

Turning The Tide: Effective Management Of Severe Diabetic Ketoacidosis In A Young Child-A Clinical Case Study

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Abstract

Diabetic Ketoacidosis (DKA) represents a critical, life-threatening complication of Type 1 Diabetes Mellitus (T1DM), particularly in paediatric populations where early recognition and prompt intervention are vital for survival. This clinical case study focuses on a 4-year-old female who presented with classic symptoms of DKA, including polyuria, polydipsia, weight loss, and acidotic breathing. Laboratory tests confirmed severe hyperglycaemia, metabolic acidosis, and ketonemia. The nursing team played an essential role in the management, providing continuous monitoring, administering intravenous fluids, insulin, and electrolyte replacement, and performing frequent neurological and vital sign assessments to detect early complications such as cerebral edema and hypoglycaemia.

Meticulous nursing care contributed to the child's rapid clinical improvement, transition to subcutaneous insulin therapy, and safe discharge. This case highlights the integral role of nursing in acute DKA management and emphasizes the importance of ongoing education and psychosocial support for the patient and family to ensure effective long-term diabetes management and prevention of recurrent DKA episodes.

Key Word: Diabetic ketoacidosis, hyperglycemia, ketosis, metabolic acidosis

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I. Introduction

Diabetic Ketoacidosis is a severe metabolic emergency resulting from an absolute or relative deficiency of insulin, leading to hyperglycaemia, ketosis, and metabolic acidosis. In paediatric patients, DKA is often the initial presentation of Type 1 Diabetes Mellitus but can also occur in those with established diabetes due to missed insulin doses, infections, or other physiological stressors. Prompt identification and treatment of DKA are critical to prevent life-threatening complications such as cerebral edema, electrolyte imbalances, and cardiovascular instability. Nurses are vital members of the multidisciplinary team responsible for early detection, initiating emergency interventions, continuous monitoring, and educating patients and families. Their role extends beyond clinical care to encompass psychological support and health promotion, which are crucial in a child's recovery and long-term management. This case study illustrates the comprehensive nursing approach to managing DKA in a young child, highlighting critical interventions, monitoring strategies, and education to improve outcomes.

II. Overview Regarding The Condition

Diabetic Ketoacidosis (DKA) is a severe and potentially life-threatening complication predominantly seen in children and adolescents with Type 1 Diabetes Mellitus (T1DM). It occurs due to a significant deficiency of insulin, which forces the body to metabolize fats as an alternative energy source. This fat metabolism results in the accumulation of ketones in the blood, causing metabolic acidosis. Common precipitating factors include missed insulin doses, infections, and physiological stressors such as trauma or illness that increase insulin requirements. The incidence of DKA has been rising globally among pediatric patients, both newly diagnosed and those with pre-existing diabetes who have poor compliance with insulin therapy. Clinically, DKA is characterized by hyperglycemia, dehydration, electrolyte imbalances, and the presence of ketones in blood and urine. Symptoms often include nausea, vomiting, abdominal pain, excessive thirst, frequent urination, and altered mental status. Treatment focuses on correcting dehydration, normalizing blood glucose levels, replenishing electrolytes—especially potassium—and reversing metabolic acidosis through carefully monitored

insulin therapy. Despite advances in care, DKA remains a significant cause of morbidity and mortality in children with T1DM, underscoring the importance of early recognition and prompt, aggressive management to improve outcomes. Complications such as hyperchloremic metabolic acidosis, hypokalemia, hypoglycemia, and cerebral edema must be vigilantly monitored during treatment to reduce risks and ensure recovery.

III. Case Presentation

Patient Profile

The patient, a 4-year-old female child, presented with classic symptoms of DKA, including increased thirst, frequent urination, and weight loss. Upon admission, the nursing staff undertook a thorough initial assessment to establish baseline vital signs, hydration status, and neurological function. This baseline assessment guided the treatment plan and enabled the nursing team to detect early warning signs of deterioration during her hospital stay.

Clinical Presentation

The child exhibited hallmark features of DKA such as polydipsia, polyuria, and weight loss, with visible signs of dehydration and acidotic breathing. Nurses performed ongoing assessments of hydration, respiratory status, and neurological condition, carefully documenting changes and communicating findings promptly to the medical team. Early identification of acidotic breathing and dehydration by nurses ensured rapid initiation of appropriate interventions, preventing further metabolic derangement.

Clinical Course and Nursing Management

Upon arrival at the emergency department, the 4-year-old patient exhibited classical signs of Diabetic Ketoacidosis, including severe dehydration, acidotic breathing, and markedly elevated blood glucose levels. Following immediate assessment, the patient was admitted to the Paediatric Intensive Care Unit (PICU) for close observation and management under the direct supervision of the attending physician.

Under physician guidance, the nursing team initiated prompt intravenous fluid resuscitation with isotonic saline and potassium supplementation to address dehydration and electrolyte imbalances. Nurses were responsible for securing intravenous access, administering fluids and medications exactly as prescribed, and meticulously recording intake and output to monitor fluid balance.

Hourly bedside blood glucose monitoring was conducted by nurses, allowing for real-time adjustment of intravenous insulin doses as directed by the physician to safely reduce hyperglycaemia without causing hypoglycaemia. Nurses also carried out frequent neurological assessments, utilizing the Glasgow Coma Scale, and carefully observed for early signs of cerebral edema such as headache, altered consciousness, vomiting, or pupillary changes. Any abnormalities were immediately reported to the medical team to facilitate rapid intervention.

Electrolyte levels, particularly potassium, were closely monitored through serial laboratory testing. Nurses coordinated with the laboratory and communicated results promptly to the physician, who adjusted potassium replacement therapy accordingly. Respiratory status was continually assessed to monitor resolution of acidotic breathing, with oxygen administered if needed under medical orders.

Throughout the hospital stay, nurses maintained detailed documentation of vital signs, neurological status, glucose levels, and electrolyte values, ensuring effective communication within the healthcare team and timely modifications to the treatment plan. In addition to clinical care, nursing staff provided comfort measures, managed symptoms such as nausea and abdominal pain, and supported the child's emotional well-being.

Education of the child's family was an ongoing process, carried out in collaboration with the physician and diabetes educators. Nurses reinforced instructions on insulin administration, monitoring of blood glucose and ketones, sick-day management, and signs of complications that require urgent medical attention.

As the child's condition stabilized, and blood glucose and acid-base status normalized, the nursing team assisted in transitioning the patient to subcutaneous insulin injections, carefully following the physician's directives to ensure safe and effective glycaemic control.

IV. Nursing Care Plan

Nursing care was the cornerstone of this child's recovery. A comprehensive care plan was developed addressing hydration, nutrition, electrolyte balance, pain, respiratory status, education, and psychosocial needs.

1. Risk for Deficient Fluid Volume

Nurses continuously assessed hydration status by monitoring skin turgor, mucous membranes, and urine output. Timely administration of IV fluids, combined with frequent vital sign checks, helped reverse dehydration while avoiding fluid overload. Nurses adjusted fluid therapy based on ongoing assessments, directly influencing the child's hemodynamic stability.

2. Imbalanced Nutrition: Less Than Body Requirements

Given the metabolic demands of DKA, nurses carefully monitored blood glucose and ketones, ensuring appropriate insulin dosing. They collaborated with dietitians to gradually reintroduce nutrition as the child stabilized, providing education to parents on dietary management critical for glycaemic control.

3. Risk for Electrolyte Imbalance

Nurses were vigilant in monitoring electrolytes, particularly potassium, due to the risk of dangerous shifts during insulin therapy and fluid replacement. They administered potassium supplements judiciously, monitored cardiac rhythms through ECG, and recognized early signs of electrolyte disturbances to prevent complications.

4. Acute Pain

Nurses regularly assessed the child's discomfort related to abdominal pain or nausea, providing both pharmacological and non-pharmacological interventions. Ensuring comfort was important for reducing stress, which could worsen metabolic imbalance.

5. Ineffective Breathing Pattern

Nurses closely observed respiratory rate and effort, noting the characteristic Kussmaul respirations associated with acidosis. They ensured oxygen was administered when needed and monitored arterial blood gases, which helped gauge the effectiveness of therapy.

6. Deficient Knowledge (Family)

Nurses took the lead in educating the family on insulin administration, recognizing early warning signs of DKA, and managing sick days. This empowerment helped reduce future hospitalizations and improved adherence to treatment plans.

7. Risk for Injury

Frequent neurological assessments by nurses helped identify any signs of cerebral edema or altered mental status. Safety measures were implemented proactively to prevent falls or injury during periods of altered consciousness.

8. Psychosocial Support

Understanding the emotional impact of hospitalization, nurses provided reassurance and emotional support to both the child and family. They fostered a calm environment, which is critical for recovery and long-term diabetes management.

Discharge Plan

Before discharge, nurses ensured the family was confident in insulin administration and hypoglycaemia management. They provided educational materials, demonstrated glucometer and ketone testing, and emphasized adherence to follow-up appointments. Nurses also coordinated with multidisciplinary teams to guarantee comprehensive outpatient support, essential to preventing readmission.

V. Outcome

The successful management of this paediatric DKA case underscores the indispensable role of nursing care. Nurses are central to early recognition, detailed monitoring, and continuous education, which together ensure safe and effective treatment. Through compassionate care and family engagement, nurses help transform a medical emergency into a manageable chronic condition, promoting better long-term outcomes for children with Type 1 Diabetes.

Thanks to comprehensive nursing care, the child's condition improved steadily, with normalization of blood glucose levels, correction of metabolic acidosis, and resolution of dehydration and acidotic breathing within 24 to 48 hours. Neurological assessments remained stable, with no signs of cerebral edema or other complications. The child tolerated transition to subcutaneous insulin and oral intake successfully. Prior to discharge, nurses conducted detailed teaching sessions with the family to ensure understanding of diabetes management, insulin administration, monitoring, and emergency protocols, including glucagon use for severe hypoglycaemia. The family was also provided with tools such as glucometers, ketone testing strips, and written instructions to support home care. Follow-up appointments were scheduled to monitor ongoing diabetes control and adjust treatment as needed. This case demonstrates that vigilant nursing care, combining clinical monitoring with patient and family education, is essential for achieving positive outcomes in paediatric DKA management.

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