow the plan of care. Pt does not always take insulin. Pt does not have adequate access to health care or resources to meet basic needs.**
Assessment:

Current vital signs: Temp 100.2F/37.9 (oral), pulse rate 88, respirations 20, BP 124/70, O2 sat 94% 2L nasal cannula, LOCx4, pt is not in any distress, breath sounds remain clear, coarse crackles RLL, nonlabored breathing pattern, heart sounds normal no abnormal beats, skin is pink, intact, dry lips and mucosa, abdominal bowel sounds in all 4 quadrants, no masses present. Urine is clear, yellow, output is 250 mL for last hours, IV site intact dry and no signs of infection. Pt pain is 2/10 sharpe and intermittent when coughing or deep breathing.

RELEVANT body system nursing assessment data: Endocrine: lips and mucosa dry, Respiratory: crackles and sharpe pain

RELEVANT lab values: Na 125, CO2 18, pt improving condition, K 5.1, glucose 578, BUN 50, Cr 2.2 with all levels improving. Cl trending upward, Ca, GFR is within normal limits

TREND of any abnormal clinical data (stable-increasing/decreasing): Show above

How have you advanced the plan of care? Monitor the pt and follow orders

Patient response: pt is calm and resting, no signs of distress

INTERPRETATION of current clinical status (stable/unstable/worsening): DKA, hyperkalemia levels are trending down. Fluid levels are becoming more stable, pt is getting better.

Recommendation:

Suggestions to advance plan of care: Keep monitoring pt, VS every 4 hours, check glucose levels

Education Priorities/Discharge Planning

1. ***What will be the most important discharge/education priorities you will reinforce with her medical condition to prevent future readmission with the same problem?***
   -importance of glucose knowledge and use of insulin

2. What are some practical ways you as the nurse can assess the effectiveness of your teaching with this patient? Ask the patient how to check glucose levels, and ask what levels they believe are low or high, ask the patient if they are familiar with signs and symptoms of hypoglycemia and hyperglycemia

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Caring and the "Art" of Nursing

1. ***What is the patient likely experiencing/feeling right now in this situation?***
   The pt is feeling hopeless, depressed and anxious due to her current living conditions and not having any support. The patient is at risk for suicide and is putting her health to the side.
2. ***What can you do to engage yourself with this patient's experience and show that he/she matters to you as a person?***
   I can use therapeutic communication to sympathize with the patient and find ways to support her in this time of need.

Use Reflection to THINK Like a Nurse

Reflection-IN-action (Tanner, 2006) is the nurse's ability to accurately interpret the patient's response to an intervention in the moment as the events are unfolding to make a correct clinical judgment.

1. What did I learn from this scenario? I learned more about DKA and other medications that can be used.

2. How can I use what has been learned from this scenario to improve patient care in the future? I can use this information when I deal with patient's who are going through similar conditions as this patient.