The Child with an Endocrine or Metabolic Alteration

HELPFUL HINT

Refer to an anatomy and physiology textbook for a more extensive discussion of the endocrine system.

MATCHING KEY TERMS

Match the term with the correct definition.

1. ______ hormone  
   a. An endocrine gland attached to the base of the brain that secretes many hormones
2. ______ gland  
   b. Chemical substance produced by one gland or tissue and transported by the blood to other tissues, where it causes a specific effect
3. ______ pituitary  
   c. Blood glucose levels below 70 mg/dl
4. ______ euthyroid  
   d. Portion of the brain that secretes releasing factors
5. ______ glucagon  
   e. Organ or structure that secretes a substance to be used in some other part of the body
6. ______ hyperglycemia  
   f. Normal thyroid function
7. ______ hypoglycemia  
   g. In a non-diabetic person, fasting blood glucose level greater than or equal to 110 mg/dl
8. ______ hypothalamus  
   h. Counteracts the action of insulin

REVIEW OF THE ENDOCRINE SYSTEM

Match each hormone with the pituitary lobe that produces it. (Answers may be used more than once.)

1. ______ oxytocin  
   a. Anterior pituitary lobe
2. ______ adrenocorticotropic hormone (ACTH)  
   b. Posterior pituitary lobe
3. ______ thyroid-stimulating hormone (TSH)  
4. ______ luteinizing hormone (LH)  
5. ______ antidiuretic hormone (ADH)  
6. ______ growth hormone (GH)  
7. ______ prolactin

DIAGNOSTIC TESTS AND PROCEDURES

1. How are alterations in endocrine functioning usually diagnosed?

2. Accurate measurements of _______ and _______ are essential when assessing a child for endocrine function.
NEONATAL HYPOGLYCEMIA

1. Hypoglycemia in the neonate is defined as a plasma glucose concentration of less than
   ________________.

2. The neonates who are most likely to experience hypoglycemia are ________________ infants and infants
   who are ________________.

3. List five signs that indicate a neonate is hypoglycemic.
   a. __________________
   b. __________________
   c. __________________
   d. __________________
   e. __________________

4. What is the intervention for a neonate who is hypoglycemic but asymptomatic?

5. What assessments are indicated if a neonate is at increased risk for hypoglycemia?

6. What complication can occur when a neonate is receiving IV glucose?

HYPOCALCEMIA

1. Neonatal hypocalcemia is defined as total serum calcium concentration of less than ________________.

2. Why does neonatal hypocalcemia occur most often in infants of diabetic mothers?

3. What is the best time to administer an oral calcium supplement?
PHENYLKETONURIA AND INBORN ERRORS OF METABOLISM

1. What is the genetic transmission pattern of phenylketonuria?

2. Phenylketonuria results in damage to which body system?

3. When should the neonate be screened for phenylketonuria?

4. What is the treatment of phenylketonuria?

Answer as either true (T) or false (F).

5. _______ The child with galactosemia must be on a lifelong low-protein limited-amino acid diet.

6. _______ Maple syrup urine disease causes ketoacidosis 2 to 3 days after birth.

7. _______ Tay-Sachs disease can be treated through dietary modifications.

CONGENITAL ADRENAL HYPERPLASIA

1. In congenital adrenal hyperplasia, the adrenal gland is not able to manufacture ________________ but instead produces excess ________________.

2. What finding in the newborn infant would raise suspicion of congenital adrenal hyperplasia?

3. The treatment of congenital adrenal hyperplasia involves lifelong ____________________________.

CONGENITAL AND ACQUIRED HYPOTHYROIDISM

Answer as either true (T) or false (F).

1. _______ Newborn screening for hypothyroidism should be done between 10 and 14 days of age.

2. _______ If untreated, congenital hypothyroidism can result in intellectual disability.

3. _______ Treatment of congenital hypothyroidism requires lifelong thyroid hormone replacement.

4. _______ The most common cause of acquired hypothyroidism in children is an autoimmune process.

5. _______ A decreased TSH level is the most sensitive indicator of primary hypothyroidism.
Match each disorder with its characteristic signs and symptoms. (Disorders may be used more than once.)

6. decreased activity
7. nervousness
8. increased appetite
9. weight gain
10. edema of face, hands, and eyes
11. cold intolerance

12. What should parents be taught about administering levothyroxine to their infant?

HYPERTHYROIDISM (GRAVES’ DISEASE)

1. The preferred treatment for a child with hyperthyroidism is ________________

2. The child receiving propylthiouracil must be monitored for which three significant adverse effects?
   a. ________________
   b. ________________
   c. ________________

3. Why may treatment for Graves’ disease be tapered after a few years?

DIABETES INSIPIDUS

1. Diabetes insipidus results when there is a deficiency of ________________

2. List the two classic manifestations of diabetes insipidus.
   a. ________________
   b. ________________
3. Describe the response of a child with diabetes insipidus to being deprived of all fluids for 8 hours.

4. What medication is used to treat diabetes insipidus?

5. How is this medication administered?

SYNDROME OF INAPPROPRIATE ANTIDIURETIC HORMONE (SIADH)

1. What is the body’s response to excessive ADH?

2. In SIADH:
   a. urine output is ________________________.
   b. urine specific gravity is ________________________.
   c. serum sodium levels are ________________________.
   d. urine osmolality is ________________________.

3. The child with fluid overload is at risk for injury related to ________________________ caused by hyponatremia.

PRECOCIOUS PUBERTY

1. Define precocious puberty.

2. What is a major consequence of precocious puberty?

3. The treatment for precocious puberty is ________________________.
4. How does the treatment in question #3 work to inhibit precocious puberty?

GROWTH HORMONE (GH) DEFICIENCY

Answer as either true (T) or false (F).

1. ______ A sign that a child may have a GH deficiency is weight less than 5th percentile for age and gender.
2. ______ Delayed puberty is a manifestation of GH deficiency.
3. ______ Stimulation testing is necessary to confirm a diagnosis of GH deficiency.
4. ______ GH replacement is administered subcutaneously 6 to 7 times per week.

DIABETES MELLITUS

1. The primary source of energy for body cells is _________________________________.
2. Glucose is stored in the liver and muscles in the form of _____________________________.
3. The main function of insulin is _________________________________.
4. What is the etiology of type 1 diabetes mellitus?

Identify the physiologic basis for the following signs and symptoms of type 1 diabetes mellitus.

5. Hyperglycemia

6. Polyuria

7. Excessive thirst

8. Hunger

9. Weight loss

10. A fasting serum glucose level exceeding _________ and a random level exceeding _________ is indicative of type 1 diabetes mellitus.
Answer as either true (T) or false (F).

11. The child in the “honeymoon” phase requires increased insulin therapy to prevent hyperglycemia.
12. The goal of insulin therapy is to assist the beta cells with insulin production.
13. Oral hypoglycemic agents are not effective in the management of type 1 diabetes mellitus.
14. Food intake should be balanced with insulin dosage.
15. The family should adhere to a consistent schedule for mealtimes and amount of food intake.
16. Exercise raises blood sugar levels.
17. Exercise should be scheduled to coincide with insulin peak times.
18. A 15- to 30-g carbohydrate snack can be eaten when the child is planning 1 hour of exercise.

19. Give three examples of a 15-g serving of carbohydrates for the treatment of hypoglycemia.
   a. 
   b. 
   c. 

20. What situations could result in hypoglycemia?

21. What intervention for hypoglycemia should be taken if the child is unconscious?

22. Why is rehydration the initial step in resolving diabetic ketoacidosis (DKA)?

23. In the treatment of DKA, what type of insulin is used and how is it administered?

24. In DKA, what values would you expect the following laboratory test results to be?
   Blood glucose: 
   Urinary ketones: 
   Arterial pH: 
25. The rise in the incidence of overweight and obese children is directly related to the number of cases of ______________________ in children.

26. What is metabolic syndrome?

27. Describe acanthosis nigricans.

28. For how many minutes a day should children with type 2 diabetes participate in moderate physical activity?

**SUGGESTED LEARNING ACTIVITIES**

1. Arrange an observational experience in an outpatient endocrine clinic. Because many children with endocrine alterations are treated in outpatient settings, this would provide firsthand knowledge of pediatric endocrine alterations.

2. Develop a teaching plan for the parents of a newborn diagnosed with congenital hypothyroidism.

3. Review teaching materials for type 1 diabetes mellitus used at your clinical site. Compare them with teaching materials at another site.

4. Talk with children who have type 1 diabetes mellitus and their families about management and living with this chronic disease.

**STUDENT LEARNING APPLICATIONS**

Enhance your learning by discussing your answers with other students.

A 7-year-old child has been sent to the emergency department from a pediatrician’s office for possible DKA. Her parents brought her to the pediatrician because she has had increased urination and abdominal pain. She has lost weight over the past few weeks. The emergency department nurse observes that the child is breathing rapidly and deeply and that her breath has a fruity odor. Her blood glucose is 580 mg/dl. Her parents are shocked when they are told that their daughter is experiencing DKA. Her father says, “We thought she might have a urinary tract infection.”
1. Why might her parents have thought that their daughter had such an infection?

2. What is the basis for the child’s symptoms?

3. What would you expect the child’s insulin schedule to be?

   The child and her parents receive intensive teaching about type 1 diabetes mellitus management. She is placed on a schedule of three insulin injections per day. A few days later, her mother calls the nurse because the child is pale, shaky, and diaphoretic.

5. What do you think is happening to the child?

6. What action would you take?

   The child has been active in soccer and softball at her school, and she wants to continue to play.

7. What can the child do to prevent problems during a game or practice?

**REVIEW QUESTIONS**

Choose the correct answer.

1. Which of these statements about congenital hypothyroidism is correct?
   a. Intellectual disability caused by hypothyroidism is reversible with treatment.
   b. The most common cause of congenital hypothyroidism is thyroiditis.
   c. The child with congenital hypothyroidism requires lifelong thyroid hormone replacement.
   d. Screening for this disorder is usually done between 3 and 6 months of age.

2. The child with precocious puberty is at risk for
   a. altered reproductive ability.
   b. delayed development of secondary sex characteristics.
   c. short adult stature.
   d. endocrine tumors.

3. A clinical manifestation of GH deficiency is
   a. weight less than 5th percentile for age.
   b. hyperglycemia.
   c. precocious puberty.
   d. height less than 5th percentile for age and gender.

4. A nursing intervention for a child with SIADH is to
   a. offer fluids frequently to increase fluid intake.
   b. explain the reason for restricting fluids.
   c. assist the child in selecting low-sodium foods.
   d. assess the child for dehydration.
5. When performing a physical assessment on a child with hyperthyroidism, the nurse would be alert for
   a. coarse hair.
   b. dry, thick skin.
   c. cold intolerance.
   d. tremors.

6. The child experiencing SIADH would be assessed for signs of the electrolyte imbalance called
   a. hyponatremia.
   b. hypernatremia.
   c. hypocalcemia.
   d. hypokalemia.

7. The cause of type 1 diabetes mellitus is thought to be
   a. viral.
   b. genetic.
   c. environmental.
   d. autoimmune.

8. A child received regular insulin subcutaneously at 8:00 A.M. At what time is this child most likely to become hypoglycemic?
   a. 8 to 9 A.M.
   b. 10 to 11 A.M.
   c. 12 noon to 2 P.M.
   d. 3 to 5 P.M.

9. Which of these situations could lead to hypoglycemia?
   a. Insufficient insulin
   b. Decreased exercise
   c. Missed meal
   d. Minor illness

10. An appropriate diabetes task for the preschool child would be to include which of the following?
    a. Perform finger puncture for blood.
    b. Choose injection sites according to a rotation schedule.
    c. Push the plunger on the syringe.
    d. Identify a “code” word to describe hypoglycemia.

11. Sick day rules for the child with type 1 diabetes mellitus include which of the following?
    a. Do not give insulin if the child is nauseated or vomiting.
    b. Test blood glucose levels at least twice a day.
    c. Test urine for ketones with each void.
    d. Offer fluids with calories if the child is not eating.

12. One adrenergic sign of hypoglycemia is
    a. blurred vision.
    b. clammy skin.
    c. irritability.
    d. increased respiratory rate.

13. If not properly balanced with insulin and diet, exercise can lead to
    a. hypoglycemia.
    b. hyperglycemia.
    c. ketoacidosis.
    d. hypokalemia.

14. The best action for a child who is experiencing hypoglycemia is to
    a. drink 4 ounces of fruit juice.
    b. eat a chocolate bar.
    c. drink a can of diet soda.
    d. get some exercise.

15. Type 2 diabetes in children is associated with
    a. intrauterine growth retardation.
    b. obesity.
    c. family history of type 2 diabetes.
    d. all of the above.