|  |  |  |  |
| --- | --- | --- | --- |
| **Maryland Next Gen NCLEX Test Bank Project**  **September 1, 2022** | | | |
| **Case Study Topic**:  (Standalone bowtie) | Type II diabetes & ketoacidosis | **Author:** | DeNiece Bennett, DNP, MSN-Ed  University of Maryland, School of Nursing |

**Case Summary**

|  |
| --- |
| A 73-year-old male client with a history of type II diabetes presented to the emergency department for a change in mental status. Client is diagnosed with ketoacidosis. |

**Objectives**

|  |
| --- |
| 1. Assess the client for complications of type II diabetes 2. Manage care of a client with ketoacidosis 3. Evaluate client responses to interventions |

|  |  |
| --- | --- |
| **Case Study Link** | **Case Study QR Code** |
| <https://umaryland.az1.qualtrics.com/jfe/form/SV_b28egVeIF5tG5F4> |  |
| **Bow-tie QR Code** | **Bow-tie Link** |
|  | <https://umaryland.az1.qualtrics.com/jfe/form/SV_87comjCnj3OOyOi> |

**Case References**

|  |
| --- |
| 1. Uren, L.D., Stacy, K.M., Lough, M.E. (2022). *Critical Care Nursing: Diagnosing and Management.* Elsevier 2. Workman, M.L., Ignatavicius, D. (2021) *Medical-Surgical Nursing: Concepts for Interprofessional Collaborative Care*. 10th Ed. Elsevier Health Sciences |

**Case Study Question 1 of 6**

A 73-year-old male with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. | | | | | |
| **Vital Signs** | |
| Time | | 1200 | |
| Temp | | 99.5° F (37.5 °C) | |
| P | | 118 | |
| RR | | 32 | |
| B/P | | 97/66 | |
| Pulse oximeter | | 89% on RA | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | |
| Valsartan 160 mg PO daily | | | | |

Which 4 findings are **most** significant?

* Lung sounds
* History of type II diabetes\*
* Respiratory status\*
* Circulation\*
* Pupils
* Temperature
* Mental status\*
* Medications

**Scoring Rule: 0/1**

**Rationale:** Because the client has a history of type II diabetes, the nurse should follow up with signs that the client’s diabetes may be out of control such as the deep and rapid respirations, the odor on the breath, and mental changes. The low B/P and tachycardia can indicate severe hypovolemia.

**Case Study Question 2 of 6**

A 73-year-old male with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200.** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. Weight 205lbs (93kg)  **1215**. Voided 30mL dark amber urine sent for urinalysis. Comprehensive metabolic panel, CBC, and ABG. IV of normal saline started. 2L O2 started per NC. Capillary glucose is 440. | | | | | | | | |
| **Vital Signs** | |
| Time | | 1200 | | | 1215 | |
| Temp | | 99.5° F (37.5 °C) | | | 99.5° F (37.5 °C) | |
| P | | 118 | | | 115 | |
| RR | | 32 | | | 30 | |
| B/P | | 97/66 | | | 98/70 | |
| Pulse oximeter | | 89% on RA | | | 92% on 2L NC | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | | | | |
| Valsartan 160 mg PO daily | | | | | | | |
| **Laboratory Report** | | |
| Lab | | | | Results | | Reference range | | | |
| ABG pH | | | | 7.20 | | 7.35-7.45 | | | |
| ABG PC02 | | | | 45 | | 35-45 mmHg | | | |
| ABG HC03 | | | | 32 | | 22-26 mEq/L | | | |
| Creatine (Serum) | | | | 1.9 | | 0.9 to 1.4 mg/dL | | | |
| Glucose random | | | | 435 | | 70- 140 mg/dL | | | |
| Other (urine) | | | | Positive ketones | | Negative | | | |
| Potassium(serum) | | | | 3.4 | | * 1. to 5 mEq/L | | | |

The nurse starts an IV and reviews the labs.

* For each finding click to specify if it is consistent with ketoacidosis or hyperglycemic hyperosmolar syndrome. Each finding may support more than one condition. Each column must have at least 1 correct option.

|  |  |  |
| --- | --- | --- |
| **Laboratory Report** | **Ketoacidosis** | **Hyperglycemic hyperosmolar**  **syndrome** |
| Ph | * X |  |
| Blood glucose | * X |  |
| Serum creatinine | * X | * X |
| Urine | * X |  |

**Scoring Rule: 0/1**

**Rationale:** Serum blood glucose levels in diabetic ketoacidosis can fluctuate between 300 and 800mg/dl. It is typically above 600 mg/dL with HHS. Low pH and urine ketones are seen with DKA. Those values are typically normal with HHS. Both conditions can cause dehydration and elevated creatine.

**Case Study Question 3 of 6**

A 73-year-old male with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200.** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. Weight 205lbs (93kg)  **1215**. Voided 30mL dark amber urine sent for urinalysis. Comprehensive metabolic panel, CBC, and ABG. IV of normal saline started. Capillary glucose is 440. | | | | | | | | |
| **Vital Signs** | |
| Time | | 1200 | | | 1215 | |
| Temp | | 99.5° F (37.5 °C) | | | 99.5° F (37.5 °C) | |
| P | | 118 | | | 115 | |
| RR | | 32 | | | 30 | |
| B/P | | 97/66 | | | 98/70 | |
| Pulse oximeter | | 89% on RA | | | 92% on 2L NC | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | | | | |
| Valsartan 160 mg PO daily | | | | | | | |
| **Laboratory Report** | | |
| Lab | | | | Results | | Reference range | | | |
| ABG pH | | | | 7.20 | | 7.35-7.45 | | | |
| ABG PC02 | | | | 45 | | 35-45 mmHg | | | |
| ABG HC03 | | | | 32 | | 22-26 mEq/L | | | |
| Creatine (Serum) | | | | 1.9 | | 0.9 to 1.4 mg/dL | | | |
| Glucose random | | | | 435 | | 70- 140 mg/dL | | | |
| Other (urine) | | | | Positive ketones | | negative | | | |
| Potassium(serum) | | | | 3.4 | | * 1. to 5 mEq/L | | | |

* Complete the sentence from the list of drop-down options.

|  |  |
| --- | --- |
| The problem the nurse should address first is | Correcting pH  Restoring volume\*  Lowering glucose |

**Scoring Rule: 0/1**

**Rationale:** The priority for care is to restore volume so the client has adequate perfusion. Once the volume is improved, insulin therapy can begin to slowly bring the glucose down. The client will be monitored to determine if the acidosis is getting worse, giving sodium bicarbonate is not done unless the pH is <6.9

**Case Study Question 4 of 6**

73-year-old male with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200.** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. Weight 205lbs (93kg)  **1215**. Voided 30mL dark amber urine sent for urinalysis. Comprehensive metabolic panel, CBC, and ABG. IV of normal saline started. Capillary glucose is 440. | | | | | | | | |
| **Vital Signs** | |
| Time | | 1200 | | | 1215 | |
| Temp | | 99.5° F (37.5 °C) | | | 99.5° F (37.5 °C) | |
| P | | 118 | | | 115 | |
| RR | | 32 | | | 30 | |
| B/P | | 97/66 | | | 98/70 | |
| Pulse oximeter | | 89% on RA | | | 92% on 2L NC | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | | | | |
| Valsartan 160 mg PO daily | | | | | | | |
| **Laboratory Report** | | |
| Lab | | | | Results | | Reference range | | | |
| ABG pH | | | | 7.20 | | 7.35-7.45 | | | |
| ABG PC02 | | | | 45 | | 35-45 mmHg | | | |
| ABG HC03 | | | | 32 | | 22-26 mEq/L | | | |
| Creatine (Serum) | | | | 1.9 | | 0.9 to 1.4 mg/dL | | | |
| Glucose random | | | | 435 | | 70- 140 mg/dL | | | |
| Other (urine) | | | | Positive ketones | | negative | | | |
| Potassium(serum) | | | | 3.4 | | * 1. to 5 mEq/L | | | |

The client is diagnosed with ketoacidosis and the nurse begins to plan care.

* For each nursing intervention, click to specify whether the intervention is indicated, contraindicated or non-essential.

|  |  |  |  |
| --- | --- | --- | --- |
| **Nursing Intervention** | **Indicated** | **Contraindicated** | **Non-Essential** |
| Obtain glycosylated hemoglobin A1C |  |  | * X |
| Teach the client pursed-lipped breathing | * X |  |  |
| Administer insulin glargine subcutaneous |  | * X |  |
| Insert dwelling foley catheter |  | * X |  |
| Administer IV potassium | * X |  |  |
| Monitor EKG | * X |  |  |

**Scoring Rule: 0/1**

**Rationale:** The nurse monitors fingerstick glucoses. The glycosylated hemoglobin A1C is not a good indicator to determine the effectiveness of treatment. Pursed-lipped breathing will help slow the pace of breathing. Treatment for DKA is with regular insulin, not glargine, because it can given IV and titrated to slowly achieve goals. The client's urine output should be measured with a urinal. Clients with diabetes have a high risk of developing infections and a high risk of delayed healing time, thereby an indwelling catheter poses a greater risk for infection. Cardiovascular changes can be observed with mild acidosis. Prolonged and untreated acidosis can lead to the onset of hyperkalemia. The heart rate will decrease, T waves become tall and peaked, and the QRS complex widens. Conversely, hypokalemia can result with insulin therapy; potassium replacement is initiated when serum levels fall below the normal range.

**Case Study Question 5 of 6**

73-year-old male with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200.** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. Weight 205lbs (93kg)  **1215**. Voided 30mL dark amber urine sent for urinalysis. Comprehensive metabolic panel, CBC, and ABG. IV of normal saline started. Capillary glucose is 440. | | | | | | | | | |
| **Vital Signs** | |
| Time | | 1200 | | | | 1215 | |
| Temp | | 99.5° F (37.5 °C) | | | | 99.5° F (37.5 °C) | |
| P | | 118 | | | | 115 | |
| RR | | 32 | | | | 30 | |
| B/P | | 97/66 | | | | 98/70 | |
| Pulse oximeter | | 89% on RA | | | | 92% on 2L NC | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | | | | | |
| Valsartan 160 mg PO daily | | | | | | | | |
| **Laboratory Report** | | |
| Lab | | | | Results | | | Reference range | | | |
| ABG pH | | | | 7.20 | | | 7.35-7.45 | | | |
| ABG PC02 | | | | 45 | | | 35-45 mmHg | | | |
| ABG HC03 | | | | 32 | | | 22-26 mEq/L | | | |
| Creatine (Serum) | | | | 1.9 | | | 0.9 to 1.4 mg/dL | | | |
| Glucose random | | | | 435 | | | 70- 140 mg/dL | | | |
| Other (urine) | | | | Positive ketones | | | negative | | | |
| Potassium(serum) | | | | 3.4 | | | * 1. to 5 mEq/L | | | |
| **Orders** | | | | |
| * Admit to ICU with diagnosis of ketoacidosis * Give 1000ml IV 0.9 NS fluid bolus over 30 minutes * The start .9NS with 20mEQ KCL/100 mL at 125mL/hr * Start regular insulin infusion at 0.1 Units/kg/h after fluid bolus * Finger stick blood glucose hourly ; titrate insulin infusion-based on ICU protocol * Obtain electrolytes every 2 hours * Continuous cardiac monitoring | | | | | | | | | | |
|  | | | | | | | | | | |

The nurse reviews orders the orders.

What actions should the nurse take while implementing the treatment plan? Select all that apply

* Begin insulin after bolus at 0.9 Units/hr
* Anticipate holding insulin for low potassium levels \*
* Request IV fluids with dextrose when glucose levels start to normalize\*
* Allow client to client to eat when status stabilizes \*
* Monitor for symptoms of fluid overload\*

**Scoring Rule: +/-**

**Rationale.** Hypokalemia can result with insulin therapy. Insulin is typically held if levels fall below 3.3mEq/L. Dextrose is added to IV fluids when glucose levels stabilize to prevent hypoglycemia. Clients can eat when their respiratory status is stable, and they feel like eating. During the initial phase of treating the client for DKA, the nurse should monitor the client’s status to prevent the onset of fluid overload. The client weighs 93 kg so based on orders the starting rate would be 9.3 Units/hr.

**Case Study Question 6 of 6**

73-year-old male with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200.** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. Weight 205lbs (93kg)  **1215**. Voided 30mL dark amber urine sent for urinalysis. Comprehensive metabolic panel, CBC, and ABG. IV of normal saline started. Capillary glucose is 440.  **1230** Transferred to ICU. IV fluids bolus given.  **1300**: Started on maintenance IV fluids and insulin drip.  **1330:** Capillary glucose 435. Awake, alert, oriented to person and place, talking in full complete sentences. Denies pain. Breath sounds are clear. Voided 300mL clear color urine. | | | | | | | | | | |
| **Vital Signs** | |
| Time | | 1200 | | | | 1215 | | 1330 | | 1330 | | |
| Temp | | 99.5° F (37.5 °C) | | | | 99.5° F (37.5 °C) | | 98.9°F (37.1 °C) | | 98.9°F (37.1 °C) | | |
| P | | 118 | | | | 115 | | 105 | | 100 | | |
| RR | | 32 | | | | 30 | | 30 | | 24 | | |
| B/P | | 97/66 | | | | 98/70 | | 100/70 | | 109/70 | | |
| Pulse oximeter | | 89% on RA | | | | 92% on 2L NC | | 94% on 2L NC | | 95% on 2L NC | | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | | | | | |
| Valsartan 160 mg PO daily | | | | | | | | |
| **Laboratory Report** | | |
| Lab | | | | Results | | | Reference range | | | | |
| ABG pH | | | | 7.20 | | | 7.35-7.45 | | | | |
| ABG PC02 | | | | 45 | | | 35-45 mmHg | | | | |
| ABG HC03 | | | | 32 | | | 22-26 mEq/L | | | | |
| Creatine (Serum) | | | | 1.9 | | | 0.9 to 1.4 mg/dL | | | | |
| Glucose random | | | | 435 | | | 70- 140 mg/dL | | | | |
| Other (urine) | | | | Positive ketones | | | negative | | | | |
| Potassium(serum) | | | | 3.4 | | | * 1. to 5 mEq/L | | | | |
| **Orders** | | | | |
| * Admit to ICU with diagnosis of ketoacidosis * Give 1000ml IV 0.9 NS fluid bolus over 30 minutes * The start .9NS with 20mEQ KCL/100 mL at 125mL/hr. * Start regular insulin infusion at 0.1 Units/kg/h after fluid bolus * Finger stick blood glucose hourly and titrate insulin infusion-based on ICU protocol * Obtain electrolytes every 2 hours * Continuous cardiac monitoring | | | | | | | | | | | |
|  | | | | | | | | | | | |

The nurse reassesses the client after giving a fluid bolus and starting the insulin infusion.

* Which findings indicate the treatment plan has been effective? Select all that apply.
* Blood pressure \*
* Mental status \*
* Breath sounds
* Pulse 100 bpm \*
* Capillary glucose
* Pain levels

**Scoring Rule: +/-**

**Rationale:** Treatment of diabetic ketoacidosis focuses on managing and correcting the serum glucose along with correcting dehydration, electrolyte imbalances and acidosis. With the administration of the intravenous fluids and the insulin infusion, the accumulated ketone bodies are reversed, thereby correcting the acidotic state, and ending the production of ketones from the fat breakdown. Reversal of the ketone production and correction of the fluid and electrolyte imbalance, the compensatory mechanisms are stimulated. The blood pressure will increase, and the heart rate will decrease. With the cells being rehydrated and glucose moving into the cells, the client's neurological status should improve. Pain was not a primary issue and breath sounds were clear to start. The blood glucose has not yet begun to decrease.

**Bowtie**

A 73-year-old male client with a history of type II diabetes presented to the emergency department due to a change in mental status.

|  |
| --- |
| **Nurses' Notes** |
| **1200.** 73-year-old male with a history of diabetes type II brought to the emergency department by spouse for changes in mental status from his baseline. The client's wife reports that he woke at 0600 to complete his morning routine. At approximately 1100 he became unaware of his surroundings and began sweating profusely and slurring his words. Breath sounds are clear but noted with a fruity citrus odor and deep rapid respirations. Sinus tachycardia per cardiac monitor**.** He is awake and alert, pupils equal and reactive to light. Weight 205lbs (93kg)  **1215**. Voided 30mL dark amber urine sent for urinalysis. Comprehensive metabolic panel, CBC, and ABG. IV of normal saline started. 2L O2 started per NC. Capillary glucose is 440. | | | | | | | | | |
| **Vital Signs** | |
| Time | | 1200 | | | | 1215 | |
| Temp | | 99.5° F (37.5 °C) | | | | 99.5° F (37.5 °C) | |
| P | | 118 | | | | 115 | |
| RR | | 32 | | | | 30 | |
| B/P | | 97/66 | | | | 98/70 | |
| Pulse oximeter | | 89% on RA | | | | 92% on 2L NC | |
| **Medications** | | |
| Empagliflozin 10 mg PO daily | | | | | | | | |
| Sitagliptin / metformin 50-1000 mg PO daily | | | | | | | | |
| Valsartan 160 mg PO daily | | | | | | | | |
| **Laboratory Report** | | | | |
| Lab | | | | Results | | | Reference range | | | |
| ABG pH | | | | 7.20 | | | 7.35-7.45 | | | |
| ABG P02 | | | | 60 | | | 75-100 mm Hg | | | |
| ABG PC02 | | | | 45 | | | 35-45 mmHg | | | |
| ABG HC03 | | | | 32 | | | 22-26 mEq/L | | | |
| BUN | | | | 34 | | | 10-20 mg/dL | | | |
| Creatine (Serum) | | | | 1.9 | | | 0.9 to 1.4 mg/dL | | | |
| Hematocrit | | | | 37 | | | Males: 42-52%; Females: 35-47% | | | |
| Hemoglobin | | | | 14 | | | Males: 13-18 g/dL; Females:12-16 g/dL | | | |
| WBC | | | | 4.7 | | | 4.5 – 10.5 x 103 cells/mm3 | | | |
| Platelets | | | | 140,000 | | | 140,000 to 450,000/ mm3 | | | |
| Potassium(serum) | | | | 3.4 | | | 3.5 to 5 mEq/L | | | |
| Sodium (serum) | | | | 140 | | | 135 to 145 mEq/L | | | |
| Other (urine) | | | | Positive ketones | | |  | | | |

* Complete the diagram by dragging from the choices below to specify what condition the client is most likely experiencing, 2 actions the nurse should take to address that condition, and 2 parameters the nurse should monitor to assess the client's progress.

|  |  |  |
| --- | --- | --- |
| Action to take |  | Parameter to monitor |
|  | Condition most likely experiencing |  |
| Action to take |  | Parameter to monitor |
| **Actions to take** | **Potential conditions** | **Parameters to monitor** |
| Administer IV insulin \* | Cardiogenic shock | Capillary glucose monitoring\* |
| Give nitroglycerin | Diabetic ketoacidosis\* | Serial electrocardiogram |
| Assist with intubation | Hyperglycemic hyperosmolar syndrome | Arterial blood gases |
| Administer antibiotics | Urinary tract infection with delirium | Urinalysis |
| Infuse normal saline fluid bolus\* |  | Level of consciousness \* |

**Scoring Rule: 0/1**

**Rationale:** The labs indicate the client has diabetic ketoacidosis an acute complication of diabetes evidenced by the hyperglycemia, acidosis, and production of ketones. Treatment of diabetic ketoacidosis focuses on managing and correcting the serum glucose along with correcting dehydration and electrolyte imbalances. With the administration of the intravenous fluids and the insulin infusion the accumulated ketone bodies are reversed thereby correcting the acidotic state and ending the production of ketones from the fat breakdown. The nurse closely monitors blood glucose and adjust insulin accordingly. With the cells being rehydrated and glucose moving into the cells the client's neurological status should improve.