

Client Profile

Ryan is an 11-month-old infant who was born with Down's syndrome and lives with his parents in a middle-class neighborhood. Ryan weighed 3.2 kg (7 lb) at birth and a heart murmur was heard. Ryan was breast fed for 4 months. His mother says that at the time, he became "disinterested" in the breastfeeding, but when she was able to get him to nurse, he would fall asleep after having nursed for only 5 minutes. Because he was not gaining weight appropriately, his pediatrician prescribed infant formula with iron and suggested that his mother begin feeding Ryan rice cereal twice a day. At 4 months of age Ryan was diagnosed with an atrial septal defect that has been monitored since the diagnosis. Ryan sits unsupported but, according to his mother, does not crawl or attempt to stand because "he gets out of breath when he tries to crawl so we bought a walker that he moves around in." Since he was 5 months old, Ryan has been receiving digoxin 200 µg and furosemide 10 mg every day.

Case Study

Ryan's parents bring Ryan in to see his cardiologist because he has been lethargic and has had diarrhea for the past 24 hours. When the nurse assesses Ryan, she finds he weighs 7 kg (15.4 lb) and his vital signs are:

Temperature: 36.5° C (97.7° F)

Pulse: 80 beats/minute

Respirations – 35 breaths/minute

His laboratory results are:

Potassium level: 2.9 mmol/L

Digoxin level: 2.5 ng/mL

1. Pathophysiology of atrial septal defect (ASD):
 - A septal defect is the connection between left and right side of the heart. The opening in the atrial septum permits left to right shunting of blood. The opening may be small, as when the foramen ovale fails to close, or large, as when the septum may be completely absent.
2. Incidence and etiology of this congenital heart defect:
 - Because the pressures on the left side of the heart are higher than on the right side, blood will shunt from the left side to the right side and increase the amount of blood that needs to be pumped into the lungs. The increased pulmonary blood flow causes increased pulmonary vascular resistance (constriction of the pulmonary vascular bed) in an effort to reduce the blood flow, and pulmonary artery hypertension. Right ventricular hypertrophy develops to counteract the increasing pulmonary vascular resistance and deliver the increased volume of blood to the lungs. Of the children who have congenital heart defects, 10% of them have an ASD.
3. Relationship between Ryan's current weight and his heart defect:
 - An infant's metabolic rate is increased due to high pulmonary blood flow; because it takes energy to suck, to breastfeed or get formula, the infant gets tired easily. Often the infant is unable to obtain enough calories to support the metabolic rate and growth, resulting in poor weight gain.

4. Other assessment data that indicates an impact on Ryan's growth and development:
 - Potassium is needed for contractility of the heart. Normal potassium is 3.5-5.0, and Ryan's potassium level is 2.9, so his heart is not pumping as effectively as it could. Decreased potassium could have resulted from diarrhea. Decreased potassium could also result from an increase in urinary potassium excretion from several things, including increased aldosterone, which is seen in congestive heart failure.
 - A normal pulse for an 11 month old baby should be between 100 and 160. Ryan's pulse is 80, which is very low. The drug, Digoxin, he is taking causes very low heart rates because it suppresses the AV node
 - Digoxin levels in the blood range from 0.5-2 ng/ml, Ryan has a Digoxin level of 2.5 ng/ml. He could be heading for digitalis toxicity, which includes signs of lethargy, diarrhea, and electrolyte abnormalities, such as hypokalemia, that can worsen the toxicity.

5. Rationale for Ryan's medication regimen:
 - The use of Digoxin increases the force of myocardial contraction, making it easier for the heart to contract. Furosemide is a loop diuretic that causes the body to get rid of urine, and blocks reabsorption of sodium and water in the renal tubes. It is used to reduce the size of the heart by decreasing the amount of blood it needs to pump, which reduces the work of the heart. Ryan's medication regimen results in less blood volume so that the heart can contract easier and preserve its energy.

6. Impression of Ryan's assessment data from the cardiologist's office:
 - My impression is that the doctor should be rethinking his medication regimen. Using Digoxin and Furosemide together may cause hypokalemia which will increase the risk of toxicity. Ryan already has a low potassium level, so using the two drugs together could cause an even more dangerous toxicity level for his body. Lethargy and a low pulse rate are both caused by the decreased blood volume because the sodium-potassium pump is altered due to the toxicity.

7. Preoperative assessment data required prior to Ryan's ASD surgery repair:
 - Physiologic Assessment: Prior to surgery, the infant is seen regularly to assess growth, and for progression of signs of CHF. Most infants with a small defect, like ASD, show no signs of difficulty with growth. Assessment of length and head circumference growth is important to determine the full impact of the condition on growth.
 - Psychosocial Assessment: Assess the ability of the parents to cope with their infant's diagnosis. Parents need an opportunity to express their feelings and to begin learning to cope with their child's illness, and they need special support.
 - Provide Family education about the child's condition including general information of the defect, info about genetic and environmental influences associated with the defect, and an overview of the child's prognosis and timing of medical and surgical interventions
 - Psychosocial Assessment: Parents may need support for their anxiety regarding an uncertain outcome of surgery, determine if they have a support system such as social services or pastoral services.
 - Parents should be educated on home care up until the surgery day, and specific interventions to follow.

8. Priorities for Ryan's preoperative care:
 - Important priorities Ryan needs right before surgery include a careful history and physical examination to detect the presence or potential development of any acute illnesses. Assess the child's behavioral patterns, cardiac function, respiratory function, weight, and fluid status.
9. Potential complications associated with open heart surgery performed on an infant:
 - Infection: signs include fever, excessive incisional pain, spreading erythema around the incision, and wound drainage beginning 3 to 4 days post-op
 - Arrhythmias: auscultate apical pulse to detect an irregular heart rate or bradycardia; both indicate a reduced cardiac output which requires immediate intervention.
 - Pneumonia or fluid in pleural space: assess the chest and lungs for breath sounds, respiratory effort, and signs of distress.
 - Impaired tissue perfusion: check pulse ox, capillary refill, extremity warmth, pedal pulses, LOC, and urine output. Reduced urine output is a sign of decreased cardiac output.
10. Ryan's parents are very anxious about his surgery and expressing concern about what they are going to see when they get to visit him in the pediatric critical care unit after his surgery. How can the nurse intervene to help Ryan's parents prepare for their visit?
 - Provide parents with support, information about how the child will look, equipment that will be used, and what care will be provided in the immediate post-op period. As the nurse, I could identify a parent whose child has a similar heart defect to provide support and information.
11. His parents express great concern about Ryan's pain management following surgery. They've heard that "some doctors don't think infants feel that much pain and what they do feel they don't remember." They have talked to Ryan's surgeon, who has reassured them that Ryan will be adequately medicated to control his pain after surgery. What should the nurse do in response to their concerns?
 - Reassure the parents the proper post-op pain management care. Pain management with 24 hour IV opioids should be provided 1 to 2 days post-op, or until the child is taking fluids. Inform the parents that once the child is taking oral fluids and foods, transition to oral analgesics occurs, and they should be administered regularly. Also, make sure that parents know how to lift and move the child in a manner that reduces stress on the incision and potential pain.
12. Ryan successfully undergoes open heart surgery to repair his ASD. Discuss the reason and purpose of the chest tubes placed in Ryan.
 - Chest tubes are placed in Ryan to drain air, fluids, and blood from around the heart and lungs.
13. Nursing responsibilities associated with the care of Ryan's chest tubes:
 - Carefully monitor vital signs, respiratory function, and observe for respiratory distress.
 - Watch for complications of chest tube placement such as hemothorax, lung tissue injury, and scarring from poor tube placement.

14. Priorities of care for Ryan during his postoperative stay in the pediatric critical care unit:
 - The child will be intubated and on a ventilator until the child is stable and able to breathe independently and then the endotracheal tube will be removed. Suctioning is performed as needed until child can handle secretions. IV lines will be inserted to monitor arterial and venous pressures, and to infuse fluids. Chest tubes are placed in the body. Radiant heat warmers may be used for hypothermia during surgery. Increased body temp is avoided when possible because it increases the metabolic rate, oxygen consumption, risk for neurological injury, seizures, and arrhythmias. Enteral nutrition is used to provide nutrients and improve the immune response. Prophylactic antibiotics are usually given.

15. Nursing interventions to meet the goals of care for Ryan:
 - Encourage the child to take deep breaths and cough, or use spirometry exercises regularly to promote full lung expansion. Provide tips for splinting chest with a pillow or stuffed animal to reduce the pain associated with coughing and deep breathing. Chest physiotherapy may be performed. Inspect the child's incision regularly for signs of infection.
 - Encourage oral fluids and nutrition, and carefully assess I&O. Promote bowel elimination following surgery and opioids. Administer antibiotics as ordered. Ensure adequate rest periods to promote healing.

16. Ryan is transferred from the pediatric critical care unit to the pediatric surgical unit. Five days later his parents are preparing to take him home. Discuss the teaching priorities for Ryan's parents prior to his discharge.
 - Provide information about: the specific cardiac defect, the surgery, and the prognosis; the medications that are prescribed to the child and their administration methods; care of the incision and identification of worrisome symptoms; nutrition and feeding strategies; health promotion like activity guidelines, need for hearing screening, and ways to promote development; bacterial endocarditis prophylaxis if prescribed
 - Prepare parents for potential behavior problems, nightmares, separation anxiety, and over dependence on parents due to the stressful experience of hospitalization. Encourage parents to promote play and other means of dealing with their feelings.
 - With the complete correction of their cardiac defect they shouldn't have any more cardiovascular problems, so allow the child to live a normal life after recovery and normalization of the child's life should be reinforced at the surgical follow-up visits.

**This information was obtained from the Ball, Bindler, and Cowen nursing book and my PDA.