N433 Care Plan

Tetralogy of Fallot

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Pathophysiology of the Tetralogy of Fallot, APA format (20 points):

Tetralogy of Fall (TOF) is a rare congenital heart defects that consists of four cardiac defects (Capriotti & Frizzell, 2016). Four specific conditions occur at the same time in the heart: pulmonary artery stenosis, right ventricular hypertrophy, ventricular septal defect (VSD), overriding large ascending aorta. TOF has been linked to other genetic mutation such as Down syndrome or DiGeorge syndrome which often have this defect. Other high-risk factors include maternal alcohol abuse, maternal diabetes, maternal poor nutrition, geriatric pregnancy (35 and older), and maternal rubella infection (Capriotti & Frizzell, 2016). In tetralogy of Fallot, pulmonary artery stenosis and VSD are the major causes of blood flow disruption. Deoxygenated blood mixes with oxygenated blood in the left ventricle. Together these conditions do not allow enough blood flow to the lungs which mean there is not enough oxygen in the blood (Capriotti & Frizzell, 2016). This explains why the child appears blue.

Neonates born with TOF are cyanotic at birth due to the right-left shunting of blood caused by the narrowing of the pulmonary artery (Capriotti & Frizzell, 2016). Typically, the infant will exhibit failure to thrive and difficulty feeding. The child's symptoms include spells of cyanosis, rapid breathing and agitation all referred to as "tet" spells (Capriotti & Frizzell, 2016). These signs and symptoms depend on the extent of blood flow obstruction. A preventative nursing action would be placing the patient in high fowler's position to reduce dyspnea. Another intervention would be to administer oxygen in the case of a hypercyanotic spell. Expected findings include difficulty breathing, bluish discoloration of the skin, syncope, weakness or unusual irritability. A bluish tint of skin is due to not enough oxygenated blood to the lungs to then move out to the body. Hypercyanotic spells are caused by the right-left shunt across the ventricular septal defect causing desaturation.

The diagnosis of tetralogy of Fallot is completed by a pediatric cardiologist who completes a physical assessment and orders several tests such as an echocardiogram, electrocardiogram, chest x-ray, continuous pulse oximetry readings, or cardiac catheterization (Mayo Clinic, 2018).

Treatment for TOF is open-heart surgery which is typically done during the first year of life (Mayo Clinic, 2018). During this procedure the surgeon convers the hole between the ventricles of the heart, while also widening the pulmonary arteries to increase blood flow to the lungs. By doing this the right ventricle wall will decrease in muscle size now that it won't have to over work. Surgery is the only effective treatment, a temporary procedure is the placement of a shunt (Mayo Clinic, 2018).

Pathophysiology References (2) (APA):

Capriotti, T., & Frizzell, J.P. (2016). *Pathophysiology: Introductory Concepts and Clinical Perspectives.* Philadelphia: F.A. Davis Company.

Mayo Clinic. (2018, March 9). *Tetralogy of Fallot - Diagnosis and treatment* https://www.mayoclinic.org/diseases-conditions/tetralogy-of-fallot/diagnosis-treatment/drc-20353482

Diagnostic Imaging

All Other Diagnostic Tests (5 points):

Prenatal tests can help determine congenital disabilities. If a provider suspects Tetralogy of Fallot, a fetal echocardiogram can assist in visualizing the fetus's heart (Boston Children's Hospital ,2020). After birth, some non-invasive interventions are auscultating the heart and lungs, checking the neonate's pulses, and measuring oxygenated hemoglobin levels. Other diagnostic tests include echo, ECG, chest x-ray, and cardiac catheterization.

Diagnostic Test Correlation (5 points):

Echocardiograms use high-pitch sound waves to produce imaging of the heart (Mayo Clinic, 2018). This test helps diagnose tetralogy of Fallot. An echo allows the provider to determine if there are ventricular septal defect and the location (Mayo Clinic, 2018). Echocardiograms provide imaging based on sound waves that can see the pulmonary valve structure and arteries, the aorta position, and possible other heart defects (Mayo Clinic, 2018).

"An electrocardiogram (ECG) measures the electrical activity of the hear each time it contracts"(Mayo Clinic, 2018). ECG helps determine right ventricular hypertrophy, enlargement of the right atrium, and the heart's rhythm (Mayo Clinic, 2018).

The chest X-ray shows the structure of the heart and lungs. A chest x-ray helps look at the heart's size and spatial relationships within the chest (Boston Children's Hospital,2020). A common manifestation of Fallot's tetralogy is a "boot-shaped" heart (Mayo Clinic, 2018). The shape of the heart is due to an enlarged right ventricle (Mayo Clinic, 2018).

Due to the blue-tinged skin, the provider would want pulse oximetry, which measures the amount of oxygen in the blood (Mayo Clinic, 2018).

Cardiac catheterization is threading a tiny flexible tube into an artery or vein in the groin up to the heart (Mayo Clinic, 2018). This procedure also measures pressure and oxygen levels in the chambers of the heart vessels (Mayo Clinic, 2018). Many pediatric patients do not need a heart catheterization, but some may benefit from placing the stent in a blocked artery to the lung (Boston Children's Hospital,2020). Some physicians use this test to plan surgical treatment (Mayo Clinic, 2018).

Diagnostic Test Reference (APA):

Boston Children's Hospital. (2020*). Tetralogy of Fallot (TOF) - Diagnosis & Treatment*

http://www.childrenshospital.org/conditions-and-treatments/conditions/t/tetralogy-of-fallot/diagnosis-and-treatment

Mayo Clinic. (2018, March 9). *Tetralogy of Fallot - Diagnosis and treatment*

https://www.mayoclinic.org/diseases-conditions/tetralogy-of-fallot/diagnosis-treatment/drc-20353482

Current Medications (10 points)
****Complete *ALL* of your patient's medications****

Brand/Generic	Digoxin Lanoxin	Morphine
Frequency	BID	Q4 hours PRN
Route	PO	IV

Classification	Cardiac glycoside	Opioid
Mechanism of Action	Increases the force and velocity of myocardial contraction, decreasing the conduction rate and increase the refractory period of the AV node.	Binds to opioid receptors in the brain and spinal cord to produce euphoria.
Reason Client Taking	Control rate and rhythm of the heartbeat. Arrhythmias, CHF	Relieves pain severe
Safe Dose Range Calculation	Children 5-10: 3.2-6.4 mcg/ kg/daily divided into two doses	IV Infusion: 0.01-0.04 mg/kg/hr post op 0.025-0.206 mg/kg/hr for sever chronic cancer pain or sickle cell crisis IV Injection: 0.5 to 0.1 0.05 to 0.2 mg/ kg given q4 hr, as needed
Maximum 24-hour Dose	40lb=18.18kg 58.18mcg/18.18kg/day	10 lbs. = 4.55 kg Infusion: 22.47 mg/4.55kg/day Injection: 6.82mg/4.55kg/ day
Contraindications (2)	History of digitalis toxicity or idiosyncratic reaction. Hypersensitivity to digoxin or its components.	Arrhythmias Seizure disorders
Side Effects/Adverse Reactions (2)	Decreased appetite, NVD.	Urinary retention, vomiting, pruritus. Respiratory depression.
Nursing Considerations (3)	Monitor serum potassium level regularly. Take apical pulse prior to giving and notify provider if below 60 beats/minute. Assess for drug effectiveness if patient has acute or chronic atrial fibrillation.	Ensure that antagonist and equipment for oxygen delivery and respiration are available. Store morphine at room temperature. For continuous IV infusion, dilute drug in D5Q and administer with infusion control device.
Client Teaching needs (2)	Do not give OTC medicine without first asking your provider. Teach patient how to take apical pulse and instruct to do so prior to each dose.	Tell patient to change positions slowly to minimize orthostatic hypotension. Advise patient to avoid potentially hazardous activities during morphine therapy.

Medication Reference (APA):

Jones & Bartlett Learning. (2019). 2020 Nurse's Drug Handbook (19th ed.). Jones & Bartlett Learning.

Nursing Diagnosis (15 points)
Must be NANDA approved nursing diagnosis and listed in order of priority

Nursing Diagnosis • Include full nursing diagnosis with "related to" and "as evidenced by" components	**Rationale** • Explain why the nursing diagnosis was chosen	**Intervention (2 per dx)**	**Evaluation** • How would you evaluate the nursing intervention?
1. Decreased Cardiac Output "related to" structural heart defects "as evidence by" dyspnea, decreased peripheral pulses and cyanosis.	Most patient have compensatory tachycardia and significantly low blood pressure in response to reduced cardiac output.	1.Assess HR and BP 2.Position child in high fowler's position	Checking VS q 3 hrs. instead of asking the CNA. Reposition q 2 hrs.
2. Activity intolerance "related to" imbalance between oxygen supply and demand "as evidence by" need to rest after short period of play.	Restricted amount of oxygen to the tissues and muscles cause the patient to feel dyspnea on exertion.	1.Build up lung capacity with the spirometer or walking a specific distance daily increasing. 2.Allow rest periods between care, wake only when necessary for care and procedures.	Set daily and weekly goals to increase less dependence on oxygen therapy after exacerbating activities.
3. Compromised family coping "related to"	This is not a common condition and	1.Observe for erratic behavior	Provide information about intervention to relieve anxiety.

developmental crises of family "as evidence by" family concern and fear about congenital heart condition.	with the rarity comes fear of the unknown. Assist the families with information in a way that they learn best.	2 Encourage expression of feelings and provide factual information about child	Provide support for problem solving and managing of the situation. Identify need to develop new coping skills.
4. Risk for injury "related to" cardiac function compromised by congenital defects "as evidence by" "tet" spells	Tetralogy of Fallot is a CHD, this can be repaired but the patient will have lifelong issues due to this condition. Knowledge is powerful, teach the caregivers and patient how to manage it.	1.Teach positions to take if child is cyanotic. 2. Prepare child and caregiver for diagnostic procedures with toy or doll to create a less traumatic experience.	Teach back for both interventions.

Other References (APA):

Hinkle, J. L., & Cheever, K. H. (2017). Brunner & Suddarth's Textbook of Medical-Surgical Nursing (Brunner and Suddarth's Textbook of Medical-Surgical) (14th ed.). Wolters Kluwer.

Discussion Questions: Congenital Heart Defect Case Study

1. Prior to reviewing the case study, what did you know about congenital heart defects?
    a. Prior to this case study I did not know much about congenital heart defects at all, this was very informative and intriguing.
2. What are the 4 congenital heart defects associated with Tetralogy of Fallot?

   a. Pulmonary artery stenosis (Capriotti & Frizzell, 2016). This condition is the narrowing of the pulmonary valve and main pulmonary artery. Pulmonary stenosis is when the pulmonary valve cannot fully open resulting in the heart working harder which results in a lack of blood reaching the lungs (National Organization for Rare Disorders, 2016).
   b. Right ventricular hypertrophy (Capriotti & Frizzell, 2016). This occurs when the muscular wall of the lower right chamber of the heart called the right ventricle is thicker than normal (Capriotti & Frizzell, 2016). The thickened wall can contribute to blocking the blood flow through the pulmonary valve, which allows blood to go from the heart into the lungs (Baffa, 2017).
   c. VSD (Capriotti & Frizzell, 2016). Ventricular septal defect (VSD), is a condition where a hole is in the wall between the two lower chambers or ventricles of the heart. The inner wall of the heart separates the two chambers, called a septum. The septum's job is to not allow blood to mix between the two chambers. A ventricular septum defect is a hole in the septum that allows the oxygenated blood to mix with deoxygenated blood (National Organization for Rare Disorders, 2016).
   d. Overriding large ascending aorta (Capriotti & Frizzell, 2016). The aorta is attached to the left ventricle allowing oxygen-rich blood to flow throughout the body in a normal heart. In a tetralogy of Fallot heart, the aorta is between the left and right ventricle. This results in deoxygenated blood from the right side to flow into the aorta instead of the pulmonary artery. This leads to severe cyanosis, if not treated can lead to life-threatening complications (National Organization for Rare Disorders, 2016).
3. What signs and symptoms are associated with Tetralogy of Fallot?
   a. Healthy babies can sometimes have bluish skin around the mouth or eyes from prominent veins underneath the skin, but their lips and tongue are pink. Babies who lack oxygen in the blood typically have blue lips and tongues in addition to their skin tint. Cyanosis is very common in TOF (Baffa, 2017). Symptoms vary widely from person to person. The severity of symptoms can range from mild to severe which relates to the obstruction of blood from the right ventricle. Cyanosis, tachypnea and agitation. Chronic hypoxia can lead to clubbing of the fingers (Capriotti & Frizzell, 2016). Other symptoms may include a heart murmur, easy fatigue, poor appetite, slow weight gain, or delayed physical growth. Upon auscultation, the first heart sound is normal with a single second heart sound that is loud. The more prominent the murmur means a harsh systolic ejection rate (Diaz-Frias & Guillaume, 2020).
4. Which defect is responsible for the hypercyanotic spells?
   a. Ventricular septal defect
5. What is the relationship between the blood flow and pulmonary stenosis that contributes to hypercyanotic spells?
   a. During "tet" spells the child's skin will turn bluish due to the fact the blood doesn't carry enough oxygen (Capriotti & Frizzell, 2016). The decrease in

systemic vascular resistance or increase in pulmonary resistance contributing to right-left shunt across the ventricular septal defect causing desaturation.

6. What causes hypercyanotic spells?
    a. Crying, defecating, playing or kicking legs can all lead to episodes of cyanosis and hypoxia that result in oxygen saturation drops. “Tet spells” or hypercyanotic episodes present during infancy or toddler age and begin to decrease after age 4-5 years old (Diaz-Frias & Guillaume, 2020). Dehydration or agitation commonly spark these spells and if patients do not receive prompt treatment, they can develop severe cyanosis that can cause syncope or even death (Diaz-Frias & Guillaume, 2020). Clubbing is not present unless the patient has had sever cyanosis.
7. What is the initial treatment of a child experiencing a hypercyanotic spell?
    a. “Tet spells” require rapid and aggressive approach including positioning to increase systemic vascular resistance. First try the knee-chest (older children typically squat spontaneously and do not develop spells), create a calm environment, then give supplemental oxygen, and lastly give IV fluids for volume expansion. If spell persists, give morphine. Oxygen therapy assists to cause pulmonary vasodilation and systemic vasoconstriction and intravenous bolus to improve right ventricle filling and pulmonary flow (Diaz-Frias & Guillaume, 2020). Morphine and intravenous beta blockers help improve the right ventricle outflow obstruction by relaxing the muscle (Diaz-Frias & Guillaume, 2020). Intravenous phenylephrine increases systemic afterload. If heart failure develops, digoxin and loop diuretics are a pharmacological option (Diaz-Frias & Guillaume, 2020).
8. How is Tetralogy of Fallot corrected?
    a. Immediate treatment is keeping ductus arteriosus open to allow some blood to enter the artery from the aorta (Capriotti & Frizzell, 2016). All children with tetralogy of Fallot will need surgery, the timing may vary dependent on symptoms (Diaz-Frias & Guillaume, 2020). The primary repair typically last two decades before requiring a pulmonary valve replacement. After surgery, most pediatric patient remains asymptomatic. Surgery is not a cure to TOF but rather palliative (Diaz-Frias & Guillaume, 2020). During the primary repair the surgeon widens the passageway between the right ventricle and the pulmonary artery. This results in blood flow improvement the lungs. The ventricular septal defect is patched to stop the mixing of blood between the ventricles. This then fixes the overriding aorta and right ventricular hypertrophy (Baffa, 2017).
9. After reviewing the case study, what are your thoughts on Tetralogy of Fallot?
    a. TOF is a very complex defect of the heart, not just one but four different heart defects. This can be present at birth or emerge in the first year of life. Having TOF can also lead to other complications such as anemia, polycythemia, and coagulation defects. This seems to be a rare malformation that occurs more frequently in males than females (Baffa, 2017).

Reference:

Baffa, Gina. (2017, May). *Tetralogy of Fallot (TOF) (for Parents) - Nemours Kids Health*. https://kidshealth.org/en/parents/tetralogy-of-fallot.html

Capriotti, T., & Frizzell, J.P. (2016). Pathophysiology: Introductory Concepts and Clinical Perspectives. Philadelphia: F.A. Davis Company.

Diaz-Frias, J., & Guillaume, M. (2020, August 10). *Tetralogy of Fallot - NCBI Bookshelf*. NCBI. https://www.ncbi.nlm.nih.gov/books/NBK513288/

NORD (National Organization for Rare Disorders). (2016, August 18). Tetralogy of Fallot. https://rarediseases.org/rare-diseases/tetralogy-of-fallot/

Proof of Completion of Case Study (10 pts)

Course completed on 10/3/2020

Case Study: Congenital Heart Defects

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1 / 1 lessons completed