

Rwandan Nurses Save Lives!
Rheumatic Heart Disease Conference ©
Healthcare Provider Manual



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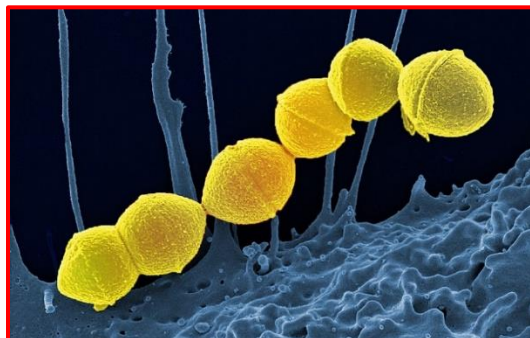
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TEAM HEART

Rwanda MoH & RBC

Module 1: Streptococcus pyogenes infections

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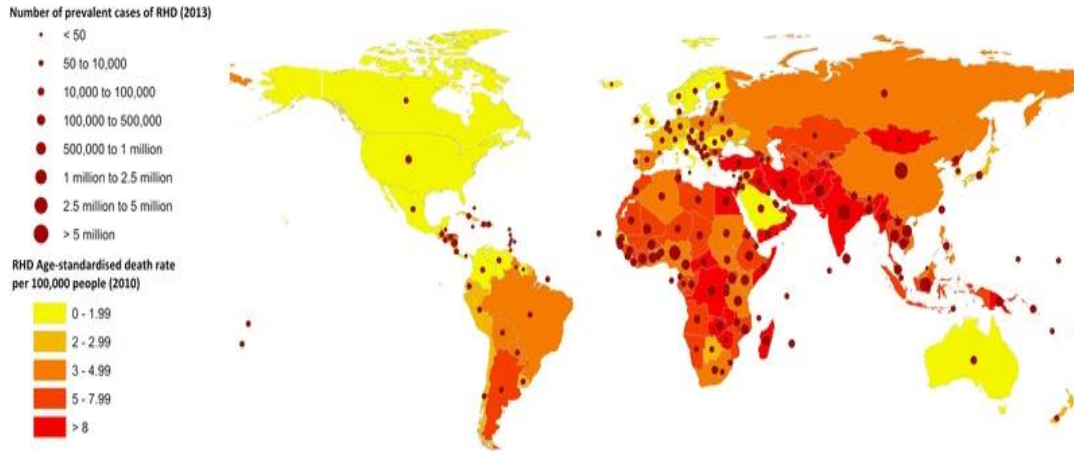


Many sore throats are caused by viruses. However, up to 40% of sore throat infections in Rwanda are caused by a **bacteria** called **Streptococcus pyogenes**. Our nursing challenge is to identify these bacterial streptococcus pyogenes infections and to treat them before long term complications result.

BACKGROUND

What is Strep throat- Streptococcus Tonsillopharyngitis?

- This is an upper respiratory infection which is caused by a Streptococcus pyogenes bacteria and diagnosed as “Strep Throat”.
- Strep throat is a very dangerous and contagious bacterial infection of the throat
- It is **endemic** in Rwanda and in several other parts of the world.
 - Endemic means there is a more Streptococcus pyogenes bacteria in a specific population over many years.
 - All of Sub Sahara Africa, Asia, and Oceania (the Islands from Japan to Australia) have endemic Streptococcus pyogenes infections.



- Strep Throat is **most common in school-age children (ages 5-15)** but may occur in younger children, especially if they have contact with school-age children.
- **The only places where the Streptococcus pyogenes bacteria live are on the skin and mucous membranes of the human host.** In some cases, there are people who carry the bacteria, but do not get sick themselves, and yet infect others (they are called carriers).
- In climates like Rwanda, the incidence of Strep Throat peaks during rainy seasons during which more than 40% of cases of sore throat in children and adolescents are caused by Streptococcus pyogenes (Mucumbitsi et.al,2017).
- Strep throat is highly contagious through droplets and contact of items that have been contaminated.

How do you think Strep Throat can go from person to person. List ways strep throat can transfer from one person to another: _____

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Is Strep Throat Contagious?

How contagious is strep throat? How long is strep throat contagious?

WITHOUT ANTIBIOTICS:
You are contagious for a few weeks.

WITH ANTIBIOTICS:
You shouldn't be contagious 24-48 hours after beginning treatment.

HOW IS THE BACTERIA SPREAD?
Strep-causing bacteria can be transmitted by direct contact, such as sharing utensils.

HOW LONG DOES IT SURVIVE?
The strep bacterium can survive on a dry surface for up to 6 months.

Visit a doctor if you have a persisting sore throat.

KNOWLEDGE

TRANSMISSION: Strep Throat transfers from person to person (remember the only host is a human).

- Household crowding with sharing of beds
- Limited hand and dish washing resources
- Schools and church gatherings
- Sharing the same glass to drink
- Eating from the same plate
- A toy that an infected child has put into their mouth
- A doorknob that is used by all of the family
- Many people living together in a small house or sharing beds
- Sharing a towel for bathing or drying hands
- Kissing

Why is it important to understand the transmission of Streptococcus pyogenes from one person to another important to Rwandans?

IMPORTANT

Nurses and physicians can also be the cause of transmitting the Streptococcus pyogenes from person to person when you do not wash your hands between patients.

Wash your hands between patients

Clean your equipment between patients

Why is Strep Throat Important?

- Strep throat can progress to more severe infections.
 - **Acute rheumatic fever (ARF) which can develop into rheumatic heart disease (RHD)**
 - Acute glomerulonephritis (kidney injury)
 - Scarlet fever
 - Streptococcal toxic shock syndrome
 - (Pichichero, 2022)

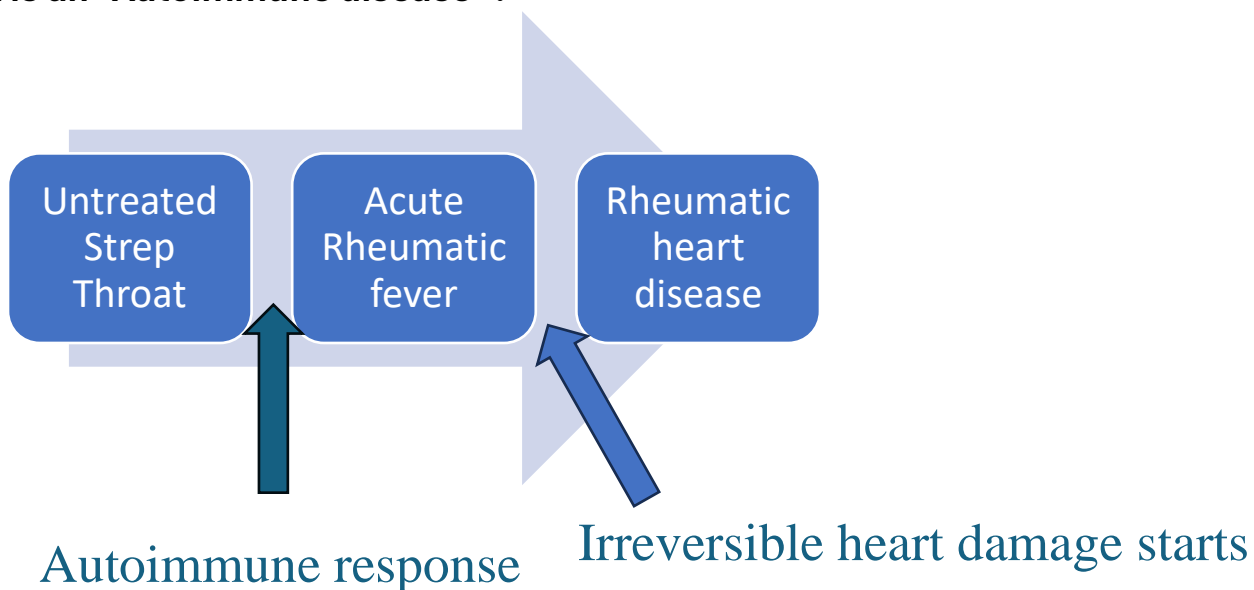


This conference is about Rheumatic Heart Disease and how nurses and physicians can protect children and others from the complications of strep throat that impact the heart.

How can a sore throat cause a heart disease?

Untreated, or under treated Strep Throat can cause an **autoimmune reaction** causing acute rheumatic fever (**ARF**) and rheumatic heart disease (**RHD**) resulting in heart failure, or cause severe inflammation of the kidneys resulting in renal failure. (Pearce et al., 2020)

What is an “Autoimmune disease”?



An “Autoimmune disease” happens when the body's natural defense system can't tell the difference between your own cells and foreign cells, causing the body to mistakenly attack normal cells.

How does untreated strep cause heart disease?

Both Rheumatic Heart Disease and renal failure are the results of complex interactions between how the human body responded to the inflammation and infection to specific virulence factors of the *Streptococcus pyogenes* bacteria (Anderson et al., 2023).

- 1-4 weeks after untreated or under-treated strep throat the body can respond by creating inflammation of **connective tissues** in the heart, joints, brain, and skin (the **autoimmune response**) as the body thinks its own kidney tissue, or heart valves are the cause of an infection. This process is due to **molecular mimicry** where the body responds to all proteins that appear similar to the proteins of the streptococcus pyogenes bacteria causing an infection.
 - If molecular mimicry is the kidneys, then severe kidney damage can occur
 - If molecular mimicry is the heart valves, then severe heart damage occurs.
- While other organs (joints, skin, and brain) are mild and temporarily affected, inflammation of the heart may lead to death or life-long disabilities secondary to RHD. The heart damage can take the form of valvular heart diseases, pericarditis, endocarditis, or heart block (this conference covers all of the heart damage).
- This **autoimmune response** occurs in children who are genetically susceptible and have untreated, or under treated GAS infections. Africans have genetic susceptibility.
(Anderson et al., 2023; Brouwer et al., 2023; Melaku Bimerew et al. 2020)

• Saving Lives through proper assessments, diagnosis and treatment of Strep throat is the reason for this conference! **You are one of the most important healthcare providers to save lives through the assessment, diagnosis, treatment, and education concerning Strep Throat in Rwanda.** Rwandan Nurses saving lives.

ly, an estimated 18 million people are suffering from a serious Streptococcus pyogenes infection with about 1.78 million new cases annually.

- The complications of GAS infections disproportionately affect those in low- and middle-income countries (Dietrich & Steele, 2018).

Why are there more complications from untreated, or under treated Streptococcus Pyogenes infection in low- and middle-income countries?

Understanding that Strep throat can irreversibly damage a heart, or kidney and understanding how the Streptococcus pyogenes bacteria goes from person to person is the MOST critical step in decreasing RHD and saving lives.

Teaching healthcare workers, teachers, and parents about Strep Throat will save lives is the most important step as awareness and understanding leads to treatment.

Who is at risk for autoimmune complications from Streptococcus pyogenes infections?

Children ages 5 years old to 15 years old who have repetitive untreated, or under treated, Strep throat are at the highest risk for the autoimmune diseases of ARF and RHD

- Rheumatic heart disease can be prevented by preventing streptococcal infections or treating them with the correct antibiotics when they do occur.
- Ages 5 to 15 are the most common ages, yet you can have exposed family members of all ages that can have infections caused by Streptococcus Pyogenes.
- As a nurse, you can learn to make a clinical diagnosis of Strep Throat that is very accurate.
- It usually takes two to five days for someone exposed to Streptococcus pyogenes bacteria to become ill with strep throat (this is called the incubation period). Yet, people in the incubation period are contagious.

What is meant by “Under treated” Strep Throat? _____

(See discussion under treatment)

Upper Respiratory infections (URI)

There are two main causes of URIs: **Viral and Bacterial**

Although bacteria and viruses are both too small to be seen without a microscope, they're as different as giraffes and a spider!

Virus

Viruses are tiny: the largest of them are smaller than the smallest bacteria. Unlike bacteria, viruses can't survive without a host. They can only reproduce by attaching themselves to specific cells. Viral infections commonly cause respiratory and digestive illnesses, but viruses can also infect most other parts of your body. **Virus DO NOT respond to antibiotics.** There are vaccines for many viruses.

Bacteria

Bacterial infections are illnesses caused relatively complex, single-celled creatures, many with a rigid wall, and a thin, rubbery membrane surrounding the fluid inside the cell. They can reproduce on their own. They can live for a time outside of the body. Bacteria can be killed by antibiotics.

Case Study: Naomi is an 8-year-old female who lives with her family in Kibungo. She has two younger sisters and 1 older brother. Naomi cares for her younger sisters. Her 6-year-old sister had a fever and bad sore throat about 6 days ago. Naomi now is complaining of a painful throat and fever.

How do you think Naomi acquired a sore throat? _____

What could be the cause of Naomi's sore throat? _____

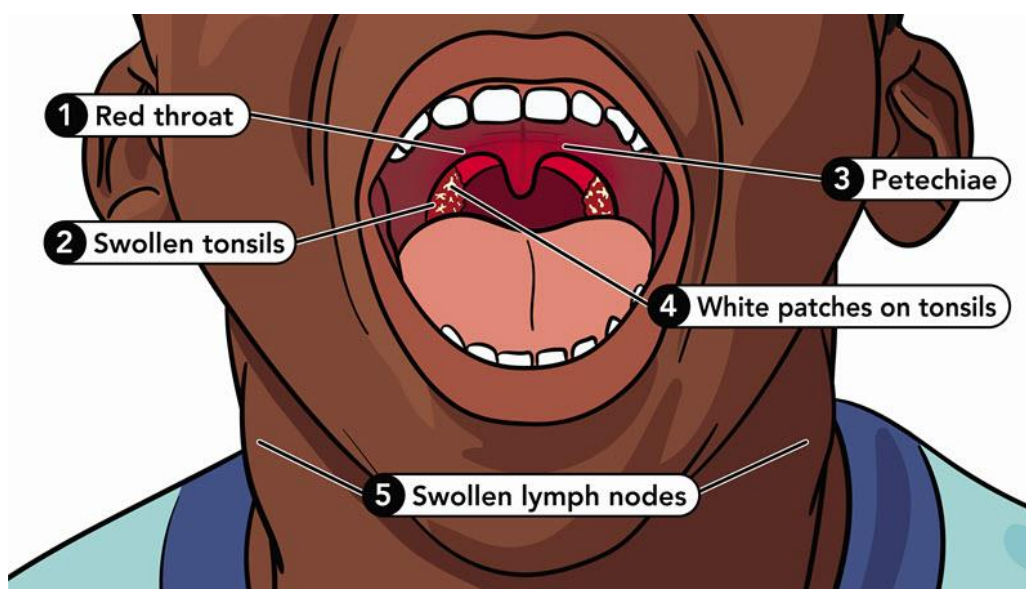
What are the steps a clinician should take to make a diagnosis and treatment plan?

1. Have a **KNOWLEDGE** of potential causes of common symptoms and **SKILLS** to complete a full assessment (physician, emotional, and environmental).
2. Ask the **HISTORY** questions- know a series of questions to ask a patient that will help you understand onset, location, impact, severity, and transmission.
3. A physical, systematic **ASSESSMENT**
4. Critically think and make a **DIAGNOSIS**
5. Have knowledge of evidenced-based **TREATMENT PLANS**
6. Provide patient and family **EDUCATION**
7. Follow up with long-term **MANAGEMENT** (if needed)

ASSESSMENT

REQUIRED CRITERIA for CLINICAL DIAGNOSIS

- Body temperature greater than 38.5°C,
- Swollen and tender anterior cervical lymph nodes,
- Tonsillar exudate, redness, swelling, or petechiae (spots)
- Absence of cough/congestion (meaning NO Cough, NO runny nose, NO congestion)



HISTORY QUESTIONS

What are the SIGNS and SYMPTOMS I will see in my patients?

To understand a patient concern, you need to ask a set of questions to understand the:

- Onset of symptoms (fast, slow, and how long have they had the symptoms)
- Location of symptoms (you will need to ask specific questions)
- Impact of the symptoms to current life, work, school
- Severity of the symptoms

- Transmission understanding- who else has or had similar symptoms (this question helps you understand if the presenting symptoms are contagious).

First ask the correct questions for clinical decisions:

Question	Clinical reasoning
When did the sore throat start?	Strep Throat has a FAST onset, viral illnesses come on slower
Is this a very bad sore throat?	Strep throat is very painful
Do you have a headache?	Strep throat and viral illness can have headaches. Severe headaches can indicate meningitis
Do your eyes itch or water?	VIRAL (conjunctivitis)
Do you ears hurt or feel full?	VIRAL (otitis)
Do you have a runny nose?	VIRAL (Upper Respiratory infection)
Do you feel like your face is full and with pressure?	VIRAL (sinusitis)
Do you have a cough?	VIRAL (Pharyngitis)
Do you have a fever?	Required for Strep Throat, common in viral
Is your neck sore?	Swollen lymph node can be painful. However, a stiff neck can indicate meningitis.
Are these symptoms impacting your ability to go to school, play sports, do your chores, work?	Strep throat often makes people tired, ill, and have a decrease in activity.
Does any other family member or friend have the same symptoms?	STREPTOCOCCUS PYOGENES is highly contagious

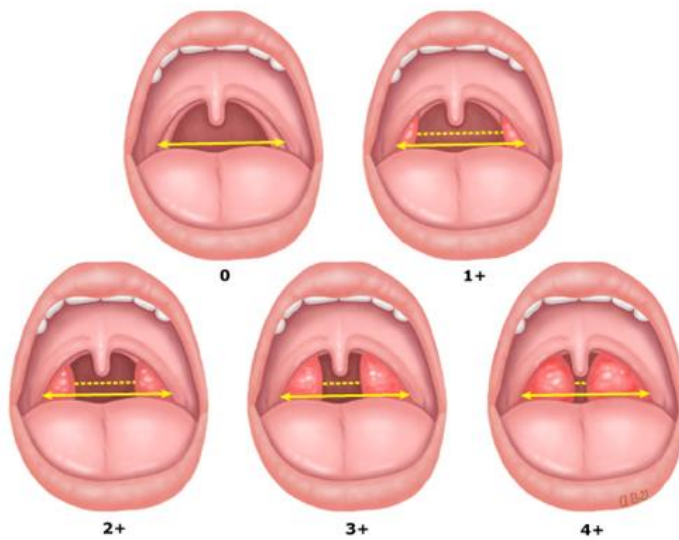
PHYSICAL ASSESSMENT

General:

- Fever (sudden and often around 38° C or higher)
- Onset abrupt (fast) Chills and / or body aches
- General malaise (feeling unwell and tired)
- Decreased appetite (a painful throat can cause a decreased appetite, plus nausea and vomiting is common in younger children)

HEENT (Head-Eyes-Ears-Nose-Throat)

- HEAD: Headache can be present - No sinus pressure
- EYES: NO redness, NO drainage (eyes are clear)
- EARS: No pain, feeling of fullness, no drainage
- NOSE: No drainage, No congestion,
- THROAT:
 - Exudative tonsillopharyngitis with enlarged erythematous tonsils
 - **“Exudative”** means pus (dead white blood cells) or white patches in the back of throat
 - **“Enlarged and Erythematous”** means the tonsils and uvula are deep red and swollen and appear like raw meat. It is often charted as “Beefy red”



Tonsils can be graded by how big they are. Determining the “Grade” 0 to 4+ can help you describe the tonsils if you need to consult or refer to another healthcare provider.

- Palatal petechiae can be present
 - **“Petechiae”** are tiny deep red spots on the soft and/ or hard palate



Image: <https://www.mymed.com/diseases-conditions/strep-throat-streptococcal-pharyngitis/signs-and-symptoms-of-strep-throat>

- Difficulties with swallowing due to pain when swallowing
- Children often drool because swallowing is so painful
- NO hoarseness (change in voice)- this usually occurs due to a cough. Voice CAN be soft due to pain.
- NO anterior stomatitis (inflammation of the mucous membrane of the front [anterior] part of the mouth, including the inner aspect of the lips, cheeks, or tongue)



Examples of Anterior Stomatitis

- **NECK:**
 - Lymph Nodes: Enlarged tender anterior cervical lymph nodes
 - Range of motion: may be tender, but can push with resistance
 - RIDGID NECK- too painful to move is considered a medical emergency and indicates meningitis (inflammation of the brain)



Learning to gently palpate the neck for lymph nodes and range of motion are parts of the nursing skills of a good physical assessment concerning a patient with a sore throat.

IMPORTANT *CRITICAL TO YOUR DIAGNOSIS** IMPORTANT**

In a clinical diagnosis of (STREP THROAT), there cannot be any Viral features (such as rhinorrhea (runny nose), conjunctivitis (pink/red eyes with swollen lids), cough, hoarseness, anterior stomatitis (inflammation and coating on the front part of the tongue), discrete ulcerative lesions or vesicles inside the mouth, or diarrhea).

These are called “Pertinent Negatives” which means that you asked the questions or did a physical exam and these viral S&S were NOT there.

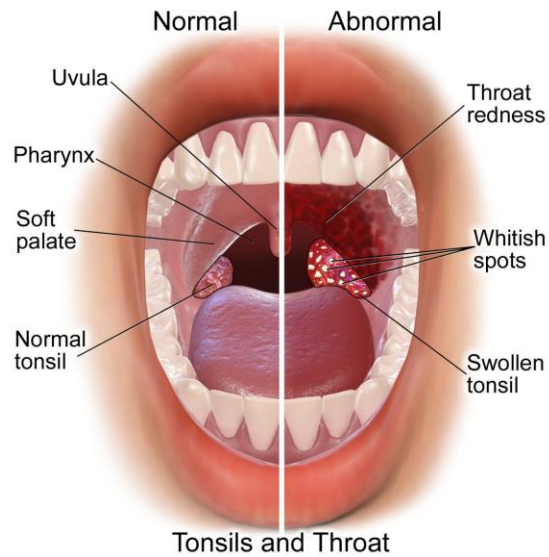
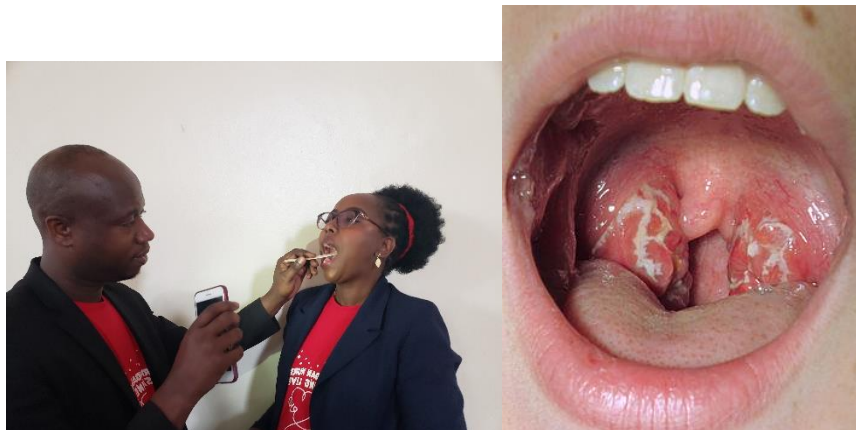


Image: <https://s31788.pcdn.co/wp-content/uploads/2018/01/Strep-Throat-Symptoms-Things-1440x1440.jpg>



Exudative tonsillopharyngitis with enlarged erythematous tonsils.

Image:

https://en.wikipedia.org/wiki/Streptococcal_pharyngitis

Are the tonsils infected or just big?

Tonsils can be big after infection. However big tonsils are not always infected tonsils! Fever, redness, pus, and pain are the key features of an active INFECTION.

Are Big tonsils problem? Yes, tonsil that interfere with breathing are a problem. Often children snore during sleep or wake up coughing. Refer these children for evaluation for a tonsillectomy.

ABDOMINAL:

- Abdominal findings Associated with Strep Throat
 - Nausea/vomiting (vomiting is very painful due to sore throat)-
 - Loss of appetite
 - Dehydration (due to a lack of fluid intake) – in varying degrees

SKIN:

Streptococcus pyogenes can cause TWO types of skin changes. 1) a body's response to the Strep throat and 2) a skin infection called impetigo (discussed later).

1. Strep throat can also cause a skin rash (But not common)

- Rash: this is normally associated with scarlet fever scarlatiniform rash (erythematous (red), finely papule rash which characteristically starts in the groin and/or axilla and then spreads to the trunk and extremities, followed by a spreading of the rash over large areas of the body.



A papule is a raised area of skin tissue that's less than 1 centimeter around. A papule can have distinct or indistinct borders. It can appear in a variety of shapes, colors, and sizes. It's not a diagnosis or disease.

Papules are often called skin lesions, which are essentially changes in your skin's color or texture. Sometimes, papules cluster together to form a rash.

2. Streptococcus pyogenes can also cause another skin infection called impetigo. **IMPETIGO** will be discussed at the end of this module. Although caused by Streptococcus pyogenes, impetigo is NOT part of Strep throat. Whereas the Strep rash IS part of the Strep throat process.

Assessment for younger children

Strep throat is contagious and most common in children ages 5-15. However people of all ages can get Strep Throat! Once you diagnose Strep Throat review Signs and Symptoms with the entire family. Older people are the same as children ages 5-15.

What are the signs & symptoms of Strep throat in children ages 1 years to 3 years old?

Children LESS THAN 3 years of age generally do not have the findings that are typical of older children. A key component to suspecting Strep Throat in a children ages 1 to 3 years old is **exposure to a positive Strep throat individual.**

- Instead of a well-defined episode of pharyngitis, they may have protracted (long) symptoms of nasal congestion and discharge, low-grade fever (eg, <38.3°C), and tender anterior cervical adenopathy (tender lymph nodes in the neck).
- Remember: All untreated STREPTOCOCCUS PYOGENES strep throat increases the risk for RHD in the future.
- If the mother is ill and has a baby under 30 days old, treat both.
 - (Musuku et al., 2017; Mellick, 2022).

What would you consider as a “positive exposure” to Strep Throat?

CRITICALLY THINK & DIAGNOSIS

How is Strep Throat diagnosed?

- In resource-rich countries, the Rapid Antigen Detection Test (RADT) is a quick diagnostic test which has high predictability for Streptococcus Pyogenes and is the recommended tool for clinical assessment for Strep Throat (Dietrich & Steele, 2018). This test is used by nurses in resource-rich countries.
 - **Rapid Strep testing (RADT) is NOT available in Rwanda in most hospitals**
- The wide range of possible symptoms makes it difficult for **untrained health professionals** to diagnose Streptococcus Pyogenes infection early...
- Yet, **an excellent history and physical exam can be done to make a good clinical decision to build a clinical plan and determination if antibiotic therapy is indicated.**
- In Rwanda, where most of our health facilities do not have access for laboratory testing for diagnosing Streptococcus pyogenes. We (nurses and physicians) must use clinical signs &

symptoms, risk factors (age, knowledge of 40% of all sore throat are positive for Streptococcus pyogenes with increase during outbreaks) and clinical presentation with our knowledge and skill for our clinical diagnosis of STREPTOCOCCUS PYOGENES Strep Throat.

Rwandan Nurses Saving lives- you can and will save lives!

You will use your knowledge and skills to make excellent clinical judgements and treat your patients with the RHD guidelines.

Critical Thinking Check list for a clinical diagnosis

Does the child have a fever?	YES	NO	
Does the child have red, swollen tonsils?	YES	NO	
Do you see red spots or white pus on the tonsils?	YES	NO	
Are the tonsillar Lymph nodes swollen and tender to touch?	YES	NO	
No cough?	YES	NO	
No runny nose?		YES	NO
No sinus congestion (pressure and pain on face under the eyes)?	YES	NO	

TREATMENT: Evidence-based treatment based on research

How is Strep throat treated?

- Correct treatment of Strep Throat is the only way to decrease the autoimmune diseases of Acute Rheumatic Fever and Rheumatic Heart Disease.
- **Streptococcus pyogenes infection can be successfully treated with the antibiotic penicillin VK for 10 days.**
 - It is very important to complete the full course of antibiotics as prescribed. **Failure to finish the full 10-days is UNDERTREATMENT.**
 - You need to assess for allergy to penicillin as this will change your treatment plan (Dietrich & Steele, 2018).
- Close contacts (family and friends) of a person with Streptococcus pyogenes infection should be given antibiotics if they have symptoms suggesting that they are also infected.
 - (Musuku et al., 2017; Mellick, 2022).
- **International Guidelines recommend penicillin as a first choice**, with erythromycin preferred for people who are allergic to penicillin (van Driel ML, De Sutter AI, Thorning S, Christiaens T., 2021).

- Antibiotic therapy does not always decrease symptoms faster but will decrease adverse outcomes by blocking with autoimmune response of inflammation and molecular mimicry (van Driel ML, De Sutter AI, Thorning S, Christiaens T., 2021).

Evidence-based plans

Your new knowledge and skills will be critical to educate patients, families, and your communities to decrease the incidence of Acute Rheumatic Fever and Rheumatic Heart disease. You are needed to make a difference in your community and with your patients.

from 2023 guidelines

PCN (Penicillin) VK:

- Adolescents/ adults: 500mg twice daily x **10 days**
- Children greater than 27 Kg: 500 mg two- or three-times daily x **10 days**
- Children 27 kg or less: 250 mg orally 2 to 3 times a day x **10 days**

PCN G benzathine- shot:

Benzathine penicillin is available as an injectable suspension that **is administered intramuscularly (IM), not intravenous, intra-arterial, or subcutaneous.**

PCN G Benzathine is slowly absorbed and remains in the body for 14 days after 1 shot.

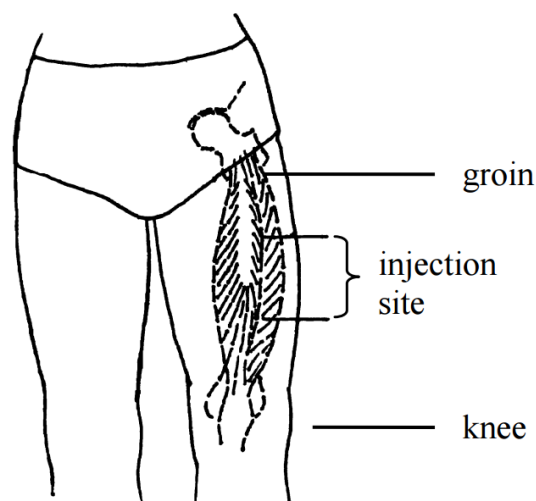
True anaphylaxis is a 0.2% risk.

- Less than 27 Kg: 600,000 units IM x 1 dose
 - OR 50,000 units/ Kg with max dose 600,000 units
- Greater than 27 Kg: 1.2 million units IM x 1 dose

In a patient older than two AND greater than 27 Kg, administer the injection to the upper outer quadrant of the buttocks.

In children less than two years old or under 27 Kg, administer the injection to the mid-lateral muscle of the thigh, not the gluteal region, and rotate the injection site on repeat doses.

Do not be give a shot near an artery or nerve.



Amoxicillin: ****Not first choice**** [use PCN if available]

- 40 to 45 mg/kg/day in divided doses every 8 hours (3 x per day); maximum dose: 500 mg/dose (1000mg per day) x **10 days**

**Patient
s with a
TRUE
PCN
Allergy:**

A **true allergic reaction** will typically involve a degree of one or more of the following symptoms: hives, rash, itching, facial/tongue swelling, throat swelling, rapid heart rate, and shortness of breath. Anaphylaxis is a SEVERE allergic reaction that is life- threatening.

ythromycin: 30 to 50 milligrams (mg) per kilogram (kg) of body weight per day, divided in equal doses and taken every 6 hours X 10days

- Cephalexin: 20 mg/kg orally twice daily. Max is 500mg per dose. x 10 days
- Cefadroxil: 30 mg/kg orally daily. Max dose is 1000mg/day. X 10 days
- Clindamycin: 7 mg/kg orally three times a day. Max is 300 mg per dose (900 mg/day) x 10 days
- Azithromycin: 12mg/kg daily x 1 day (max dose is 500mg), then 6 mg/kg daily X 4 days (max dose is 250 mg)

What are the benefits of antibiotic treatment?

- Decrease transmission of Strep throat from one human to another and protection of other family members and friends.
- Successful treatment usually means that an infected person recovers without any major complications of Acute Rheumatic Fever or Rheumatic Heart Disease.
- Treatment of strep throat by a proper antibiotic will save lives from RHD.
- If treated with antibiotics, people with Streptococcus pyogenes infection stop being infectious 24 hours after treatment is started! (Children and return to school).

Are there any risks to the treatment?

- **Common side effects** of antibiotics include **nausea, vomiting and diarrhea**.
- If PCN G is given by shot, it is common to have injection site soreness, swelling and redness that will go away in a few days. **The injection is painful.**
- Occasional dizziness or syncope (fainting), related to a **vasovagal episode** in patients (usually from anxiety, or fear of injections). **Fainting** is not from the medication, but from the process of getting a shot.
- An unusual taste in the mouth can occur lasting a few days- Nothing is wrong, this is a side effect.
- Up to 3% of patients can experience symptoms indicating a hypersensitivity.

Understanding Risks of Complication from Penicillin

Always give IM PCN in your clinic

Always monitor the patient for 20-30 minutes after the injection

Side Effects: symptoms that can occur that are uncomfortable, yet NOT dangerous:

Pain, or swelling, or redness at injection site, anxiety, fear, a different taste in the mouth, rapid breathing (usually anxiety)

Concerns: new onset of wheezing (like asthma), hives, skin blisters, drop in blood pressure and consciousness, itching, rapid onset nausea, vomiting, and diarrhea

Your plan needs to be developed with your District Hospital. Your response can include:

- Rapid IV hydration
- Benadryl
- Transfer to District Hospital

What are the risks of not getting treatment?

If the Streptococcus pyogenes- infected person is not given antibiotic, or does not complete the full course of antibiotic therapy then:

- The infection may become worse (they can get pneumonia, meningitis, sinusitis or abscess)
- The infected and **untreated person will infect others**. If left untreated, people with Streptococcus pyogenes infection are usually infectious for 2–3 weeks after developing a sore throat.
- The person is at a higher risk for their body to **develop an autoimmune response** resulting in acute rheumatic fever and Rheumatic Heart Disease, which is fatal.
- Another possible autoimmune response is damage to the kidneys resulting in renal failure as the child grows older.

Why do you think some patients are not treated, or undertreated?

Case study review: Naomi is an 8-year-old female who lives with her family in Kibungo. She has two younger sisters and 1 older brother. Naomi cares for her younger sisters. Her 6-year-old sister had a fever and bad sore throat about 6 days ago. Naomi now is complaining of a painful throat and fever. Her history revealed a rapid onset of a sore throat and fever, she feel very ill impacting going to school. Her exam showed large, swollen tonsils with white pus, painful lymph glands, clear lungs, normal heart beats, normal abdomen. T38.1, RR 22, HR 98, BP 110/62.

What do you think? _____

What will you do for Naomi?

- Tell her parents Naomi has a viral infection and not to worry. Although painful, viral infections cannot be treated with an antibiotic because a virus is not a bacteria.
- Explain that Naomi has a severe sore throat caused by a bacteria. It is called strep throat and antibiotic treatment is necessary because if not treated the body can respond and damage Naomi's heart.
- Tell her parents that if she gets worse to come back to the clinical and you will then treat the sore throat with antibiotic, but only if she gets worse.

Write your plan: _____

EDUCATION FOR PATIENTS & FAMILY

What is Strep Throat?

- A bad sore throat caused by a bacteria that is common in Rwanda.

Why is it important?

- If untreated the bacteria can cause a reaction in the body that causes damage to the heart valves and ultimately can cause Rheumatic heart Disease.

How is it transmitted?

- The Strep bacterial is contagious- it is transmitted by hands, and anything the mouth touches: food, eating utensils, towels, tooth brushes, children's toys, glasses.

How is it treated?

- Penicillin is the main antibiotic used around the world to treat and prevent Rheumatic Heart Disease.

What happens if the child does not complete the full antibiotic course?

- In 1-4 weeks the child could get another fever and it is related to the body's response to the Strep Bacteria. This fever can have other symptoms. It is called Acute Rheumatic Fever.

What can happen in the future?

- The valves in the heart can become scarred and block the normal flow of blood. Ultimately, death can come early due to heart damage.

MANAGEMENT of Streptococcus pyogenes infections

1. Ensure proper antibiotic is used to treat the infection
2. Give parents the Signs and Symptoms of ARF (next module)

What do I need to do as Rwandan healthcare Provider?

KNOWLEDGE

Know the likelihood of a sore throat being caused by Streptococcus pyogenes bacteria

- Acute pharyngitis is one of the most common problems children are brought to see a healthcare provider.
- In SSA, including Rwanda, 40% of pharyngitis can be caused by Streptococcus pyogenes. It can be even higher during outbreaks.
- You need to know the difference between viral and bacterial infections.

Know what can happen

If Strep throat is not treated with the proper antibiotic or undertreated, then the child has an increased risk for developing an autoimmune response resulting in acute rheumatic fever and then RHD. RHD can be fatal.

HISTORY & PHYSICAL

Know the Signs & Symptoms

- Review the Signs & Symptoms as provided, practice the history and physical exam during the skills section, apply your new knowledge and skills with your patients, work with your mentor to grow your confidence in diagnosis.
- Know what to ask in the history.

Know differential diagnosis: (A differential diagnosis are medical diagnosis that may explain the symptoms). A sore throat can be caused by:

- Strep throat
- Respiratory viruses (parainfluenza, rhinovirus, coxsackievirus, adenovirus, etc.)
- Other diseases: Malaria or sexually transmitted diseases
- Non-infectious Causes

- Allergies
- Gastroesophageal reflux disease
- Exposure to second-hand smoke
- Trauma
- Foreign body

Know how to treat Strep Throat

- Know which antibiotics are available in your area, what are the costs, and should an IM injection be given to ensure the full prescription plan is followed.
- Work with your District Hospital for set protocols and have a referral system.

Know how to give and decrease the pain from PCN G benzathine shots.

Reducing injection pain and patient anxiety, both of which are known risk factors for injection-related fainting.

Reducing anxiety: talk to your patient, smile; explain to the mother; have child lay down with the mother (reduce the risk of blood pooling in the extremities that can drop blood pressure).

Methods for pain reduction include: **warming the solution by holding the filled syringe in your hands applying firm pressure to the site for 10 seconds or application of an ice pack before cleaning with alcohol; allow alcohol to dry before inserting the needle; give SLOWLY over 2-3 minutes. Can use local lidocaine apply topically if available. Can use vibrations before and during injection.**

For patients requiring IM PEN G every 3-4 weeks for RHD treatment: Have patient have a small amount of solid food within the hour before injection. Patients should be well-hydrated prior to injection. Drinking 250- 500 ml of water before injection has been found to prevent reflexive fainting.

Providers who administer BPG should be taught how to recognize and quickly treat symptoms such as low blood pressure, low heart rate or fainting.

Know what to educate to patient and families on Strep throat

You will have an educational tool kit to guide you.

Community and family education:

- A major focus is disease prevention and limit contamination.
- Streptococcus pyogenes infection is contagious.
- Streptococcus pyogenes bacteria can cause the body to create an autoimmune response and irreversible damage to the heart resulting in early death.

What are important educational points for families?

More educational points:

- Contact with members of the **immediate household** (family) should be limited until **24 hours** after antibiotics started.
- People with **weakened immune systems** refrain from contact with patients with active strep throat, until at least **48 hours** of correct antibiotic therapy has been given.
- Encourage family member with sick children to monitor elderly grandparents for pneumonia.
- Children who have Streptococcus pyogenes Strep infection should not go to **school** or day care until **48 hours** of correct antibiotic therapy.
- Every person should **wash their hands** thoroughly with hot soapy water for 20 SECONDS after contact with a person who has been diagnosed with Streptococcus pyogenes infection and ensure the hands are dried thoroughly with a clean towel.
- Do not share **towels**
- **Keep toothbrushes separate** and wash with hot soapy water, or get new toothbrushes after 5 days of proper antibiotic therapy
- **Wash** all toys, kitchen utensils, counter tops, doorknobs, pens/pencils with **HOT** soapy water
- **Do not share food**, eating utensils, or dishes with those with a Streptococcus pyogenes Infection
- (Mellick, 2022)

Other thoughts: _____

When to refer the patient to immediate care at a district hospital?

1. Very high fever -greater than 40.5 (seizure risk)
Why? _____
2. Pain with range of motion of the neck (meningitis)
Why? _____
3. Drooling, or inability to swallow and ill-appearing (epiglottitis)
Why? _____

Other: _____

What are the most important messages on Strep Throat to you?

What is the skin infection caused by Streptococcus pyogenes? -Impetigo

- Streptococcus pyogenes is only found in human skin and mouth. When infectious, the Streptococcus pyogenes in the mouth causes Strep throat, on the skin the infection is called **Impetigo**.
- **Impetigo has been found to cause RHD** in many Oceania countries and some African countries. It is uncertain whether RHD in Rwanda is also caused by impetigo, however impetigo is a source of STREPTOCOCCUS PYOGENES on the skin and has the potential of causing an abnormal immune response resulting in ARF and RHD.
 - Sub Saharan Africa has more severe forms of RHD at younger ages which is thought to include both an increased genetic susceptibility and Streptococcus pyogenes skin infections (impetigo) (Auala T, Zavale BG, Mbakwem AÇ, Mocumbi AO., 2022).
- **Impetigo is very contagious- Just like Strep Throat is very contagious**
- Infected children should avoid close contact with other children until the rash is clear or improving after two days of antibiotics. **Treatment is the SAME as Strep Throat!**
- If a child comes in contact with the rash, be sure to have them wash their hands and the exposed skin thoroughly with soap and water.
- Keep all infected children's washcloths and towels separate from those of other family members.

History

When did the sores appear	Streptococcus pyogenes lives only on humans: skin and mucous membranes. On the skin it takes 7-10 days from exposure to show.
Do they itch?	Impetigo is itchy

Was there a clear liquid, or a honey-like crust?	Impetigo is diagnosis by the clinical presentation by the “honey-crust.”
Does anyone else in the family have similar skin lesions?	Streptococcus pyogenes is contagious.

Assessment:

Skin-

- Impetigo infection has a classic **honey crust**. (Looks like dried yellow honey)
- Impetigo can develop anywhere on the body. It is especially common on the face, including around the nose, mouth and ears. It is also frequently seen on the arms and legs.
- Skin lesions from scabies, fungus, or injuries, can become infected with *Streptococcus pyogenes* bacteria.



CRITICALLY THINKING & DIAGNOSIS

Your diagnosis is made upon your knowledge of *Streptococcus pyogenes*

What can happen after impetigo?

- Poststreptococcal **glomerulonephritis** (Kidney damage) is a potential complication of streptococcal impetigo that most often occurs within one to two weeks following infection. Common clinical findings include edema, hypertension, fever, and hematuria (blood in the urine).
- **Acute Rheumatic Fever and RHD** are also known to occur from impetigo in places where *Streptococcus pyogenes* is hyperendemic (very common in the population at all times). It is uncertain, yet possible, RHD in Rwanda is caused by repetitive episodes of impetigo.

TREATMENT and MANAGEMENT of impetigo?

- The primary cause of impetigo is *Streptococcus pyogenes*.
- **Treatment is the same as Strep Throat (Penicillin)**
- Topical Mupirocin and retapamulin can be used if available.

EDUCATION

Prevent impetigo

People can get impetigo more than once. Having impetigo does not protect someone from getting it again in the future. There are no vaccines to prevent *Streptococcus pyogenes* infections, but there are things you can do to help protect yourself and others.

Educate your patients and their families:

To help prevent *Streptococcus pyogenes* infections, you should:

- Clean and care for wounds
- Wash your hands and clothes often
- Take antibiotics how are prescribes
- Be cautious in transmission of the disease

Clean and care for wounds



Wash hands often

Wash hands often with soap and water or use an alcohol-based hand rub if washing is not possible.



Clean wounds

Clean all rashes cuts and injuries that break the skin (like blisters and scrapes) with soap and water.



Bandage wounds

If possible, clean and cover draining or open wounds with clean, dry bandages until they heal.

- **See a nurse or doctor**

Seek healthcare with rashes or cuts that look like there is a honey-crust.

Frequent body and hair washing with soap and clean, running water is important to help prevent impetigo.

- You should wash the clothes, linens, and towels of anyone who has impetigo every day. These items should not be shared with anyone else. After they have been washed, these items are safe for others to use.
- The best way to keep from getting or spreading *Stretococcus pyogenes* bacteria is have everyone in the house wash their hands often. Wash hands every time the lesions are touched (very hard with young children and rashes around the mouth).
- Take antibiotics.
- Antibiotics help prevent someone with impetigo from spreading the bacteria to others. Antibiotics can prevent the possible autoimmune reaction of Acute Rheumatic Fever and Rheumatic Heart Disease.

What can I tell parents that cannot afford topical antibiotic creams?

- Use oral antibiotics (Penicillin)
- Lesions can be treated with a mixture of honey and turmeric, or aloe vera. If around the face apply the honey for 20 min and wash off. If the child licks the honey, the bacteria can be transported to the throat!

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Module 2

Acute Rheumatic Fever

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What is Acute Rheumatic Fever (ARF)?

- Acute Rheumatic Fever (ARF) is an **autoimmune inflammatory disease** involving heart, joint, brain, and skin that occurs two to four weeks after an untreated (or under treated) infection with **Streptococcus pyogenes of Strep Throat or Impetigo** (Michael et al 2022).
- **Recurrence rate of ARF is high** (Chowdhury, Koziattek, & Rajnik 2023) **because the reinfection rate of Strep infections is high.**

KNOWLEDGE on ARF

Who is usually affected by Acute Rheumatic Fever (ARF)?

- ARF only **occurs after a Streptococcus pyogenes infection.**
- ARF most often affects children from **5 to 15 years old** (Mayo clinical, 2022).
- ARF continues to be the **most common cause of the acquired heart diseases** (permanent heart valves disease and heart failure) (Tal et al 2022; Ralph and Currie 2022; Fab et al 2021).
- Children with a repeat Streptococcus pyogenes infection (impetigo or Strep Throat infection) are at higher risk for ARF.
- Children living in **Sub Saharan Africa are at increased risk** for untreated Strep Throat infection and impetigo, therefore at higher risk for ARF.
- **The reasons for increased risk for ARF include:**
 1. High prevalence of the Streptococcus pyogenes bacteria on human skin and mucous membranes
 2. Sharing of beds
 3. No indoor running water
 4. Long distance to access healthcare
 5. Low healthcare provider understanding that Streptococcus pyogenes infection can lead to irreversible heart disease
 6. Low community awareness
- There may be a link between insufficient nutrition in childhood and susceptibility to ARF. Although not known for certain it could be:
 - Because insufficient nutrition can increase susceptibility to developing aggressive autoimmune responses to S. pyogenes infection,
 - Or because poor nutrition is connected to household overcrowding and other factors associated with poverty that increase susceptibility to Streptococcus pyogenes infection.

(Chowdhury, Koziattek, & Rajnik 2023; Sika-Paotonu et al. 2017)

Rwandan Research on Rheumatic Heart Disease (RHD) and Malnourishment

An echocardiogram study on malnourished children in eastern Rwanda showed an increased prevalence in RHD (Hagimakubana, 2020).

Ho

How does ARF cause irreversible cardiac valve damage?

- The cardiac valves are damaged from the body's **inappropriate autoimmune response** with an inflammatory response to the *Streptococcus pyogenes* bacteria.
 - The body's immune system builds an antibody to fight the *S. pyogenes* infection by blocking a certain protein. However, there is a similar protein found in connective tissue in the brain, heart valves, and joints. Thus, the body's own immune system is fooled and tries to destroy its own protein.
 - This is called **Molecular Mimicry**. (Arvind, B., & Ramakrishnan, S. 2020; Steer & Gibofsky et al., 2022).

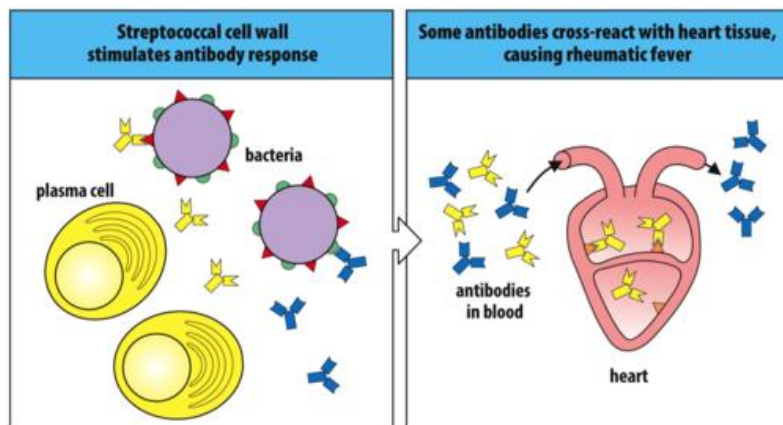


Figure 16.30 The Immune System, 4th ed. (© Garland Science 2015)

<https://o.quizlet.com/WmMFFCt65nInVupwYpOGkg.png>

- Damage to cardiac valves is **chronic and continuous**, resulting in heart damage and death when the child becomes a young adult (Sheer A. et al., 2022).
- ARF can happen more than once! Those children who experience ARF more than once have the highest risk of developing Rheumatic Heart Disease because it is an autoimmune disease, and **each *Streptococcus pyogenes* infection causes a greater autoimmune response**.
 - In areas where *Streptococcus pyogenes* bacteria are common, there is almost a 50% recurrence rate for another *Streptococcus pyogenes* infection (Chowdhury, Koziatek, & Rajnik 2023).
- **60% of those afflicted with ARF will develop chronic rheumatic heart disease (RHD)** (Wallace & Bronze (Ed) 2021; CDC/Acute Rheumatic Fever; Sika-Paotonu D, Beaton A, Raghu A, et al., 2017)

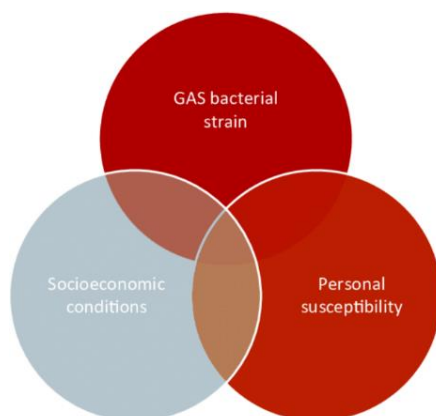
IMPORTANT NOTE: ARF is not contagious.

People cannot catch rheumatic fever (ARF) from someone else because it is an immune response and not an infection.

However, people with a Streptococcus pyogenes infection can spread the bacteria to others

How prevalent is ARF?

- **ARF occurs worldwide** because Streptococcus pyogenes infections occur everywhere.
- In countries where Streptococcus pyogenes is rapidly treated with the correct antibiotic, the incidence is low and where Streptococcus pyogenes infections are not diagnosed, treated with traditional medicine, or have incomplete antibiotics therapy the incidence is higher (Okelle et al., 2021; Tal et al. 2022; Okello et al., 2021).
- In Sub-Sahara Africa, the prevalence of ARF is not known as education on the knowledge and skills to diagnosis ARF has not been shared with many nurses and physicians.
- There are **two ways that ARF is seen** in patients.
 - **70%-75% of patients will have an acute febrile illness with joint problems**
Case Study: Innocent is a 12-year-old male who complained to his mother that his knee was red and swollen. He denies falling. His mother thinks it is from playing football, but he said he has not played because he is not feeling well, and his chest hurts so he can only walk.
 - **25% of patients have an acute febrile illness and neurologic/behavioral disorder** with Sydenham chorea. This can be very confusing to the healthcare provider and seem not related to a potential deadly cardiac disease!
- There are **connections** between the strain of **Streptococcus Pyogenes** (there are different strains in different parts of the world), the **community/homes access** to fresh water, hand washing ability, soap, dish washing supplies, culture, living arrangements, healthcare services, knowledge and skills of healthcare providers, and the people's **genetic susceptibility**.



[The interplay of risk Scientific Diagram](#)

[factors for rheumatic fever. | Download \(researchgate.net\)](#)(Michael et al, 2022)



As a clinician, how will I know if a child might have ARF?

- Acute rheumatic fever (ARF) is complex and usually missed diagnosis because it can present in different ways.
- The KEY to recognizing ARF is finding out if the patient had a recent very bad sore throat, fever, NO cough/congestion (thus, a presumed Strep Throat infection) or had impetigo and received either no antibiotics or did not complete the course of therapy.
- It is essential to understand there is a link between a Streptococcus pyogenes infection and an autoimmune response that can directly impact connective tissue found in joints, brain, kidney and heart.
- When caring for Streptococcus pyogenes infections (Strep Throat infection and Impetigo), please provide education to parents related to possible symptoms letting them know that a complication from Strep throat infection or impetigo is irreversible heart damage (therefore treatment for Streptococcus pyogenes infections is very important).

Case Study: Nicole is a 13-year-old female who has started crying and laughing inappropriate in school. She also has a muscle twitch around her lips and is moving her arms with exaggerated arm swings and hand motions. Her mother says at night she is sleeping peacefully.

What do you think? _____

Case Study: Emmanuel is a ten-year-old male and lives in a 2-bedroom house with his three younger brothers and sisters and his parents. He loves to play football. Yesterday he reported a painful knee which is red and swollen. What do you think or what to know?

HISTORY

To make a clinical diagnosis, it is important to understand the patient's symptoms. The first step is ALWAYS to ask the correct questions in order to make clinical decisions:

Question	Clinical reasoning
In the last month, was there a time when the child had a sore throat or bad skin infection?	ARF occurs 1-4 weeks after a Streptococcus pyogenes infection of Strep Throat infection or impetigo.
Is there fever?	100% of patients with Acute Rheumatic Fever have fever.
Has the child complained of painful joints that are not related to trauma?	60-80% of children with ARF will complain of a sore joint- usually knees, ankles, wrists and elbows. Different joints may hurt at different times.
<p>Has the child reported any chest pressure/pain or heaviness? shortness of breath? or pain in chest when laying down?</p> <p>Does the child tire easy, take longer to walk to/from school, or complain that it is difficult to do chores?</p>	50-80% of the children will experience inflammation of the heart muscle. This inflammation is painful so that when the heart beats faster, it is more painful. Lying down can make the heart hurt more.
<p>Have you noticed unusual movements?</p> <p>Has the child had unusual emotions (cries or laughs inappropriately)?</p>	0-30% of children with ARF will have symptoms caused by inflammation in the brain which causes a change in emotions or jerky movements and odd finger/hand positions.
Have you noticed any skin rash, or odd bumps on knees or elbows?	0-6% of children can develop nodules along the tendons of joints. Although rare, this signifies heart valve damage.
Does any other family member have the same symptoms?	ARF is not contagious, so no one else should have the same symptoms. HOWEVER- if siblings had a Streptococcus pyogenes infection at the same time, then it is possible both could have had an autoimmune response and have ARF.

ASSESSMENT

POSSIBLE ACUTE RHEUMATIC FEVER (ARF) PRESENTATIONS

100% have had a *Streptococcus pyogenes* exposure

100% of children present with a **fever of unknown cause**

60-80% of children complain of **sore joints without trauma**. Different joints hurt at different times. The joints could be red and swollen.

50-80% of children report **chest pain, shortness of breath, or fast heart rate (greater than 100 beats/minute at rest)**

10-30% of children have **unusual jerky and uncontrollable body movements**. These children may have a change in behavior or laugh/cry at odd times. Typically involves hands, feet and face.

0-10% of children present with **nodules on joints along tendons** (this is associated with more severe cardiac valve damage)

0-6% of children present with a **skin rash** (the rash looks different from IMPETIGO, or a drug reaction rash)

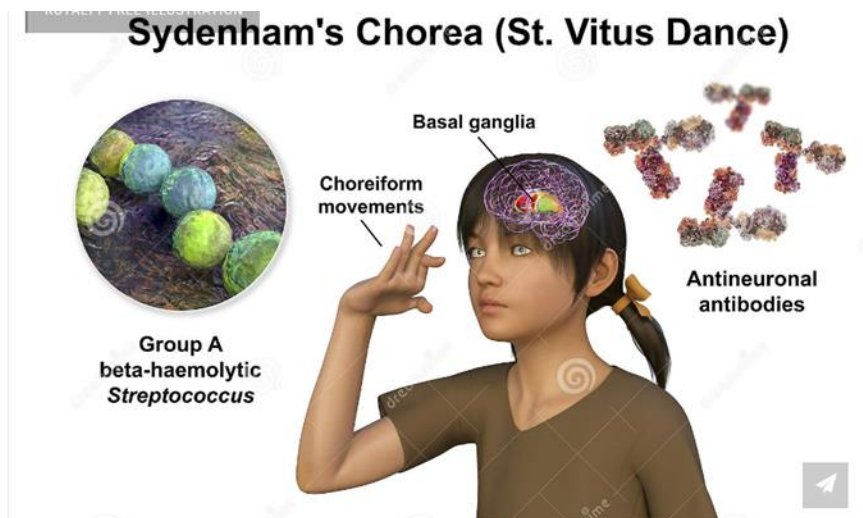
PHYSICAL EXAM

GENERAL: Fever (usually greater than 38 degrees Celsius), tired, ill

HEENT (Head- Eyes-Ears-Nose-Throat)

- Physical exam should be normal
- Tonsils may still be enlarged, but should not look actively infected.

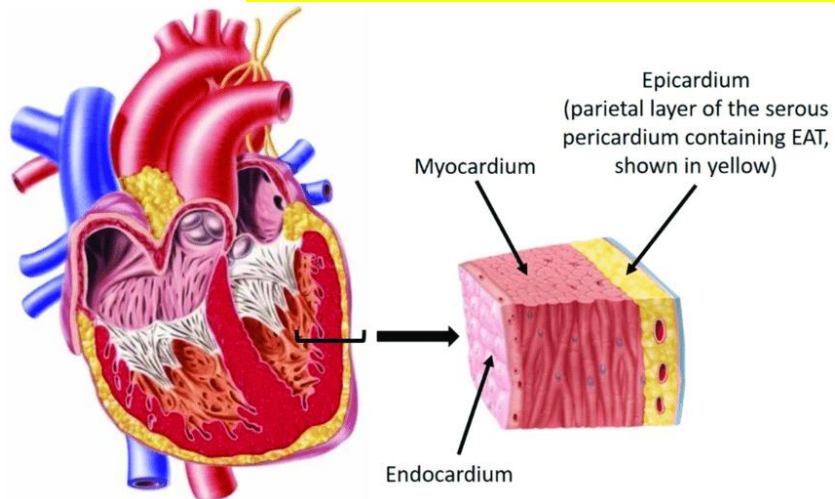
NEUROLOGICAL ASSESSMENT:



Sydenham's chorea, an autoimmune disease that results from *Streptococcus* infection, formation of anti-neuronal antibodies damaging brain basal ganglia that cause involuntary movements, 3D illustration

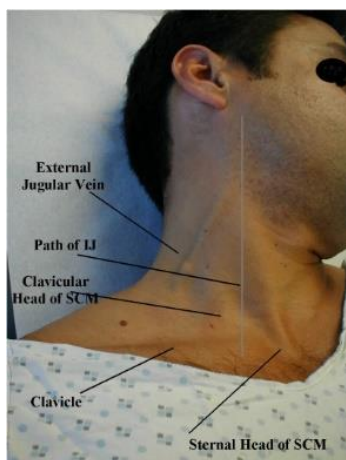
- Central nervous system involvement (**called Sydenham chorea**) occurs in **10 to 30%** of ARF patients
 - Jerky, uncontrollable body movements
 - It is a movement disorder characterized by chorea (involuntary brief, random, and irregular movements of the limbs, trunk, and face)
 - Fingers can be held in odd positions
 - Face can go in and out of a grimace, or have a tic (repetitive movement)
 - These movements look like twitches and disappear during sleep.
 - Children may display significant changes in behavior with laughing, crying, mood swings with emotional lability, and hypotonia. (Chowdhury, Koziatek, & Rajnik 2023).
- **RESPIRATORY ASSESSMENT:**
 - Lungs should be clear unless there is severe carditis, then you can hear fluid in the lungs. If there are abnormal heart sounds and abnormal breath sounds, **inflammation of the heart muscle (carditis) is suspected. REFER the patient to the NCD clinic immediately**
 - Patients can be Short of Breath (SOB) and tire easy.
 - Patient can have a cough if severe inflammation of the heart is present. This cough is from backed up blood. The cough is more common when the child lays down to sleep.
 - This cough is NOT related to an upper respiratory infection. There will be no Signs and symptoms indicating a viral or bacterial infection.
- **CARDIAC ASSESSMENT:**
 - **50% to 80% of children with ARF will have inflammation of the heart!**
 - Carditis is the most serious presentation of ARF and can involve all of the heart muscle (pericardium, epicardium, myocardium, and endocardium) (Chowdhury, Koziatek, & Rajnik 2023).

- Usually, carditis is painful and creates symptoms. BUT carditis can also have NO symptoms!
 - All children with carditis will have abnormal heart sounds.



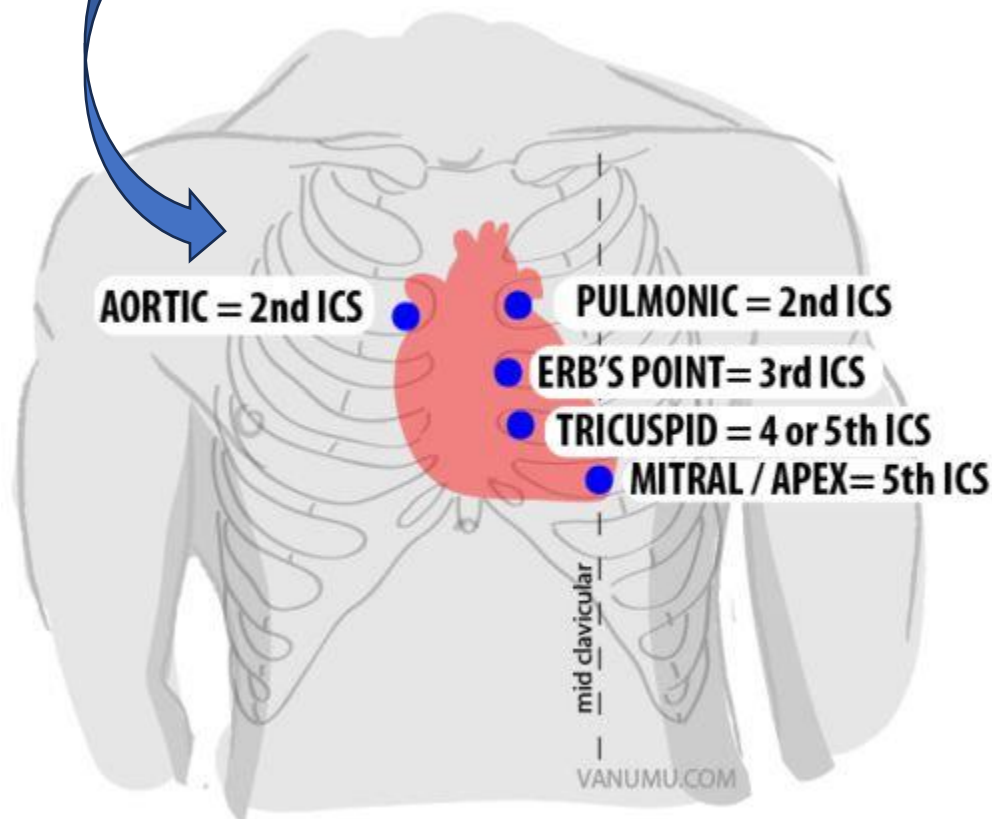
- **Symptoms:**
 - None...or
 - Fatigue, tiredness
 - Shortness of breath with exertion
 - Chest pain, pressure, heaviness
 - An inflamed heart is usually painful.
 - Pain increases when a person lays flat and leaning forward is often more comfortable.
- **VITAL SIGNS:** cardiac inflammation causes Tachycardia.
 - Consider carditis if the resting heart rate is greater than 100 beats per minute(children older than 5). **Tachycardia requires an echocardiogram. REFER to NCD clinic immediately if you suspect ARF.**
 - What are normal heart rates for children?

- _____
- _____
- _____
- _____



- Assess for **Jugular vein distension (JVD)** (you will learn on Skills Day)
- JVD is a sign that the heart is not pumping blood as well as normal. It is a sign of heart failure.
- **AUSCULTATION:** ARF causes abnormal heart sounds: Inflamed valves create a new heart murmur where there is muffling of the cardiac sounds. Any murmur requires an echocardiogram.

- Most common valve affected is the mitral valve. The murmur is heard best below the nipple at the 5th Intercostal space (MCL 5ICS). The murmur radiates lateral left.
- Aortic valve can be involved. An aortic valve murmur is heard best at the right 2nd intercostal space along the sternal border. Aortic Murmurs can radiate to carotids.



...What could this patient have?

Differential diagnosis of a patient presenting with shortness of breath, fatigue, tiredness, chest pain/pressure, tachycardia:

ARF, congenital heart disease, RHD, heart failure, valve disease, sickle cell anemia, infective endocarditis, or depression/anxiety.

• ABDOMINAL ASSESSMENT

- Should be normal, non-tender, normal bowel and bladder function.
- Normal bowel tones in pitch and frequency

• MUSCLE-SKELETAL ASSESSMENT

- It is common of ARF patients to have generalized sore or weak muscles

- **60% -80% of children experiencing ARF will have arthritis.** Check the joints: Arthritis (usually migratory polyarthritis predominantly involving the large joints).



- **Most common knees, ankles, elbows, wrists.**
- Can be red, swollen and warm to touch
- Can be one joint and then moves to another
- Pain without trauma
- If the arthritis goes unmanaged, several joints are affected in quick succession, with each joint inflamed maximally for a few days to a week.

- Subcutaneous nodules – **occurs in up to 10 percent ARF cases**



The painless nodules are found over joints (such as the elbows, knees, ankles, and knuckles), the back of the scalp, and the vertebrae (backbone).

The nodules are firm, round, mobile, and range from 0.5-2 cm in size.

The nodules are usually only found when severe carditis is present. They usually resolve within one month but may persist for longer.

SKIN ASSESSMENT

- A skin rash called, “Erythema marginatum” occur in less **than 6 percent ARF**
 - When present, **it is found on the trunk and upper arms and legs, but almost never on the face, palms or soles.**
 - The rash appears as pink or red macules (flat spots) or papules (small lumps), which spread outwards in a circular shape.
 - As the lesions advance, the edges become raised and red, and the center clears. The shape is often wavy.

- The lesions can fade and reappear within hours, reappearing in hot conditions.



- Erythema marginatum may persist intermittently for weeks to months, even after successful treatment of ARF.
 - ([https://dermnetz.org/topics/rheumatic-fever#:~:text=Subcutaneous%20nodules%20\(small%20lumps%20under,and%20the%20vertebrae%20\(backbone\).](https://dermnetz.org/topics/rheumatic-fever#:~:text=Subcutaneous%20nodules%20(small%20lumps%20under,and%20the%20vertebrae%20(backbone).))
- **Differential diagnosis** of a patient presenting with fever, skin rash, nausea, and fatigue: ARF, typhoid fever, malaria, Lassa fever, Ebola, and scarlet fever
-

Lab/ EKG findings:

- **Abnormal labs:** Elevated acute phase reactants (erythrocyte sedimentation rate [ESR] greater than 30, C-reactive protein [CRP]) – (greater than 3.0 mg/dl)
- **Abnormal EKG:** Widespread concave ST elevation and PR depression and Sinus tachycardia are common in acute pericarditis due to pain and/or pericardial effusion



○

CRITICAL THINKING & DIAGNOSIS

How is ARF diagnosed?

- The diagnosis of ARF is complex involving EKG, echocardiogram, serial labs, and clinical presentation. However, the first critical step is the knowledge there is a link between an untreated, or undertreated Strep infection, a current fever and ARF.
 - Health center, NCD, or private facility nurses, your decision will be based on your knowledge and skills and clinical decision.
- Currently, there is no diagnostic laboratory test for ARF, so diagnosis remains a clinical decision based on the ARF diagnostic algorithm.
 - Rwanda has high incidence of Strep throat and RHD... therefore there is a high incidence of ARF.
- As a nurse, if you suspect a child might have ARF through your history and physical, then REFER TO District hospital NCD clinic/CARDIOLOGY. Your patient will need an echocardiogram and 12 lead EKG at the District Hospital. Work with your NCD colleagues and physicians to make the referral quickly. Always see the patient back in your clinic in 7 to 10 days to ensure there is proper follow up.
- You will need to advocate for your patient and follow closely as you wait for the results of the echocardiogram and evaluation by the cardiology clinic.
- Providing information to parents about ARF, Streptococcus pyogenes infections (Strep throat infection, or impetigo), is critical so you have the opportunity to see and diagnose ARF early. **You are important!** Rwandan Nurses can save lives!
 - USE YOUR STETHOSCOPE

EVIDENCED-BASED TREATMENT

How is ARF treated?

- Treatment of ARF consists of antibiotic therapy, anti-inflammatory therapy, and heart failure management.
- Hospitalization is standard of care for optimal management of ARF, especially for an initial episode.
 1. Lab test, EKG, and echocardiogram tests need to be completed.
 2. Response to heart failure and carditis therapy can be observed.
 3. Long-term preventative measures need to be started at this initial hospitalization with appropriate education for the patient and their families.
 - Antibiotic therapy-
 - After recovery the patient will need PCN treatment every 3 WEEKS x 10 years to protect against RHD
 - Heart Failure management
 - Education on Strep throat and impetigo infections
 - Quality of life and lifestyle management and support
 - Education for patients and parents
 - Understanding of the signs and symptoms of Heart Failure
 - Clear understanding of the importance of continue antibiotic therapy (it is an autoimmune response)

- Need for continuous medication can create a stigma. Provide support!
(Ralph & Currie 2022).
- **Goals of treatment** — The six major goals of treatment are:
 1. **Eradication of the Streptococcus** pyogenes bacteria through antibiotic therapy to block the autoimmune response (each new exposure produces a strong autoimmune response)
 - Treated the same as Strep Throat infection: Penicillin (PCN) is the preferred medication
 - Consider the most convenient and sensible approach is to administer long-acting intramuscular (IM) penicillin G benzathine.
 - If a throat culture is possible, test all household members and treat those who are positive whether they have symptoms or not (these people are carriers of the infection)
 2. **Symptomatic relief** of acute disease manifestations (eg, arthritis, fever)
 - For arthritis pain, Naprosyn is the recommended medication:
 - Non-steroidal anti-inflammatory drugs (NSAIDs) are given as a standing dose until symptoms resolve and inflammatory markers have improved, provided the medication is well tolerated. Improvement is typically noted in one to two weeks, although longer courses (6 to 12 weeks) may be needed for persistent or rebound symptoms and elevated C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR)
 - Using Naprosyn, or any NSAID for longer than 1 week increases the risk of an stomach ulcer- watch for abdominal pain. Refer to District Hospital if it develops.
 - Proton-pump inhibitor prophylaxis may be considered for those at increased risk of NSAID-induced inflammation/ulcer/upper GI bleeding due to the NSAID.
 - For fever paracetamol is the recommended medication
 3. **Manage rheumatic heart disease** (RHD; eg, carditis, heart failure) if present
 - Covered in Heart Failure and Rheumatic Heart Disease sections.
 4. **Manage chorea if present:**
 - Sydenham chorea (SC) is generally self-limited, and most cases do not require treatment beyond the usual chronic antibiotic therapy to prevent recurrence of ARF and minimize the risk of RHD.
 - Refer to District Hospital or a pediatric neurologist if symptoms severe.
 5. **Prophylaxis** against future Streptococcus pyogenes infection to prevent progression of cardiac disease.
 6. Provision of **education** for the patient and patient's caregivers

There is no therapy that cures the valvular damage in the setting of ARF! The cascading events of cardiac remodeling has started with the molecular mimicry and is irreversible.

However, preventing any additional episodes of untreated Strep Throat and ARF will **SLOW** the progression, thus adding years of life to that child or person who is living with RHD.

EDUCATION

- Providing education to patients and their families is critical to increasing awareness of the link between *Streptococcus pyogenes* infections and ARF/RHD. Education starts with the discussions concerning Strep Throat/Impetigo diagnosis and treatment.
- With ARF, added education:
 - Acute Rheumatic fever is a complication from Strep Throat/impetigo. It is NOT contagious.
 - ARF is called an auto immune disease where the body thinks normal tissue is the antibiotic and attack normal tissue. In ARF the main tissue is the heart valves. However, the symptoms the child feels are from parts of the body inflamed from the autoimmune reaction.
 - Heart- valve: the child can have chest pain/pressure and shortness of breath
 - Brain- the child can be experiencing strange emotions-cry/laugh; or have muscle twitches and odd positions
 - Joints- red, swollen, painful joints or nodules on the tendons.
 - Treatment is antibiotic that works against *Streptococcus pyogenes* and it is given every 3 weeks in Rwanda because the risk of another Strep infection is high and repeat infections cause even more inflammation and autoimmune reactions.

MANAGEMENT

What do I need to do as Health center nurse?

- As the healthcare provider in your health clinic, your responsibility is to understand ARF and remember to ask about a possible recent past sore throat when children come to your clinic with Signs & Symptoms of ARF, or fever of unknown origin.
- **If you suspect ARF, refer your patient immediately to NCD/cardiology.**
- **Rheumatic heart disease is the most important long-term sequela of acute rheumatic fever due to its ability to cause disability or death.**
- Know that untreated rheumatic fever increases a person's risk of recurrent attacks and worsens prognosis. Prognosis is related to the prevention of recurrent attacks, degree of cardiac valvular damage, and degree of overall cardiac involvement.
- Know that cardiac complications may vary in severity and include, but are not limited to, pericarditis, endocarditis, arrhythmias, valvular damage, and congestive heart failure.
- Know the signs & symptoms of ARF:
 - **fever, joint pains, muscle aches, fatigue, tiredness, chest pain/pressure, shortness of breath, skin rash or nodules, jerky motions, mood swings or irritability.**
- Know how to treat:
 - **REFER TO DISTRICT HOSPITAL NCD CLINIC/CARDIOLOGY as soon as possible.**
 - Treat with antibiotic, + NSAID, + paracetamol as needed.
 - Admit to the hospital, if possible

What is the most important information I must remember concerning Acute Rheumatic Fever (ARF):

ARF can be difficult to diagnose and *presenting symptoms may be subtle. It is therefore strongly recommended that all patients with suspected ARF be admitted to hospital.*

Hospitalization is important for timely blood testing, echocardiography and Cardiology team review.

Case Study: Nicole is a 13-year-old female who has started crying and laughing inappropriate in school. She also has a muscle twitch around her lips and is moving her arms with exaggerated arm swings and hand motions. Her mother says at night she is sleeping peacefully.

Now what do you think?

What is your plan? _____

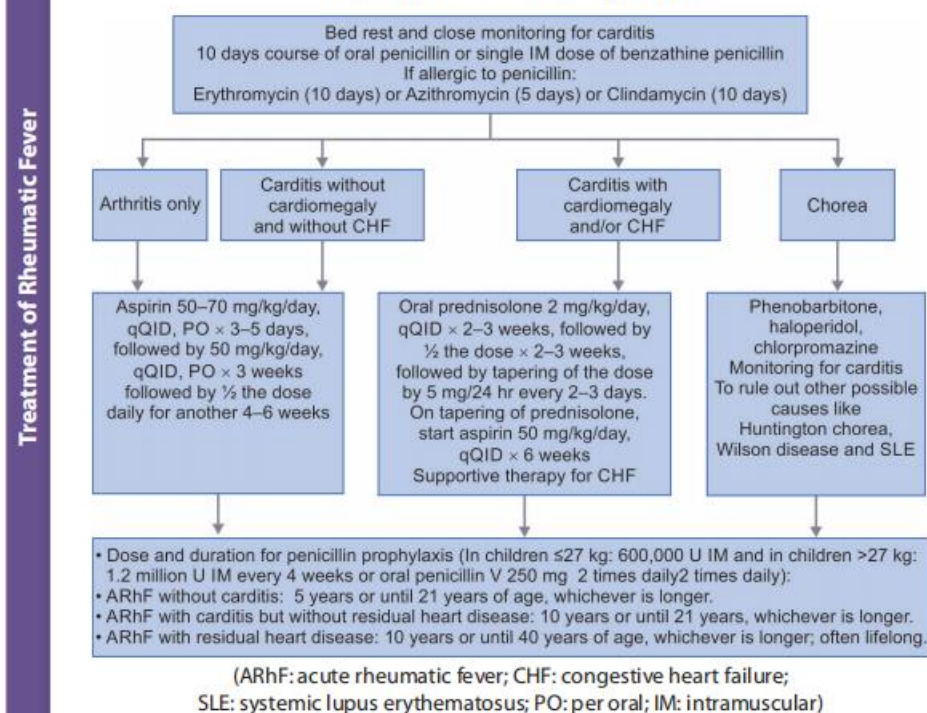
Case Study: Emmanuel is a ten-year-old male and lives in a 2-bedroom house with his three younger brothers and sisters and his parents. He loves to play football. Yesterday he reported a painful knee which is red and swollen.

What do you think? _____

What is your plan? _____

The treatment has not changed in the last few decades and consists of mainly antistreptococcal and anti-inflammatory therapy. **Flowchart 1** shows the main management principles.

Flowchart 1: Treatment algorithm.



First-line agents – For most patients with symptomatic ARF-associated arthritis, we suggest a nonsteroidal anti-inflammatory drug (NSAID such as naproxen or ibuprofen) as the first-line anti-inflammatory agent because NSAIDs have a lower risk of adverse effects compared with other agents (aspirin or glucocorticoids). We typically use naproxen in this setting since it has the advantage of less frequent dosing. Dosing for naproxen is as follows:

- For children >2 years old – 10 to 20 mg/kg/day in two divided doses given orally every 12 hours (maximum daily dose 1000 mg)
- For adults – 250 to 500 mg twice daily (maximum daily dose 1250 mg)

Duration of treatment – NSAIDs are given as a standing dose until symptoms resolve and inflammatory markers have improved, provided the medication is well tolerated. Improvement is typically rapid (less than 48 hours) but occasionally may take one to two weeks, although longer courses (6 to 12 weeks) may be needed for persistent or rebound symptoms and elevated C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR).

Some experts use glucocorticoids (eg, prednisone 1 to 2 mg/kg/day, maximum daily dose 80 mg) in patients with severe carditis with acute cardiac failure, particularly in the presence of persisting high inflammatory markers or in patients facing imminent surgery, despite the lack of evidence supporting such therapy. Glucocorticoids are stopped when HF is controlled and inflammatory markers have improved. If a course longer than one week is needed, then it is prudent to taper the dose by approximately 25 percent per week.

BPG is the most effective formulation for GAS eradication⁵⁷ and is superior to oral penicillin prophylaxis in preventing GAS pharyngitis and recurrent ARF (2020 American Heart Association Guidelines)

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Links

[Risk factors for acute rheumatic fever: A case-control study - The Lancet Regional Health – Western Pacific](#)
[Rheumatic Fever: All You Need to Know | CDC](#)

Video to watch : [Rheumatic Fever Made Easy \(Including Jones Criteria and Mnemonic!\) - YouTube](#)

Module 3- RHEUMATIC HEART DISEASE: part 1

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KNOWLEDGE

What is Rheumatic Heart Disease (RHD)?

- Rheumatic Heart disease is the second step in the autoimmune disease progression from untreated strep throat to heart valve damage.
- The heart is a main location of irreversible valve damage that becomes Rheumatic Heart Disease (Arvind & Ramakrishnan, 2020; Moloi et al., 2016; Dass & Kanmanthareddy, 2021).

Review our scenarios:

Case Study: Nicole is a 13-year-old female who has started crying and laughing inappropriate in school. She also has a muscle twitch around her lips and is moving her arms with exaggerated arm swings and hand motions. Her mother says at night she is sleeping peacefully.

Case Study: Emmanuel is a ten-year-old male and lives in a 2-bedroom house with his three younger brothers and sisters and his parents. He loves to play football. Yesterday he reported a painful knee which is red and swollen.

What are the risks to Emmanuel and Nicole to develop RHD and why?

- ❖ Rheumatic heart disease affects predominantly those living in poverty with inadequate access to health care and endemic exposure to streptococcus pyogenes (Dass & Kanmanthareddy, 2021).

BRAINSTROM: What are the common reasons for repetitive Strep infections in children ages 5-10?

Progressive Heart Valve Damage after ARF:

- ❖ If valvular heart disease remains untreated, then heart failure or death may occur from RHD.
- ❖ Progressive valvular disease commonly develops in the years following one or more episodes of ARF.
- ❖ 60% of children with ARF will develop Rheumatic Heart Disease. This is related to genetics, endemic streptococcus pyogenes, poor community awareness, and lack of diagnosis and treatment of Strep infections and ARF.
- ❖ In Rwanda, the current average age of a **valve replacement is 24 years** old (Team Heart, 2023).
- ❖ The main valves affected are the Mitral and Aortic Valves
- ❖ **RHD is endemic in Rwanda** and all of SSA- as well as many places in the world, because infections caused by Streptococcus pyogenes are endemic.
 - The primary age group for the **ONSET of RHD: ages 5 to 15 years old.**
 - The primary age of clinical diagnosis is MUCH later with **60% of the children** in Rwanda **receive a LATE diagnosis.**
 - It is common for women to be unaware that they have rheumatic heart disease until pregnancy. **Pregnancy** demands the heart to increase its capacity by 100%, Valves damaged and scarred cannot function well during pregnancy and the women suffers from heart failure.

Ending Late Diagnosis

It is through education like this one, nurses and physicians will gain the knowledge and skills to diagnosis and treat Strep infections to decrease ARF and RHD and to identify children early in the course of RHD.

Rwandan Nurses Saving Lives.

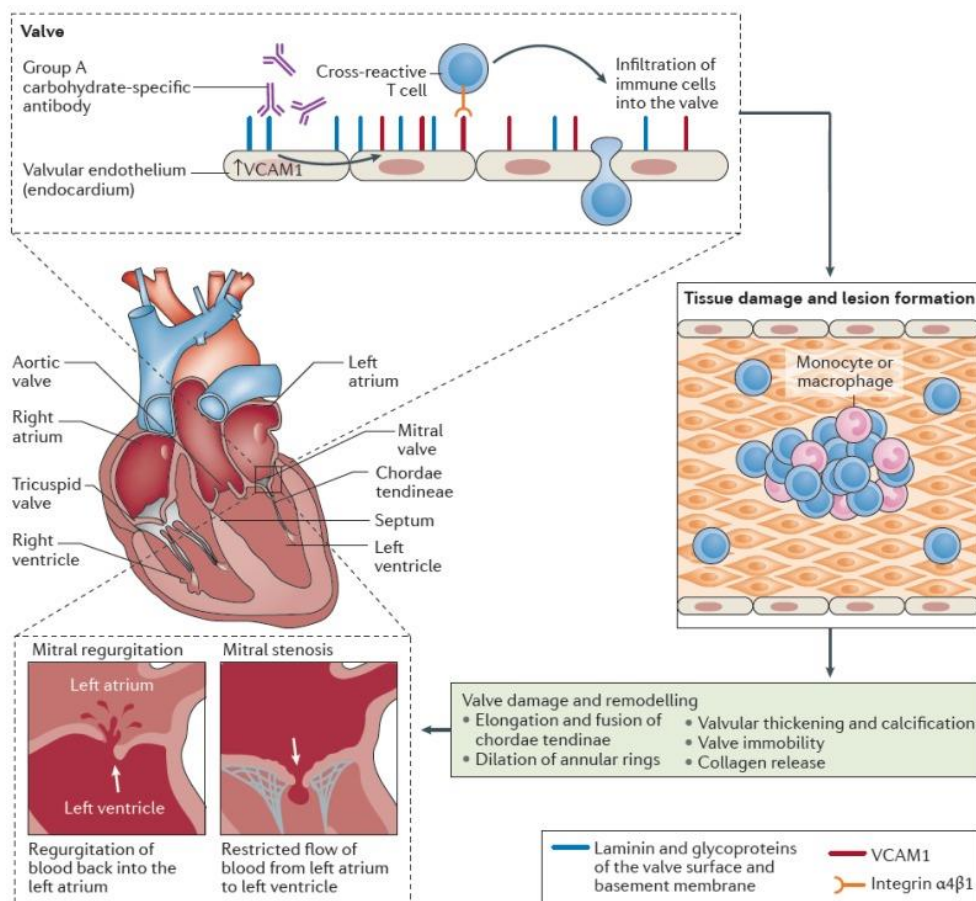
Prevalence (how many children have RHD)?

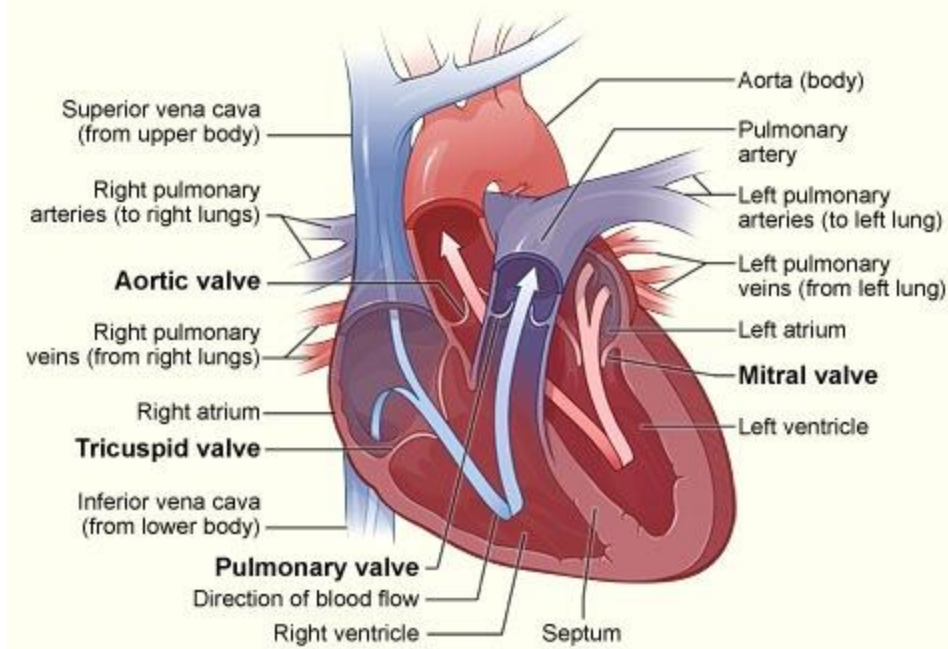
- ❖ Over **15 million people** in the world have evidence of RHD.
- ❖ Oceania and central sub-Saharan Africa are the two regions that have not experienced a significant decrease in morbidity (illness and disabilities) and mortality (death) and since 1990 (Dass &, 2021; Zühlke, & Peters, et al., 2022).
- ❖ The disease remains prevalent and endemic in sub-Saharan Africa including Rwanda.
- ❖ RHD is responsible for 250,000 deaths in young people worldwide each year, plus an additional 100,000 people older than 25. Over 15 million people have evidence of rheumatic heart disease (Dass & Kanmanthareddy, 2021).
- ❖ A prevalence research in Rwanda indicates the prevalence of RHD is high and close to that of the Aboriginals of Australia (Highest in the world).
- ❖ Every District Hospital reports new cases of symptomatic RHC every month with almost half being diagnoses only after there are severe signs and symptoms of heart failure.

WHY is knowing about Rheumatic heart disease important?

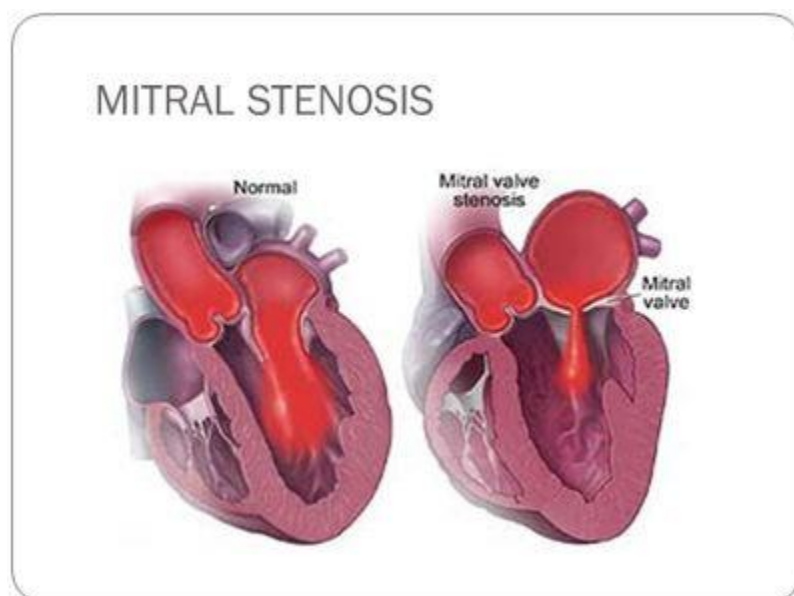
- ✓ RHD is preventable!
- ✓ Symptomatic chronic RHD face high rates of death within 2 years of diagnosis.
- ✓ Chronic illness/disability are common where RHD is endemic.
- ✓ RHD is irreversible heart valve damage that leads to heart failure and death.
- ✓ RHD is often diagnosed when a complication develops-(Zühlke, & Peters, et al., 2022):
 - 33 percent of symptomatic Heart Failure
 - 22 % of atrial fibrillation (irregular and rapid heart rates)
 - 29% of pulmonary hypertension (high pressure in the lungs)
 - 7% of cardio-embolic stroke
- ✓ Chronic RHD should be suspected in patients with a history of acute rheumatic fever (ARF) and/or suspected pathologic cardiac murmur.
- ✓ Echocardiography is required for the recognition of the valvular disease seen in chronic RHD. (Zühlke, & Peters, et al., 2022).

Anatomy





Normal Blood Flow through the heart



Change in blood flow when the mitral valve becomes damaged by RHD

Rheumatic Heart Disease is now staged.

To help improve communication between health providers, Rheumatic Heart Disease is staged. This is similar to Heart Failure patients. Each stage is specific and progressive from stage A to stage D.

Understanding stages will help you provide the best communication to the Cardiac team and discussing patients with your District hospital's NCD nurses.

Stage	A	B	C	D
Definition	Meets minimum requirements by Echo	Mild RHD; at risk for developing clinical symptoms of valvular heart disease	Moderate RHD; at high risk for complications and need for surgical intervention	Severe RHD with clinical complications: HF, Atrial fibrillation, stroke, pulmonary hypertension
Risk of progression	Low risk if on prophylaxis	Mod to high risk of disease progression	High risk of complication and death	High risk of death
Initial Care	Place in a national registry, refer to cardiology, Education to family	Place in national registry, refer to cardiology, education to family, support antibiotic every 3 weeks, monitor for heart failure and treat.	Place in national registry, refer to cardiology, Management of HF, education to family, Antibiotic every 3 weeks for life, minimal monthly follow up at health centers	Place in national registry, refer to cardiology, patient to Provincial or national level hospital to evaluation and plan, start HF management, monitor labs, education to family, emotional support, weekly HF evaluation until stable.
Prophylaxis duration	Antibiotic every 3 weeks x 2 years, the repeat echo	Every three weeks x 10 years minimum.	Every 3 weeks for life	Every 3 weeks for life

2023 World Heart Federation guidelines for the echocardiographic diagnosis of rheumatic heart disease. <https://doi.org/10.1038/s41569-023-00940-9>

Case Study: Fausta is 15 years old and the oldest in her family of five children. She is responsible to care for her brothers and sisters. Over the last few months she has developed fatigue, shortness of breath, and she has told her mother that she cannot help with the laundry because she is too tired. She also reports at nighttime she feels like she cannot breathe and has to sit upright to catch her breath. Her mother determines she does not have a fever, and no signs of infections. Her mother thinks she just does not want to help the family. Yet, Fausta continues to report being tired and short of breath with any activity. Her mother brings Fausta to your clinic.

What do you want to know? _____

HISTORY

What are the SIGNS and SYMPTOMS I will see in my patients?

Remember that with many patients, the diagnosis of RHD is first made when they present late in the disease process with heart failure or a cardiac complication. The sooner cardiology is involved in their care, the better the outcomes and quality of life. Rwandan nurses can save lives!

ALWAYS... First ask the correct questions for clinical decisions:

Question	Clinical reasoning
Have you been feeling more tired than usual?	Once the heart valves are damaged from the autoimmune response, scar tissue builds up thereby decreasing the heart's ability to pump blood forward. The heart cannot meet the demands required for good blood flow during activity. This creates fatigue, tiredness.
Do you get short of breath, or have trouble breathing? Do you have to catch your breath when you walk, do laundry, carry and object?	A damaged heart cannot pump enough blood during activity. This creates shortness of breath.
Do you cough at nighttime, or do you wake up at night and have to sit up to catch your breath?	When a person, with RHD valve damage, lays down the blood flows backwards and blood goes into the lungs. This fluid will cause a person to cough or have to sit up to breath. This is called "Orthopnea" When they have to sit up at nighttime to catch a breath, it is called, (Paroxysmal nocturnal dyspnea."
How many pillows/ blankets are under your head when you sleep- has this changed?	To sleep better a person will put additional pillows or blankets under their head to raise their head so the fluid in the lungs stay in the base of the lungs. Lying flat creates the feelings of fullness, or being underwater.
Any swelling in your feet?	A failing heart cannot keep up with the body's normal amount of blood. To decrease the amount of blood, the body will build up fluid in the legs and abdomen as edema.
How is your appetite?	As heart failure progresses, the person's appetite decreases due to fluid buildup in the liver, ascites in the abdomen which decreases appetite and with little food, the person feels full. Plus, there is a decline in the perfusion of blood to the digestive system as the body struggles to provide enough oxygen to all of the tissues.
Have you had any chest pain or pressure episodes?	RHD patients can have additional episode of cardiomyelitis creating chest pain.
Have you felt your heartbeat fast?	Fast heart rates can occur from

	infection/inflammation or from an abnormal heart rhythm called atrial fibrillation. This abnormal rhythm can cause a stroke by sending a clot to the brain.
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Fausta's Scenario:

Now think of Fausta: Fausta has been complaining to her parents that she does not want to do her chores to wash clothes because it makes her short of breath. Her sisters complain that Fausta coughs at nighttime and keeps them awake.

What do you think? _____

PHYSICAL ASSESSMENT

Vital Signs:

- ❖ Temp: normal
- ❖ Heart rate: higher than normal
- ❖ Resp rate: can higher than normal
- ❖ Blood pressure: normal until significant heart structure damage, then the blood pressure will drop.

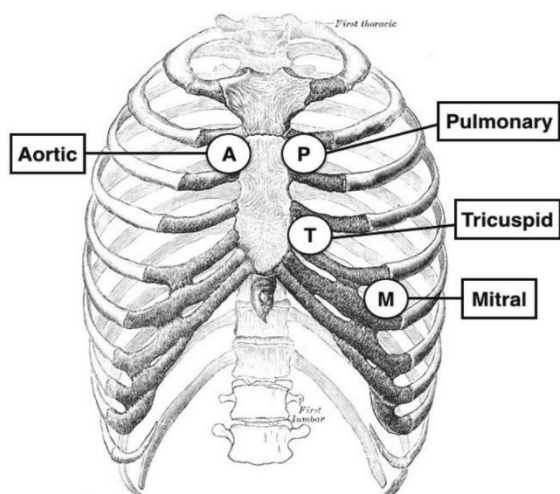
HEENT: should be normal, EXCEPT for jugular vein distension that is often seen.



Neuro: should be normal. However, RHD patients are at a higher risk of a stroke.

Respiratory: In RHD, the lungs tend to have extra fluid. This extra fluid makes a crackle sound. This is called, "rales." Typically heard at the bases of the lungs.

Note: Pneumonia will also create rales. Pneumonia patients will have a cough, fever, and appear ill.



Cardiac: In RHD, the valve damage is permanent, thus you will hear **ABNORMAL heart sounds**. You will hear a murmur.

Note: refer all abnormal heart sounds to a district hospital NCD clinic for an echocardiogram,

Abdomen: As RHD progresses, fluid can build up in the liver which can cause an enlarged liver and/or hepatojugular reflux.



Extremities: RHD causing heart failure can cause swelling in the feet, ankles, and legs.

Fausta's Case Study

Physical exam: VS T36.8, HR 98 RR 22 BP 114/78

She is alert and oriented x 3 (person, place and time). Mucous membranes are pale pink and moist. Mouth is without evidence of active strep. Neck is supple. +jugular vein distension (JVD). Chest with bibasilar rales. Heart sounds abnormal with + murmur best heard at 5 ICS lateral left. Abdomen soft, + hepatojuglar reflux. Extremities with bilateral +2 edema to mid-tibia.

Now what you do think? _____

What are your next steps? _____

TREATMENT

How is RHD treated?

There is no cure for RHD.

- ✓ The first strategy is **long-term preventative antibiotic therapy** with PEN G IM shot every 3-4 weeks until cleared by cardiology (years to life) to prevent additional unrecognized/untreated Strep infections and ARF episodes.
- ✓ **EDUCATION:** The second Strategy is **education**. Patient and family education is critical for nutritional, physical, pharmacological, emotional, and spiritual well-being of the patient who has an incurable disease.
 - Community education concerning strep infections and possible heart disease
 - Community education on the treatment- the use of monthly antibiotic therapy-STIGMA
 - Advocacy to the patient and family to maintain medical care... for life
- ✓ **MANAGEMENT:** The third strategy is **development of individualized heart failure plans** (HF lecture) by the cardiac team (nurses, cardiologists, fellows, NCD nurses) using the medications of ACE I/ARB, Beta blocker, Loop Diuretics, and Spironolactone.
- ✓ The fourth strategy is **cardiac surgery**. Ultimately, valve(s) repair or replacement (RHD-valves lecture) is often required to improve QOL and prolong life.
 - Post-surgery lifelong anticoagulation for mechanical valves and for all with a history of atrial fibrillation
 - Close monitoring for acute on chronic HF (H&P), atrial fibrillation (EKG), pulmonary hypertension (echo), stroke or clot.

CRITICAL THINKING & DIAGNOSIS

What do I need to know to diagnose RHD?

As a Health center nurse, you will not diagnose RHD, but you will refer patients for echocardiograms. The diagnosis is made by echocardiogram. You can and should determine the RHD Stage of your patients.

- ❖ You need to know the S&S of Strep throat, ARF, and RHD- know how to ask the questions to clarify the symptoms.
- ❖ You need to use your stethoscope!
 - Know what cardiac sounds are normal and **referral all abnormal sounds.**
 - Know what pulmonary sounds mean fluid and potential pulmonary edema/ heart failure.

Nurses are important and Rwandan nurses will save lives.



https://www.youtube.com/watch?v=Hk3K5_Zyawc

mitral regurgitation

<https://www.youtube.com/watch?v=KK70reK7syg>

mitral stenosis

❖ ***ALL cases require confirmation by Echocardiography.***



As you refer a patient to cardiology team, it is helpful to have the data available for the cardiologist physicians, and NCD nurses. This data includes:

- Echocardiography (assess size, shape, and function of each chamber and valve).
- Lab investigation: CBC with WBC smear, comprehensive lab-renal function, electrolytes, liver function tests, thyroid panel, BNP (assess for active infection, parasites, kidney function, electrolyte status, hydration, liver function, thyroid levels, and current cardiac damage)
- Chest X ray (assess for TB and any pulmonary edema)
- Electrocardiogram ECG (assess for abnormal rhythms)
(Leal et al., 2019)

WHY NURSES SHOULD KNOW ABOUT RHD

- ✚ The nurse is a pillar in the health care system. Involving the nurse in the prevention and management of RHD will result in better outcomes.
- ✚ The nurses work at all levels of the health system from the community level to specialist referral. If the nurses are skilled in RHD they will participate in prevention for all levels, screening, education and treatment of valvular disease and heart failure.
- ✚ Excellent management at the health center of Strep Throat/Impetigo, ARF, RHD and good care of patients after surgery for repairing the valves is dependent on nursing care and the education nurses provide (Ou et al., 2022).

The big role of nurses is to participate in the screening of RHD, earlier diagnosis, and proper treatment of Streptococcus pyogenes infections.

- In many countries there are lab tests for throat infection. (These may become available in Rwanda in the future).
 - ✚ Throat culture
 - ✚ Serology for streptococcal antigens and antibody
 - ✚ Nonspecific evidence of inflammation
 - ESR ↑ CRP ↑ WBC (leukocytes)

BRAINSTROM: What are the most important points concerning RHD and your work as NCD nurse in your Health center?

Know what to educate patient/family/community. Health education should focus on:

- Streptococcus pyogenes infections are common in Rwanda, and they are contagious.
 - The most common way the bacteria goes from person to person is on hands!
 - Hands that have touched the bacteria can then contaminate objects- silverware, other food, toothbrushes, toys, towels are all common objects to transfer the strep bacteria to person to person.
 - Strep infections can cause the body to react causing inflammation in the brain, joints, and heart valves.
 - Inflammation of the heart valves leads to permanent damage, heart failure, and early death.

- The main treatment is to prevent another strep infection by the use of antibiotics.
- (Leal et al., 2019)

WHEN TO REFER your patients to the Cardiology team?

- **Initial: First Diagnosis, or suspicion of ARF, RHD, Heart Failure**
- **All new murmurs**
- **All patients with increasing Shortness of breath, fatigue, tiredness, and edema**

When should you tell you patients and family to seek care?

- New Confusion.
- New Difficulty breathing, fluid overload.
- Chest pain, pressure.
- New swelling or pain in lower body (remember to also consider deep venous thrombosis if the leg swelling is unilateral).
- Irregularly-irregular heartbeat (Atrial fibrillation)
- Any new questions or concerns

This conference encourages each participant to provide one community education service within the first two months after this presentation. When nurses provide good evidenced-based information, it builds community trust and helps to change cultural habits. Death by RHD can be reduced by community education provided by nurses!

Rwandan nurses save lives.

BRAINSTORM: Why is it important for nurses to educate communities? Where do you think are good educational locations? What do you think should be shared in your community? Who should NCD nurses educate?

Why?

Where?

What?

To whom?

What are the main points you will use in your clinical practice from this lecture?



Take home message- It takes a team to care for one RHD patient!

- ❖ The patient
- ❖ The patient's family and support people
- ❖ The community health workers
- ❖ The patients school instructors or workplace employers
- ❖ The Health Post and Health Center nurses
- ❖ The NCD nurse
- ❖ The physician
- ❖ The pediatrician
- ❖ The cardiologist
- ❖ The pharmacist

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Module 4

RHD Part 2- Rheumatic Heart Disease – valve damage (RHD-VD)

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KNOWLEDGE

What is the Rheumatic Heart Valve Disease (RHD-VD)?

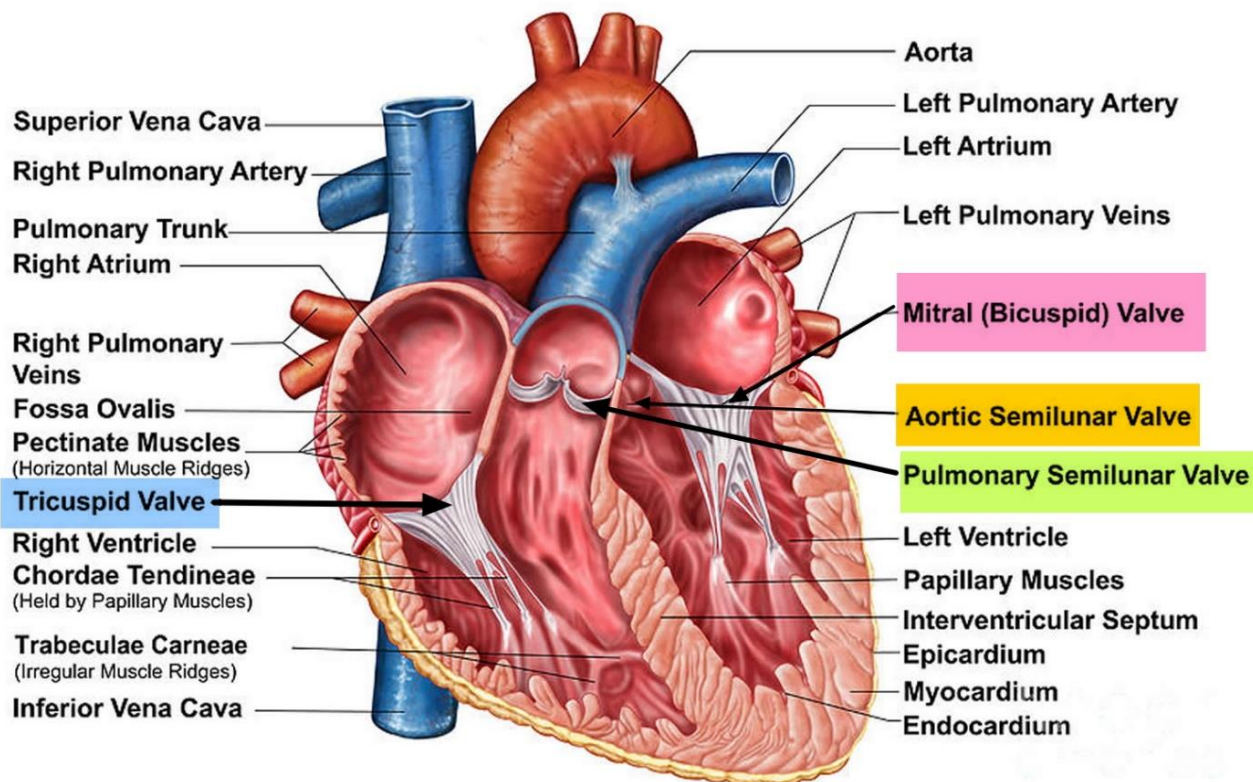
- RHD-VD is irreversible damage to the heart valves leading to a life of fatigue, shortness of breath, inability to walk or work to the fullest capacity and often causes death at a young age.
- The mitral valve is affected in almost all RHD-VD cases, with regurgitation (leaky valve) in the early stages, and stenosis (can open only a tiny pit) in later stages (Passos, Nunes, & Ailawa, 2021).
- RHD-VD can also affect aortic valves (with calcification and stenosis) and rarely the tricuspid valve.
- Chronic autoimmune inflammatory processes are chronic in RHD-VD resulting in accelerated loss of valve function (Passos, Nunes, & Ailawa, 2021).
- If correct antibiotic therapy is provided every three weeks, then the autoimmune inflammatory process will become dormant (sleeping until there is an exposure to Streptococcus pyogenes).
- This chronic autoimmune inflammatory process is complex involving pressure in the pulmonary system, poorly functioning heart valves, decreasing cardiac function, and rapid dilation of the left ventricle pulling the mitral valve (creating leaking/regurgitation).
- Rheumatic heart disease (RHD) is the principal cause of valve disease in Rwanda and in low- and middle-income countries around the world. (Huang *et al.*, 2021).
- Although RHD-VD first occurs in childhood (ages 5-15 after ST and ARF), its incidence peaks in adulthood, usually between the ages of 25–45 years (Passos, Nunes, & Ailawa, 2021).

Why is RHD-VD important?

- RHD-VD causes valve dysfunction dramatically reducing the valve's ability to function resulting in heart failure, long-term physical disability, poor quality of life and early death (Passos, Nunes, & Ailawa, 2021).
- RHD-VD symptoms develop slowly and are often missed until the disease has progressed into the severe stage.
- If healthcare providers miss the HF and cardiac changes, then often these patients cannot receive a life-saving valve replacement because the heart is physically damaged and heart failure is severe. However, excellent medication plans can help stabilize the patient.
- **Therefore- Nurses can save lives because nurses can gain the knowledge and skills to assess, diagnose, and work in a team for early cardiology involvement for medication, lifestyle changes, emotional support, and surgical treatments.**

How does RHD-VD happen?

The heart muscle pumps the blood around the body. The heart is made up of four connected chambers: Left atrium, the right atrium, the left ventricle and the right ventricle. There are four valves in the heart, guarding the exits of the four chambers. They are called the mitral, aortic, tricuspid and pulmonary valves.



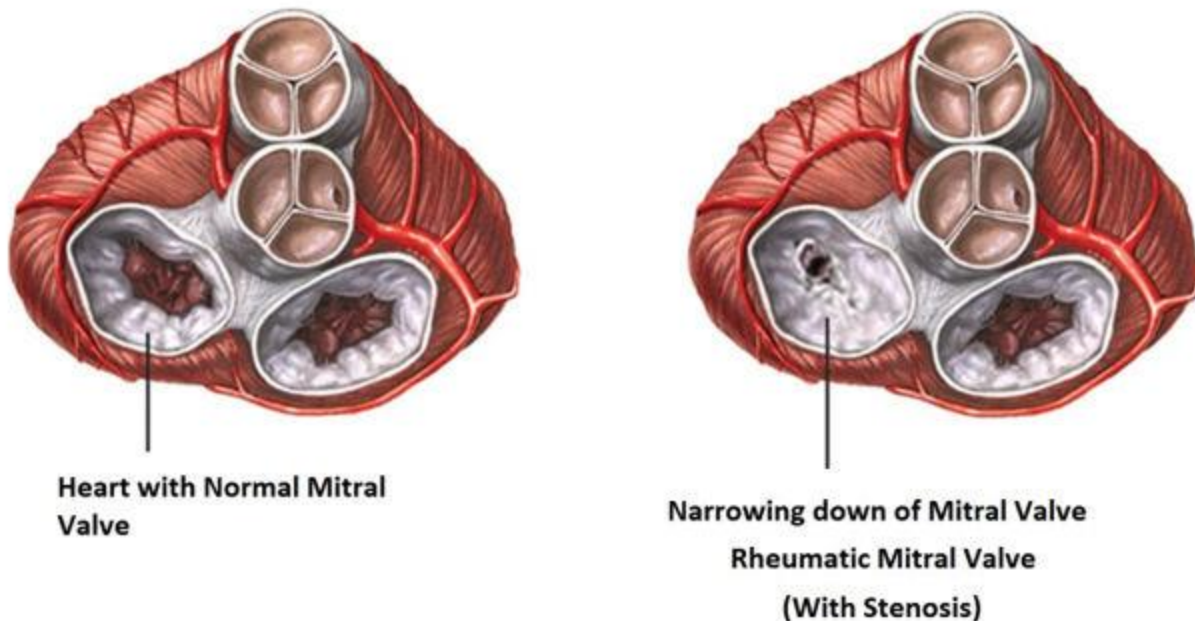
(<https://healthjade.com/purpose-heart-valves/>)

The **Tricuspid and Mitral valves** separate the top chambers (atria) from the bottom chambers (ventricles). They have long chords (chordae tendineae) that stretch and contract to open and close the valves. The chordae tendineae attach the valves to the papillary muscles or the heart muscle.

The **Pulmonic and Aortic Valves** are more like discs.

The **Tricuspid & Pulmonic** valves are on the right side of the heart. The **Mitral and Aortic** valves are on the left side of the heart.

RHD-VD affects the left side of the heart most of the time. The autoimmune process results in **a thick valve** with **short and thickened chordae tendineae** creating regurgitation (backward flow and leaking) (Passos, Nunes, & Ailawa, 2021).



<https://www.heart-valve-surgery.com/Images/rheumatic-fever-heart-valve-comparison.jpg>
<https://www.heart-valve-surgery.com/Images/rheumatic-fever-heart-valve-comparison.jpg>

What can go wrong with heart valves?

If any of the four valves are damaged the flow of blood through the heart is affected and the heart cannot work efficiently enough. There are two main ways that valves can be affected:

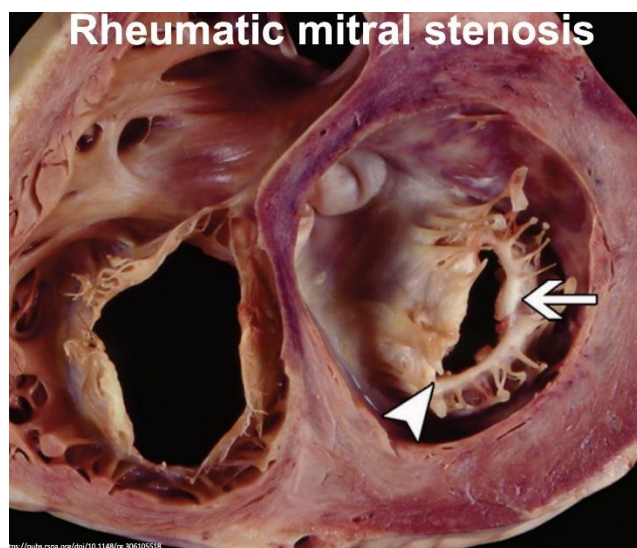
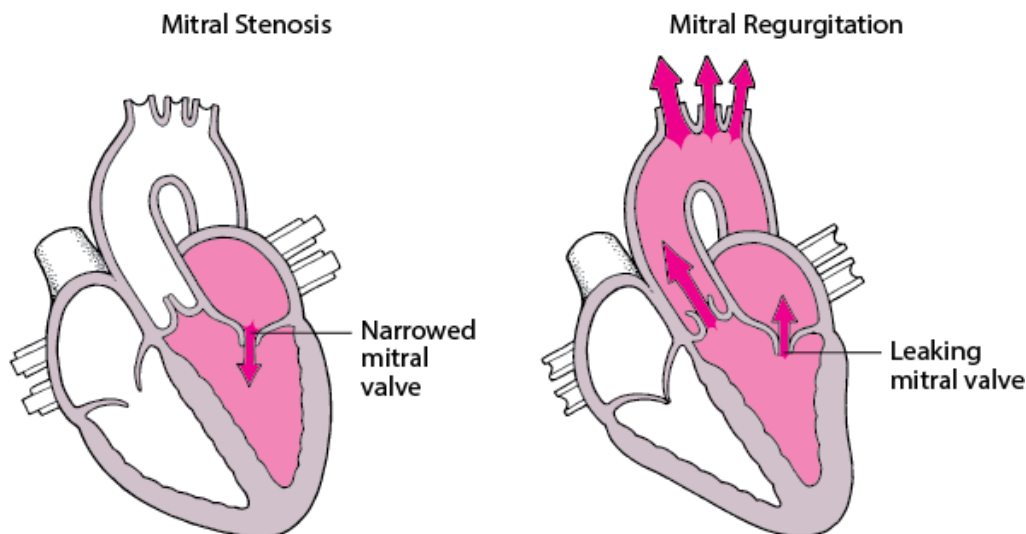
➤ **Valves can leak= Regurgitation.**

Leaking occurs when the valve does not close firmly enough to prevent the blood in the chamber leaking back through the valve. This is called valve regurgitation. The heart must work harder as it tries to cope with the normal flow of blood as well as the extra blood that has leaked back through the valve.

➤ **Valves can narrow= Stenosis.**

Narrowing occurs when the opening of the valve is narrowed from scar, infections, or fibrosis and cannot open fully, thereby restricting blood flow between chambers. This is called valve stenosis. The heart must work harder to overcome this restriction. Heart valves can leak and be stenosis at the same time!

- It is possible for more than one heart valve to be affected. Both leaking and narrowed valves place additional strain on the heart muscle.



In this picture, you can see a normal Tricuspid valve on the left and the RHD-damaged Mitral valve on the right.

The Mitral valve cannot open big enough for the normal volume of blood to flow through the valve at normal left atrial pressures.

As a compensatory mechanism, the pressure in the left atrium increases. The increased pressure causes the pressure in the lung tissue and alveoli to also increase. The result is accumulation of blood in the pulmonary interstitium and alveoli, leading to shortness of breath, cough, orthopnea, and bendopena (shortness of breath

when you bend over).

This reduction of blood that can pass with each heartbeat, means blood is left in the lungs creating heart failure and fluid overload.

In your patients, the valve damage and valve function are determined by an echocardiogram.

Case: Christina is a 23-year-old female living in Rwesero. She has been working as a seamstress. She is from a family of 7 children. She has three sisters and three brother. Her older brother died at age 15 from an unknown cause. She remembers he was tired often and coughed at nighttime. He did not have TB. Christina has been married for 1 year and is now pregnant. She is four months along, and she reports

she has been very tired, short of breath when carrying fabric, and at nighttime she has placed two extra pillows to help her breathe better during sleep. She tells you that she has not been sick for many years, yet she was never able to do sports in school because of her “breathing problems.”

What do you think? WHY? _____

HISTORY- Asking the Questions

Question	Rationale
When you are active (play sports, carry firewood, walk to school/market, make a bed) do you feel tired- is it more difficult- or are you taking longer?	Damaged valves decrease the amount of blood that can flow through the heart. Thus, the person has less oxygen and blood to their muscles. They come weak, tired, fatigued easily.
Do you become short of breath or have to breath more than usual when you are active- Do you think your breathing is different that other children/people?	Shortness of breath (SOB)is a key finding in people with damaged valves. This occurs when blood is backed up in the lungs and the heart rate is increased from exertion. This is called PAROXYSMAL NOCTURNAL DYSPNEA or PND). SOB also occurs when the heart cannot pump enough blood to give all of the needed oxygen to the body’s organs and tissues.
At nighttime, or when you lay down- do you cough?	When the heart cannot pump normally through the mitral valve, blood goes BACKWARDS to the lungs. When a person lays down, the lungs get fluid and that causes a person to cough. It is called ORTHOPENIA. If they have to sit upright to get a breath, it is PND.
Do you feel short of breath with you bend over?	A person with sever valve disease will have blood going BACKWARDS from both the Right and left heart chambers. On the right side the blood goes backwards to the liver. When a person bends over the liver is compressed increasing the intrathoracic pressure and results in shortness of breath when bending. This is called BENDOPENIA.
Do you feel like your feet, ankles, legs are swollen?	When valves are damaged, the heart cannot pump blood normally at the same volume ad rate. When the normal volume is too much for damaged valves, the body reduces the blood volume by

	creating edema in the feet and increasing up the legs (plus the lungs, liver, and abdomen).
How is your appetite?	When valve damage get severe, there is poor blood flow to the stomach and intestines. Plus, edema increases. Thus, appetite decreases. This is part of the high RHD in malnourished children.

ASSESSMENT

General: EARLY valve disease patients can appears normal with only mild limitations.

LATE valve disease patients will appear tired and chropnically ill

VITAL SIGNS:

- Normal Temperature-No fever
- Heart rates: mildly increased baseline
- Respiratory rate: mildly increased, and increasing more with exertion
- Blood pressure: usually normal. Low pressures are common in severe valve disease

SKIN:

- Dry
- Edema- can cause reddeness, weeping insever cases



HEENT: Normal

Neck:

- There can be + Jugular vein distention
- There can be + hepatojugluar reflx

Respiratory:

- Rate: increased
- Pattern: short inhale and long exhale
- Auscultation:
 - decreased sounds at base
 - Rales- crackles

Cardiac:

- Murmur
- Increased rate

- Displaced Point of Maximum Intensity (PMI)- in heart Failure and RHD, the heart gets bigger pushing the PMI to the left.

Abdomen:

- Can have ascites from fluid shift
- Can have enlarge liver
- Can have + Hepatojugular reflux



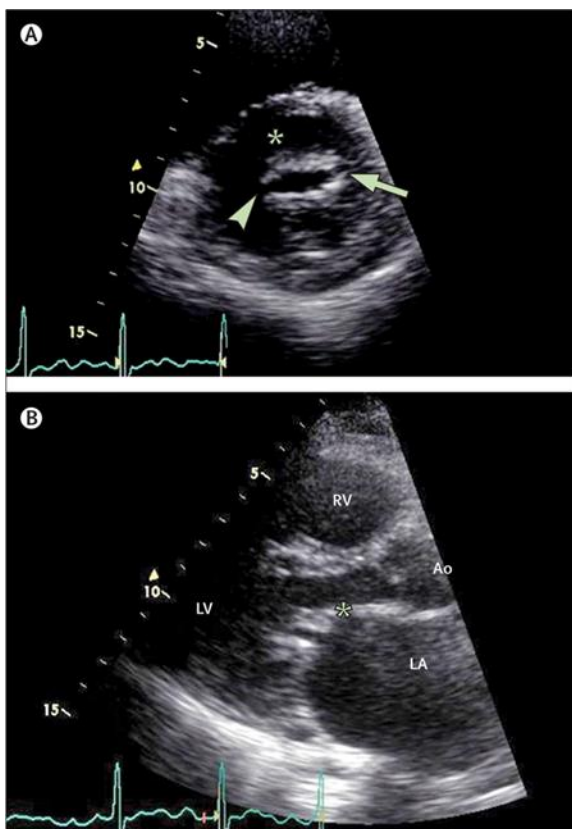
DIAGNOSIS & CRITICAL THINKING

The diagnosis of RHD is only made from the review of an echocardiogram. The sooner your patients receive an echocardiogram, the earlier a diagnosis can be made.

Refer patients with:

- Suspected ARF
- Abnormal heart sounds
- A PMI that is far left
- Symptoms of Heart failure

This echocardiogram shows significant RHD-VD of the mitral valve.



The result of long-term mitral inflammation and scarring from the autoimmune response decreased the valve opening and now shows both regurgitation and stenosis. The chronic backward flow is diagnosed by the massively large Left Atrium (LA).

This patient would have:

- Shortness of breath with activity
- Nighttime cough (orthopnea)
- Short of breath when bending over (Bendopnea)
- Decrease ability to be active, or even to complete normal daily activities
- Fatigue
- Swelling
- Night-time cough, SOB when first lying down (orthopnea) and SOB awakening the patient in the middle of the night (paroxysmal nocturnal dyspnea)

The exam would be positive for:

- A cardiac murmur
- Rales (crackles) in the lungs
- JVD and/or hepatojugular reflux
- A large liver

Rwandan Nurses saving lives through excellent history & physical exams!

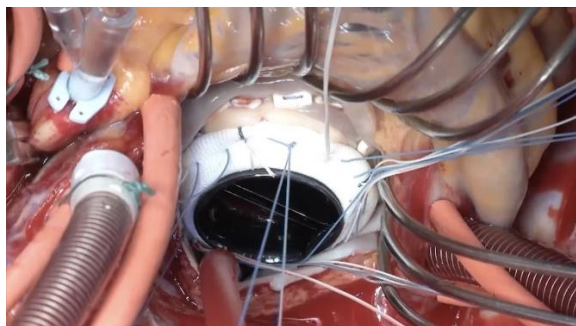
PATIENT EDUCATION

- Supportive care by a team (the patient, family, NCD nurses, SCNs, physicians, fellows, cardiologists, pharmacists)
 - Education that is centered on the patient
 - Maximize Emotional support
 - Decrease stigma
 - Dietary support: Maximize diet for protein, vitamins, minerals, LOW salt, low cholesterol, high fiber, high potassium
 - Maximize activity as tolerated
 - Maximize quality of life

MEDICAL & SURGICAL TREATMENT

- Medication support
 - ACE Inhibitor or ARB (lisinopril, losartan, valsartan)
 - Beta Blocker (carvedilol or metoprolol succinate)
 - Loop diuretics (furosemide, torsemide)
 - Post-operative- warfarin (mechanical valves)
 - Spironolactone
- Rheumatic Valve Heart Disease Surgical support
 - Any of the cardiac valves can be repaired or replaced.
 - There are different kinds of valves: mechanical and bioprosthetic
 - Each have pros and cons
 - In Rwanda, most RHD patients receive a mechanical valves because they last longer (about 20-25 years).
 - Mechanical valves create small clots, therefore a daily medication of coumadin is required.





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Appendix- RHD-VD

Additional KNOWLEDGE of RHD Valve damage.

What are the types of common valve RHD dysfunction and what are the S&S?

- Mitral valve stenosis

Mitral valve stenosis describes a progressive narrowing of the mitral valve orifice. Primary cause is the **Rheumatic carditis** with rare occurrence related to congenital malformation. Mitral stenosis occurs in twice as many women as men.

Clinical manifestations (S&S)

- Dyspnea on exertion
- Fatigue and weakness
- Respiratory symptoms (orthopnea, paroxysmal nocturnal dyspnea)
- Mild hemoptysis with bronchial capillary rupture
- Susceptibility to pulmonary infection

Physical findings

- HEENT: Normal- except may have Jugular vein distension (right side of the neck)
- CARDIAC: Auscultation: diastolic murmur heard best at the mitral location at the 5th intercostal space midclavicular line and radiating left laterally to axillary line. This murmur can radiate to the back. There may extra cardiac sounds of an opening snaps or a gallop
- RESP: Abnormal breath sounds with rales (crackles), decrease at bases
- ABDOMEN: may have hepato-jugular reflux, large liver, ascites
- EXTREMITIES: May have edema to feet, ankles, knees, or thighs (bilateral) – Sever edema can cause red skin or drainage to be present.

Diagnostics

- Echocardiogram
- ECG: it is common to see atrial fibrillation and other atrial dysrhythmias.
- Chest radiograph: pulmonary congestion, redistribution of blood flow the upper lobes, large cardiac chambers

➤ Mitral Valve Regurgitation (MVR)

MVR may result from **rheumatic disease**, aging of valve, endocarditis, collagen vascular disease, or papillary muscle dysfunction. In MVR disease, the stretching of the mitral annulus is related to LV enlargement, or papillary muscle dysfunction. In MVR the valve annulus, Leaflets, chordae tendinous, and papillary muscle may all be dysfunctional, or the dysfunction may be isolated to just one component of the valve.

Clinical manifestations (S&S)

- Weakness and fatigue
- Exertional dyspnea, nocturnal cough, orthopnea and paroxysmal nocturnal dyspnea
- Palpitations
- Severe symptoms precipitated by LV failure, with consequent low output and pulmonary congestion

Physical findings

- HEENT: Normal- except may have Jugular vein distension (right side of the neck)
- CARDIAC: Auscultation: systolic murmur heard best at the mitral spot 5th intercostal space midclavicular line and left to axillary line. Typically, the louder the murmur, the worse the regurgitation. There may a gallop
- RESP: Abnormal breath sounds with rales (crackles), decrease at bases

- ABDOMEN: may have hepato-jugular reflux, large liver, ascites
- EXTREMITIES: May have edema to feet, ankles, knees or thighs (bilateral) – Sever edema can cause red skin or drainage to be present.

Diagnosics

- Echocardiogram
- Chest radiograph: left atrial and left LV enlargement, variable pulmonary congestion.
- ECG: LV hypertrophy, atrial fibrillation

➤ Aortic Valve Stenosis (AS)

AS describes a narrowing of the aortic valve. It can result from aging, **rheumatic valvulitis**, or deterioration of a congenital bicuspid valve.

Clinical manifestation (S&S)

- Exertional dyspnea (SOB/Fatigue with activity)
- Exercise intolerance (cannot complete same chores, activities as could a few months ago)
- Syncope (light headedness, fainting)
- Angina (chest pain, or pressure that comes and goes and common with activity)
- Heart failure (LV failure)

Physical findings

- HEENT: Normal- except may have Jugular vein distension (right side of the neck) and a decreased rate of rise of the carotid pulse
- CARDIAC: Auscultation: systolic ejection murmur heard in the aortic auscultation site at 2nd intercostal space RIGHT sternal boarder. This murmur can radiate to the carotids. There may be a gallop (an extra sound “lub-bud-dub”)
- RESP: Abnormal breath sounds with rales (crackles), decrease at bases
- ABDOMEN: may have hepato-jugular reflux, large liver, ascites
- EXTREMITIES: May have edema to feet, ankles, knees or thighs (bilateral) – Sever edema can cause red skin or drainage to be present.

Diagnosics

- Echocardiogram
- Chest radiograph: post stenotic aortic dilation, calcification
- ECG: LV hypertrophy

➤ Aortic Valve Regurgitation (AVR)

AVR also known as aortic insufficiency, can occur as a result of **rheumatic fever**, systemic hypertension, syphilis, rheumatoid arthritis, aging valve tissue, a bicuspid aortic valve disease (genetic) or damage to the valve resulting from discrete subaortic stenosis.

Clinical manifestation

- Fatigue
- Dyspnea and exertion
- Palpitations (funny beats felt in the chest)

Physical findings

- HEENT: Normal- except may have Jugular vein distension (right side of the neck)

- **CARDIAC:** Auscultation: diastolic murmur heard at the aortic spot at the 2nd intercostal space RIGHT asternal boarder. There may also hear snaps or a gallop
- **RESP:** Abnormal breath sounds with rales (crackles), decrease at bases
- **ABDOMEN:** may have hepato-jugular reflux, large liver, ascites
- **EXTREMITIES:** May have edema to feet, ankles, knees or thighs (bilateral) – Sever edema can cause red skin or drainage to be present.

Diagnosis

- Echocardiogram
- Chest radiograph: boot shaped elongation of cardiac apex
- ECG: LV hypertrophy

➤ Tricuspid stenosis

Tricuspid stenosis is rarely an isolated lesion.it often occurs in conjunction with mitral or aortic disease. its origin most often is **rheumatic fever** (yet is present in less than 10% of RHD cases)or a complication of endocarditis .

Clinical manifestation

- Venous distension
- Peripheral edema
- Ascites
- Hepatic engorgement

Physical signs

- **PE:** JVD, hepatojuglar reflux, hepatomegaly
- **Chest radiograph:** Right atrial enlargement
- **ECG:** Right atrial enlargement
- **Auscultation:** Diastolic murmur
- **HEENT:** Normal- except may have Jugular vein distension (right side of the neck)
- **CARDIAC:** Auscultation: diastolic heard at the tricuspid location at the 4th intercostal space LEFT sternal Border
- **RESP:** Abnormal breath sounds with rales (crackles), decrease at bases
- **ABDOMEN:** may have hepato-jugular reflux, large liver from hepatic engorgement, the liver may feel like there is a pulse (called pulsatile liver), ascites (edema of the abdomen)
- **EXTREMITIES:** May have edema to feet, ankles, knees or thighs (bilateral) – Sever edema can cause red skin or drainage to be present.

Diagnosis

- Echocardiogram

➤ Tricuspid valve regurgitation

Tricuspid valve regurgitation usually results from advanced failure of the left side of the heart that eventually affect the right side of the heart, severe pulmonary hypertension, carcinoid, Rheumatic arthritis , Radiation therapy, trauma.

Clinical manifestation

- Decreased cardiac out put
- Neck vein distension
- Hepatic engorgement
- Ascites
- Edema
- Pleural effusion

Physical findings

- Chest radiograph: right atrial and ventricular enlargement
- ECG: Right ventricular hypertrophy and right atrial enlargement, atrial fibrillation
- HEENT: Normal- except may have Jugular vein distension (right side of the neck)
- CARDIAC: Auscultation: diastolic heard at the tricuspid location at the 4th intercostal space LEFT sternal Border
- RESP: Abnormal breath sounds with rales (crackles), decrease at bases
- ABDOMEN: may have hepato-jugular reflux, large liver from hepatic engorgement, the liver may feel like there is a pulse (called pulsatile liver), ascites (edema of the abdomen)
- EXTREMITIES: May have edema to feet, ankles, knees or thighs (bilateral) – Sever edema can cause red skin or drainage to be present.

Diagnosis

- Echocardiogram

➤ Pulmonic valve Disease

Pulmonary valve disease is not a common disorder in adults. It is most often related to congenital anomalies and produces failure of the right side of the heart. The cardiac murmur would be heard in the pulmonic auscultation location at the 2nd intercostal space LEFT sternal border.

Diagnosis

- Echocardiogram

➤ Mixed valvular lesions

Many person have mixed valvular lesion as an element of stenosis and regurgitation. Mixed lesion can accentuate the severity of a condition. For example, when combined aortic stenosis and aortic regurgitation increase left ventricular volume and pressure and thereby multiply the degree of left ventricular work.

Diagnosis

- Echocardiogram

Module 5- HEART FAILURE

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KNOWLEDGE

What: Heart failure

Heart Failure is a complex clinical syndrome with symptoms and signs that result from any structural or functional impairment of ventricular filling or ejection of blood. The accepted definition of “heart failure” is “failure of the heart to pump an adequate amount of blood to meet the needs of the body.” (2022 ACC/AHA/HFSA GUIDELINE ON CHF).

Causes of heart failure- There are many causes of heart failure:

- Valve disease: There can be many causes of valve disease
 - congenital valve disease
 - **Rheumatic Heart Disease**: valve damage from autoimmune response
 - infection
 - Coronary artery disease: Myocardial infarction (heart attack)- infarcted vessels that feed a valve.
- Cardiac arrhythmias – changes in the electric pattern that causes the heart to beat.
- Hypertension (High blood pressure)- chronic high blood pressure causes the heart muscle to get thick and is a significant risk factor for a heart attack.
- Cardiomyopathies: Cardiomyopathy occurs from anything that can damage the function of the heart. There are many insults that can decrease the cardiac function. A few important to Rwanda include:
 - Streptococcus pyogenes Infection (Strep Throat or impetigo)
 - Infections (viral and bacterial) Viral myocarditis, Chagas, HIV, Lyme disease, TB, HIV
 - Environmental toxins (from air, water, or soil)
 - Lack of nutrition (especially thiamine, vitamin B1 and selenium deficiencies)
 - Repetitive parasite infestations
 - All NCDs: High blood pressure, diabetes, obesity
 - Lifestyle: smoking, alcohol, illicit narcotic use
 - Extreme stress or sadness (called Broken heart syndrome)
 - Medication-induced: most common medication are medications to treat cancers.
 - Autoimmune Infiltrative and inflammatory: Amyloid, sarcoidosis, neoplastic (cancers)
 - Pregnancy
- Congenital heart disease: These are cardiac malformations that occurred as the fetus developed. There are many areas of the heart that can be affected. For example:
 - The great vessels (aorta and Vena cava can switch places, any of the valves can be deformed in shape or function, the heart (all or part) can fail to grow, the aorta can

develop an area of constriction, there can be holes between the right and left chambers of the heart, and parts of the heart, valves, or vessels can be missing.

For this course, the focus is on Heart Failure that is directly related to **Rheumatic Heart Disease**. However, **ALL Heart failure patients have similar signs and symptoms, therefore ANY patient with HF S&S should have an echocardiogram.** Refer all patients with abnormal echocardiograms to cardiology.

Stages of Heart Failure (HF) : There are four stages of HF. **Stages combine symptoms and heart structure** and place an increased risk of mortality from Stage A to Stage D. These are similar to the RHD stages.

Stage	Risk	Signs, symptoms, and structure
A	At Risk for heart failure	No S&S . These patients have risk factors. CHILDREN: Congenital heart disease or history of ARF . ADULTS: The most common risk factors are hypertension, Diabetes, metabolic syndrome, obesity, smokers, those with high cholesterol levels.
B	Pre-heart failure	No overt S&S. POSITIVE structural changes in the heart verified by echocardiogram: Reduced left or right ventricular systolic function, reduced ejection fraction, ventricular hypertrophy, chamber enlargement, wall motion abnormalities, and any valvular heart disease .
C	Symptomatic heart failure	These patients are SOB, fatigued, tired, unable to complete tasks/walk as they once could, Also, they may have cough at night while lying down, need to raise their head to sleep, swelling in legs or abdomen and a change in appetite. Symptoms are usually improved by resting and sitting. POSITIVE echocardiogram of abnormal valves or chamber size/function .
D	Advanced heart failure	Marked heart failure symptoms (as in "C") that interfere with daily life and occur at rest. Usually and with recurrent hospitalizations. Significant structural changes and marked decrease in function . *Currently in Rwanda, this is the most common stage for 1 st diagnosis of RHD.

- Stages can progress from A to B to C to D ...a patient's stage **does not improve** (D to C to B to A)

NY Heart Classification: Classifies a patient on the SYMPTOMS

Class

Patient Symptoms

I	No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation or shortness of breath.
II	Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, shortness of breath or chest pain.
III	Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes

	fatigue, palpitation, shortness of breath or chest pain.
IV	Symptoms of heart failure at rest. Any physical activity causes further discomfort.

- NYHC **DOES change** with medication, improve diet, exercise, no smoking, no alcohol

BRAINSTORM: Scenario: Paul is a ten-year-old living with RHD. His echocardiogram shows mild to moderate Mitral regurgitation, normal wall motion and normal ejection fraction. He receives his PCN BG injection every three weeks since his diagnosis at age 8. He can walk to school carrying his backpack, but cannot participate in football or sports. He is sleeping well at night without PND or orthopnea.

Stage ____ : why? _____

NYHC: ____ : Why do you think he is doing so well? _____

Why is heart failure Important?

- Heart failure is an emerging worldwide threat.
- Heart Failure is common because there are many causes.
- People with Heart failure have a decrease quality of life and are not able to work well.
- Heart failure is progressive.
- If treated early, many patients can live well. If diagnoses late, it is difficult to treat.

(Lippi & Sanchis-Gomar, 2020)

What about Heart Failure & Rheumatic Heart Disease?

- Most RHD patients will develop HF.
- Their Signs & Symptoms can be confusing in the outpatients setting when symptoms are just starting. It is critical that all nurses understand Heart failure S&S and be able to recognize the need for an echocardiogram to insure early entry into cardiology.
- When early S&S are missed, and children are not referred until their disease is advanced, they can develop severe valve damage with heart dysfunction. Some will miss the ability to have otherwise life-saving heart surgery because the damage is not reversible.

What are the consequences of untreated heart failure in Rheumatic Heart Disease? **Early DEATH!**

Rwandan nurses can save lives! You can assess, diagnose, and treat Strep throat, impetigo, acute rheumatic fever, heart failure, and rheumatic heart disease for early access to cardiology and life-saving surgery.

Who is at risk of HF related to RHD?

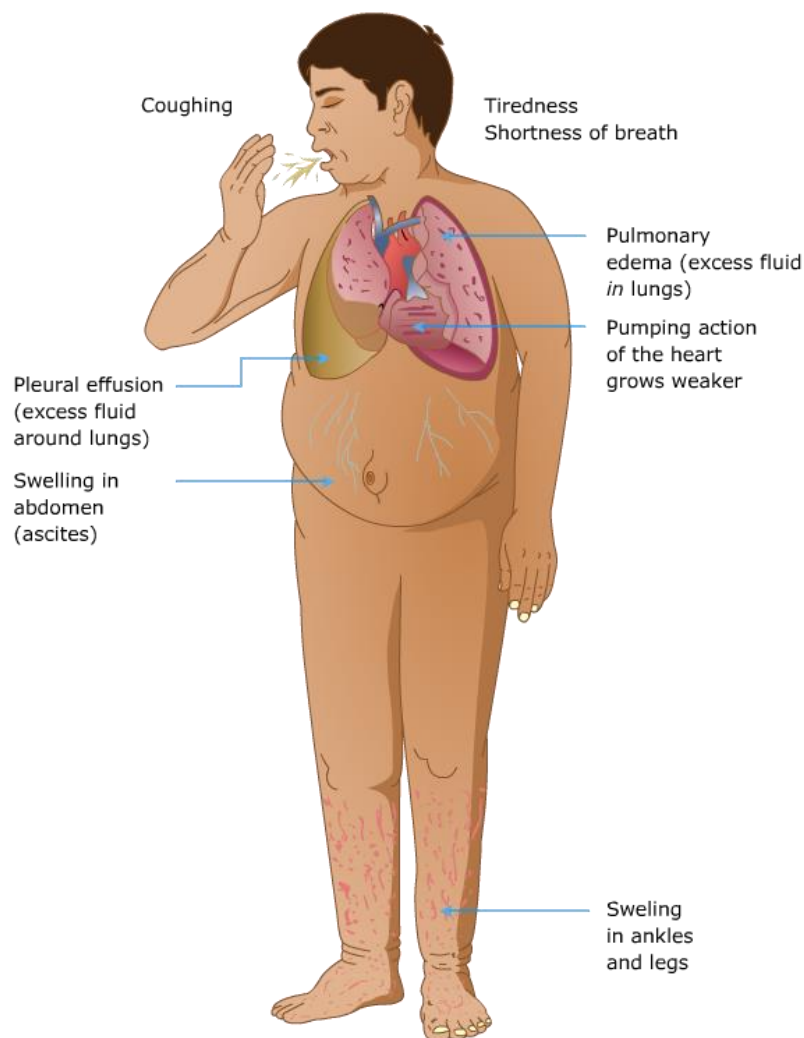
- All who have had Strep throat, or impetigo that was not treated with appropriate antibiotic for the correct time frame.
- Especially people with repetitive infections
- Children ages 5-15 are at highest risk- yet S&S are often not recognized until 18-25 years old.

ASSESSMENT- ASK THE QUESTIONS (HISTORY)

BRAINSTORM –The importance of the history

Review the rationale provide. Write the question you want to ask your patient/family that correlates to the rationale. Remember to consider onset, duration, severity of symptoms (how the S&S impact the quality of life), and a question to determine if they are contagious.

- Your questions should include the major symptoms discussed in Modules 3 and 4



Question	Rationale
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	Onset is slow. The patient will naturally slow down to make the SOB less. This is also called functional capacity.
	As the heart fails, it cannot pump blood well and the blood backs up in the lungs. This pulmonary congestion is first felt at night time, or when lying down flat.
	HF impacts daily activities. Understanding how HF is impacting a person's activities can help the nurse design medication plans.
	Chest pain can occur when there is a decline in blood flow to the heart muscle.
	Dizziness with exertion is a critic sign of poor forward blood flow from aortic stenosis or severe mitral valve disease (stenosis and regurgitation).
	Palpitations or the feelings of rapid heart rates the come and go can indicate Atrial fibrillation which puts the patient at risk for a stroke.
	Some people with HF develop ascites which can make the patient feel like they are full quickly after eating a small amount of food.
	HF commonly causes swelling in the feet, then up the legs.
	Severe edema can lead to redness and skin weeping making the patient at risk for skin infections.
	At night time, as fluid shifts, many patients cough

	at night time.
	Understanding the patient's emotional status and fears concerning their symptoms will help you design your educational plan for the patient and family. Anxiety & Depression is common.

ASSESSMENT- THE PHYSICAL ASSESSMENT

General: HF patients in early stages may appear normal. As HF progresses, patients will look weak and ill.

- **Reduced exercise tolerance** – because exercise demands the heart to work harder and a failing heart cannot keep up with demands. This makes the person tired, and SOB. **THESE IS A KEY SYMPTOM, it is called "FUNCTIONAL CAPACITY"**.
 - ROS Question: *Can you do all the activities you did a few months ago at the same speed, or have you been slowing down because of rapid breathing?*
 - For children, reduced exercise tolerance is usually related to play, sports, and chores around the house.
 - For adults, reduced exercise tolerance is related to walking to the market, carrying laundry/groceries/wood, making a bed, doing laundry, and sweeping.
- **Fatigue, tiredness, increased time to recover after exercise.** Another key symptom!
 - ROS Question: *How tired are you compared to 2-3 months ago? Same, better, worse?*
- Confusion (especially in the elderly) – decreased blood to the brain when the EF decreases.
- Depression- in HF this is usually related to the inability to do the same activities that they could.

Vital Signs of Decompensated Heart Failure

- Vital signs Blood pressure Very low (SBP < 80 mmHg)
- Very high (SBP > 180 mmHg)
- Pulse Very low (< 40 bpm)
- Very high (>120 bpm)
- High respiratory rate > 24 breaths/minute
- Low oxygen saturation. Less than 90% SaO₂ (remember the pulse ox will ADD 2 points to dark skin where a reading of 92% is actually 90%)

(Bukhman et al. PIH Noncommunicable disease: Rwandan Edition)

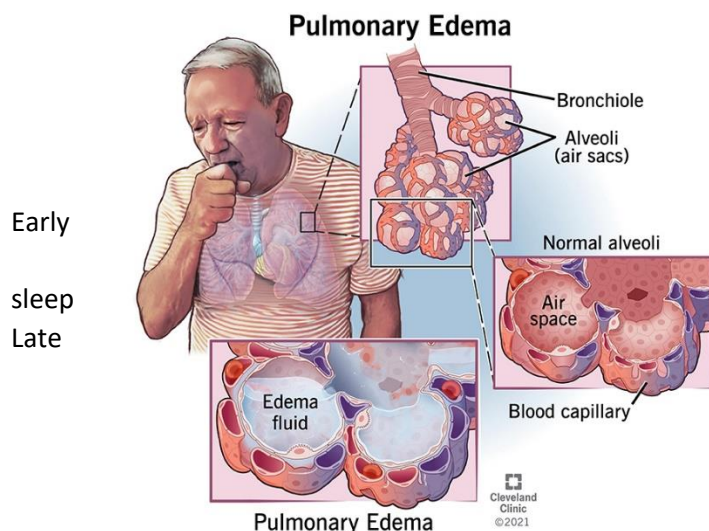
HEENT: Normal except for Juglar Vein Distension and hepatojugular reflux is common in fluid overload.

Question: What side of the patient do you stand on to assess for hepatojugular reflux? _____

RESPIRATORY: Auscultation often reveals abnormal sounds:

- Fluid in the sounds of crackles and rales.

- Increased respiratory rate and prolonged exhale (Tachypnoea)
 - Pleural effusion (decreased or no sounds at bases)



- **Breathlessness – short of breath (SOB)**, difficulty getting a breath.

○ ROS Question: *Have you notice that you are short of breath, or feel like you need to breath faster when you walk, exercise, do chores?*

Disease= SOB during exercise, exertion
Middle Disease= SOB with walking, at

Disease= SOB at rest

- **Orthopnea** = SOB when lying flat (this occurs because with HF there is extra blood in the lungs as the heart cannot pump it effectively. That extra blood makes it difficult to breath and can cause a nighttime cough)

○ ROS Question- *When you sleep, have you put extra pillows or blankets under your head to breathe easier?*

- **Paroxysmal nocturnal dyspnea** – Waking up a night and having to sit up and take several breaths because it feels like the person cannot get enough air (this is related to fluid the naturally shifts at nighttime and increased perfusion by the kidneys when the body is resting. The failing heart cannot handle the extra blood and leaves it in the lungs creating SOB).
 - ROS Question: *When you sleep, have you woken up and had to sit upright to catch your breath?*
- **Fatigue, tiredness, increased time to recover after exercise.** Another key symptom!
 - ROS Question: *How tired are you compared to 2-3 months ago? Same, better, worse?*
- **Ankle swelling**- can start at the ankles and increase to knees, thighs, and body (called anasarca)
 - ROS Question: *Have you noticed that your feet or ankles have been swollen- especially in the evenings?*
- **Sudden weight gain**- as fluid is retained, the weight increases. In HF weight can increase 1-2 Kg per day. It is rapid weight gain. Weight can be edema in the legs-lungs-or abdomen.

• Cardiac

- **murmur** – an abnormal swishing sound
- Third heart and/or fourth heart sounds (**gallop rhythm**)
- **Tachycardia**- the heart rate has to increase to keep the cardiac output
- **Left Laterally displaced apical impulse** – the size and location where you can best feel the heartbeat.

• Abdomen

- Can have ascites or hepatojugular reflux
- Normal bowel sounds

- Always check spleen as large spleen may indicate another cause of HF
- Hepatomegaly (large liver)
- **Extremities**
 - Peripheral edema (ankle, sacral, scrotal)
 - Poor perfusion - Cold extremities
 - Redness, skin infection

Addition possible physical findings

- Weight gain (>2 kg/week)
- Weight loss (in advanced HF)
- Tissue wasting (cachexia) – malnourishment in children (late sign)
- Oliguria (low urine output)

DIAGNOSIS & CRITICAL THINKING

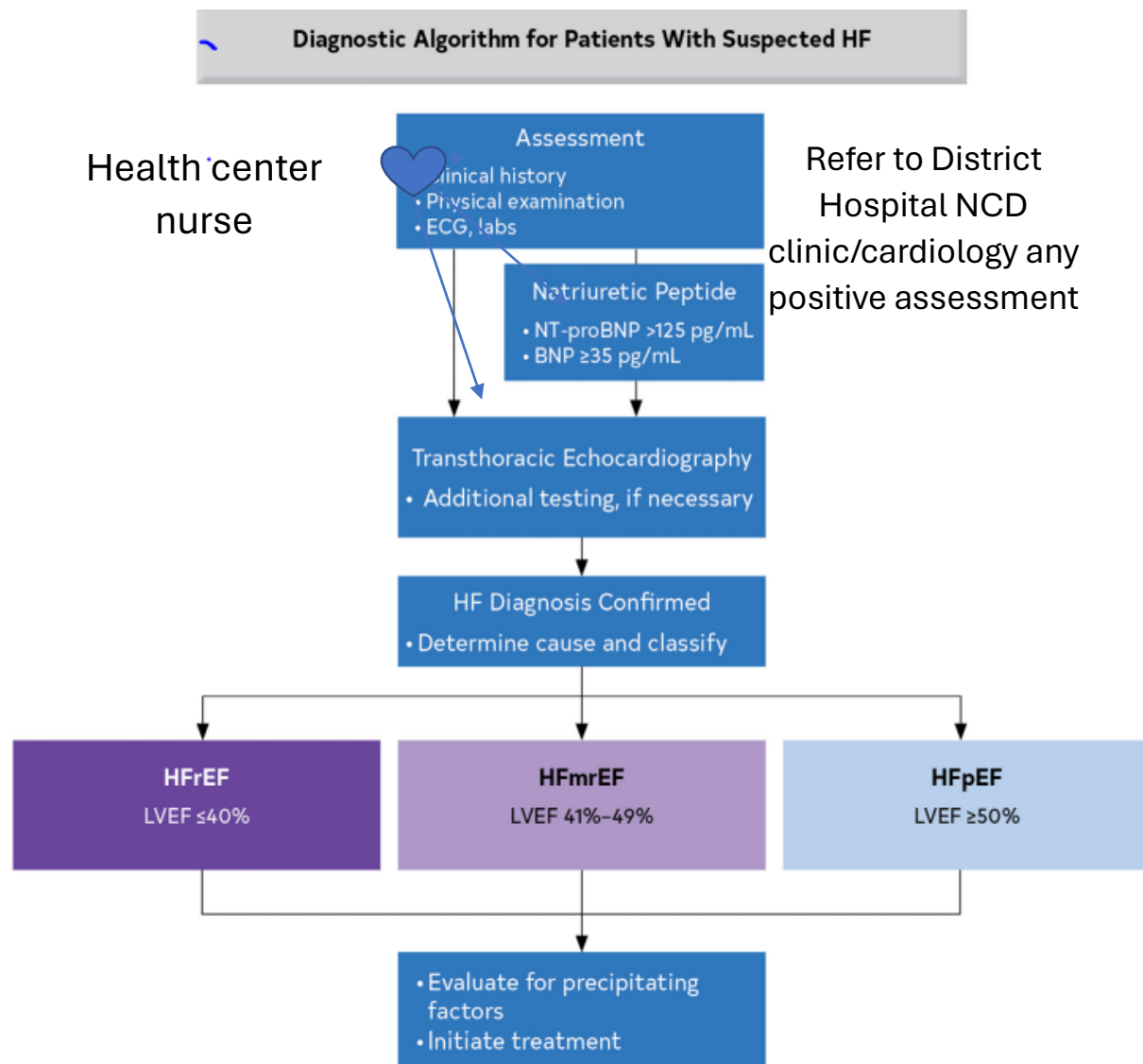
How is Heart failure diagnosed?

- **HF is diagnosed through a history and physical exam**, and supplemented by echocardiogram, EKG, and labs
 - **Echocardiogram** tells you what is the structural damage creating the heart failure:
 - This heart is too big (dilated cardiomyopathy)
 - The heart is too thick (hypertrophic or hypertensive cardiomyopathies)
 - Valve damages (Rheumatic or congenital)
 - Congenital malformations
 - Decreased left ventricular pumping ability (low EF)
 - Blood clots inside the heart
 - Infections/inflammation of the heart muscle
 - If there is fluid around the heart in the pericardial sac (called “pericardial effusion”).
- **Symptoms** are more severe with exertion and occur because **fluid accumulation** (dyspnea, orthopnea, paroxysmal nocturnal dyspnea, edema, and abdominal discomfort from hepatic congestion and ascites in the setting of right heart failure)
- **Other symptoms are due to decreased cardiac output** (fatigue, anorexia, tachycardia, and weakness). Other symptoms include nocturnal cough, loss of appetite, wheezing, palpitations, depression, syncope, bendopnea (short of breath while bending forward), and dizziness.
- **Volume overload** manifests as peripheral edema (edema of the extremities [starting at the feet and increasing up the legs], ascites, scrotal edema, and hepatosplenomegaly), elevated jugular venous pressure (JVP), and pulmonary congestion (rales on the exam and pleural effusions).
- Displaced apical impulse (laterally past the midclavicular line, which is a sign of LV enlargement)
- **At each clinic visit symptoms and signs of heart failure require reassessment to monitor response to therapy and stability over time. It is also important to check vital signs and assess volume status during each clinic visit.**

- As a nurse, your diagnosis is through your history and physical, then rapid referral to DH NCD clinic/cardiology and echocardiogram.
 - If you have access to echocardiogram through your District hospital- Order and obtain as soon as possible
 - If you can, obtain labs: CBC, complete Metabolic panel (kidney, liver, and electrolytes), CRP, thyroid, BNP (specific to heart failure), and iron/iron saturation
 - You will need to learn to hear heart sounds. “lub-dub” is normal. Any swoosh sounds, muffling of sounds, or extra sounds need an echocardiogram and refer to District Hospital NCD clinic/cardiology.
 - All of the SOB and edema symptoms are related to fluid overload. You will need to listen to your patients’ lungs and determine if the sounds indicate fluid over load (see skills section on lungs).

Critically thinking

- Putting the story together
- Consider onset (usually slow)
- Consider history & potential causes of HF
- Consider patient’s story
- Consider your physical exam
- Consider labs, echo



HF TREATMENT

MEDICATION PLAN.

- The medication plan for treating heart failure is similar no matter the cause.
- You will need to work with your NCD nurse at the District Hospital.
- Working together **WITH** the patient can help plans be successful. The patient (child and parents) need to understand
 - WHAT is going on with their heart?
 - HOW did it happen?

- WHY each medication is important?
- WHEN to take their medication?
- WHO is responsible... everyone, it is team effort!

STEP 1. To start a Heart failure plan, you need the patient's:

- the completed history, vital signs, weight and height, physical exam, and echocardiogram results

STEP 2. Talk with the patient & family and provide education:

First learn your patient's story. For children, try to learn what they want to do when they grow up.

Ask the parents what they are hoping for their child and what they expect in the chronic healthcare process. Topics can include:

- A. Heart damage by a Streptococcus pyogenes infection and autoimmune response is Rheumatic Heart Disease

The damage is irreversible, BUT medications can SLOW or STOP further damage.

- B. Medications are DAILY and they help relieve the heart of high pressure and improve blood flow.
- C. In RHD, every 3 weeks the patient MUST take an Antibiotic (Usually Penicillin tablets x 10 days, or a PCN injection).
- D. If symptomatic Heart Failure develops, additional diuretic medications are required.
- E. Empower the patient to share with family and friends that they have a damaged heart valve and require daily medication can decrease STIGMA, or gossip that the patient has TB/HIV.
- F. Diet and Exercise are important to staying as healthy as possible.
- G. Heart disease is stressful and sad. Many people get depressed. The Nurses and cardiac team are there for every patient to get support.
- H. Educate the importance of contacting you with ANY increase in S&S for medication review and assessment. Explain that you work together as a team.
- I. Educate the importance of working as a team to help the patient achieve the highest quality of life.

STEP 3. Medications used in Rwanda for HF management include:

- ACE Inhibitors/ ARB: Lisinopril, Enalapril, Losartan, Valsartan, Olmesartan
 - DO NOT GIVE TO WOMEN WHO CAN BECOME PREGNANT. THESE MEDICATION ARE TOXIC TO UNBORN CHILDREN
 - Captopril is an ACE Inhibitor that is used in the ICU because it is short acting. It needs to be taken 3 x per day. All of the ones listed can be taken once daily. Change the medication to lisinopril or enalapril.
 - ACE I/ARB DECREASE the workload of the pumping chamber. Very important in mitral and aortic valve disease.
 - ACE Inhibitors can cause a COUGH- it is a dry, hacky cough.
- Beta Blocker: Carvedilol, metoprolol succinate- These BB can be given to diabetics and patients with severe HF.
 - BB slows the heart rate to improve filling time. This is important when the mitral valve cannot open well.
 - BB allows each cell to improve the stretch and contraction, thus improving how the heart squeezes.

- Loop Diuretics: Furosemide, Torsemide
 - Critical medication to reduce fluid buildup in the lungs, legs, and abdomen (ascites)
 - This medication must increase when there is more fluid and decrease when the edema is declining.
- A special HF diuretic: Spironolactone
 - Protects the heart from toxins and helps reduce edema. Spironolactone increases potassium, thus often combined with Furosemide.
- Other diuretics: HCTZ, chlorthalidone
 - Improves the diuretic power of Furosemide to decrease edema and fluid overload.

• Medication	½ life	Impact & facts
Captopril ACE I- decreases afterload (means it is easier for the heart to pump blood forward) and protects left side of the heart, protect kidneys- can cause a cough	Less than 2 hours	Great for ICU. Must be given at LEAST 3 times per day Do NOT give to women of childbearing years- it is toxic to the unborn baby
Lisinopril- ACE I - decreases afterload (means it is easier for the heart to pump blood forward) and protects left side of the heart, protect kidneys- can cause a cough	12 hours	Can be given once daily Do NOT give to women of childbearing years- it is toxic to the unborn baby
Losartan – ARB: - decreases afterload (means it is easier for the heart to pump blood forward) and protects left side of the heart, protect kidneys- NO cough.	6 hours	Do NOT give to women of childbearing years- it is toxic to the unborn baby
Valsartan- ARB - decreases afterload (means it is easier for the heart to pump blood forward) and protects left side of the heart, protect kidneys- NO cough.	9-24 hours	Do NOT give to women of childbearing years- it is toxic to the unborn baby
Furosemide- diuretic. Each person is different in metabolism LOWERS POTASSIUM	2 hours- therapeutic effect 6 hours	HF Patients should take at lunch time. Increase dose until weight loss, decrease if dry. Based on “ideal weight”- daily dosing is best. Must increase foods high in potassium.
Torsemide- diuretic (available at Provincial and national-level hospitals)	3.5 hours -effect lasting 6-9 hours	HF patient should take at lunchtime. Less need for daily dosing.
Spironolactone- diuretic. RAISES POTASSIUM	15 hours	Dose is not adjusted daily
HCTZ- diuretic (weak)	8-15 hours	Used in hypertension management, but can be an add-on for severe HF patients
Carvedilol- Beta Blocker. A GREAT BB- drug of choice for HF/post MI/ diabetes	7-10 hours	Given twice daily
Nifedipine- a calcium channel	2 hours	Do not use in HF patients.

blocker. Rarely used in US due to adverse cardiovascular side effects		
Amlodipine- CCB	30-50 hours	EXCELLENT CCB for preload reduction and highly effective in hypertension management. Preload is the amount of blood and force the muscle need to work against).

What are the Signs & Symptoms that indicate the failing heart is creating edema (Lungs, legs, and abdomen)?

Never combine two medications from the same family of medications...

Never two ACE I, ARBs or 1 ARB + 1 ACE I

Never two beta blockers

Never two loop diuretics

Starting Medication plans:

If the Blood Pressure is greater than 120 systolic Lisinopril 10 mg + Lasix 10 mg. Increase Lasix by 10 mg daily until symptoms better. Then decrease by 10 mg and see the patient back in 1 week.

Reasons for Acute Decompensation in Patients with Heart Failure

1. Medication nonadherence or recent changes in medications
2. Change in diet (e.g., increase in salt intake) – Chinese foods, ate at a restaurant
3. Acute illness (e.g., pneumonia, rheumatic fever, endocarditis)
4. dehydration or fluid overload
5. Worsening valvular disease
6. Pregnancy Exacerbates all types of heart failure, but especially mitral stenosis (2nd and 3rd trimester) and peripartum cardiomyopathy.
7. Arrhythmia Especially common in patients with cardiomyopathies and valvular disease, particularly mitral stenosis.

8. Worsened hypertension Very high blood pressure can cause acute stiffening of the heart muscle and back up of fluid into the lungs (pulmonary edema).

(Bukhman et al. PIH NCD manual: Rwandan edition)

BRAINSTORM-

CASE STUDY: Innocent is a 9-year-old male who had several untreated episodes of Strep Throat. He then experienced ARF that was also undiagnosed. He became chronically ill, short of breath, fatigue, and a cough. Innocent began to lose weight and is now considered malnourished. He recently stopped going to school. His parents took him a nurse who used a stethoscope and immediately heard a murmur 5-6 Intercostal space radiating left. The nurse notices that she can see the heart beat and when feeling the Point of Maximal Impulse (PMI), she knows that PMI area is large and deviated to the left. Innocent has crackles in the lungs, positive edema, and positive ascites. She suspects RHD. VS: T36 RR28 HR126 B/P 110/58.

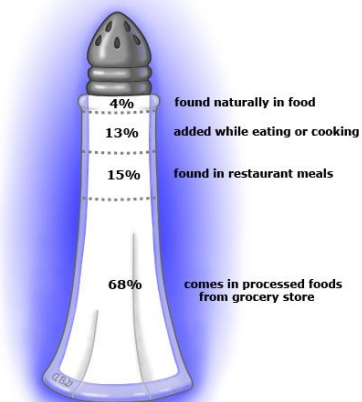
Innocent is fluid overloaded. What should the nurse do?

STEP 4. DIET EDUCATION-

Diet is one of the most important aspects of daily life a patient needs to know.

HF patient can become fluid overloaded by eating too much salt.

Sources of sodium in your diet



Salt consumption directly impacts blood pressure in all ages and can increase the onset of hypertension. Reducing salt intake lowers blood pressure in non-hypertensive and hypertensive individuals, across the lifespan from children to older-aged persons.

50% of all strokes and heart attacks are related to hypertension.

HF patients need foods high in potassium: Mangos, avocados, oranges, bananas, potatoes, carrots, papaya, tomatoes, plantains, milk, pork, spinach, almonds, pumpkin and pumpkin seeds... foods that are yellow,



%: percent.
Original data from: He FJ, MacGregor GA. Reducing population salt intake worldwide: from evidence to implementation. Prog Cardiovasc Dis 2010; 52:363.

orange, red and green are high in potassium!

Why do HF need foods high in potassium?

Because the medication of Furosemide and torsemide LOWER potassium. These medications are the most important to decrease edema in the lungs, legs, and abdomen.

What foods do you think have the most salt in the Rwandan diet?

STEP 5. EXERCISE

- EXERCISE improves the quality of life, helps move fluid, and helps a failing heart.
- Have your patients start by walking slowly and increasing the amount or speed a little everyday.
- The goal is 30 min everyday of walking.

○ 30 min x 1 or 15 min x 2 or 10 min x3

What are the benefits of treatment?

- Improvement in patient's wellbeing and quality of life
- To decrease the fluid overload on the heart
- To attempt to decrease events of acute on chronic heart failure
- To decrease hospital readmission rates due to worsening heart failure

There is no cure from Heart Failure. With an excellent medication plan, you can help reduce the stress on the heart from fluid and help your patients feel better. If HF is from RHD, then the valve damage may be repaired, or the valve replaced. For a patient to be a surgical candidate, there must be good control of their HF.

Great Heart failure control starts with the nurse- patient relationship and trust. These plans are complex and require close monitoring and support to the patient.

Refer to District Hospital NCD clinic/cardiology. If there is greater than 1 week to the referral try to obtain:

- Chest X-ray
- 12 lead EKG
- Echocardiogram
- Lab: CBC with smear, complete blood analysis (renal function, electrolytes, liver function), thyroid, BNP, iron/iron saturation
- Call cardiology, or your NCD protocol, to discuss further evaluation and management until the cardiologist can see the patient

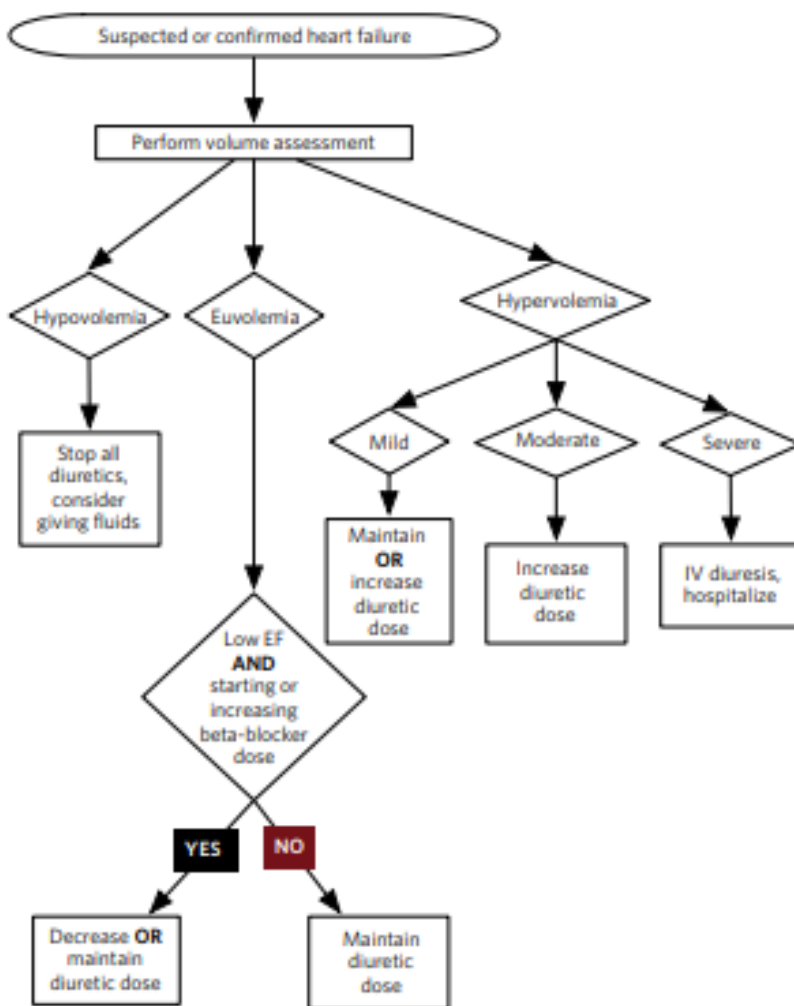
Chronic care management

- Fluid control with loop diuretics based on renal function, electrolytes, daily weights, heart rate, blood pressure, and symptoms.
- Individualized plan should be developed by a healthcare provider trained in cardiology and complex HF management, or a supervised plan based on NCD policies and procedures. Most plans include:
 - Furosemide or Torsemide
 - Spironolactone
 - Lisinopril or Losartan
 - Carvedilol or metoprolol succinate if HF related to coronary artery disease or the EF is less than 45%

Chronic care management education:

- Heart failure is not cured, it only gets worse. Every patient needs monitoring at home and in your office.
- Emphasizing diet and medications to patients with HF is important as one of the most common causes of heart failure readmission is the failure to take the medications, failure to increase furosemide, or eating a high salt diet. Please make sure the patient and family have a good understanding of why you are prescribing the medications and what each medication will do to help the heart failure.
- A single session of self-care training has been found important and provides some benefit. However, assessing HF patient's self-care ability is important at every visit. This will build trust and improve home assessments.
 - Self-care includes nutrition, knowledge of disease process, wellness with emotional and spiritual health, development of friendships and positive relationships, daily exercise, and setting goals for personal attainment that are with the patient's functional capacity and reality.
 - A Stage C Class IV patient should not have a goal to play a full football game but could have a goal to walk 50 meters without a break.

If any of your patients with HF are admitted to the hospital, then you will need to be prepared to see them again post hospitalization within 7 to 10 days of discharge.



(Bukhman et al., PIC NCD manual: Rwandan Edition)

Understanding fluid status in your HF patients

Category	Hypovolemic	Euvolemic	Hypervolemic		
			Mild	Moderate	Severe (decompensated)
Weight	Less than dry weight	At dry weight	≤ 5 kg above dry weight	≥ 5 kg above dry weight	≥ 5 kg above dry weight
Symptoms	Variable	Class I-II	Class I-II	Class II-III	Class III-IV
Vital signs	Tachycardia Hypotension	Normal	Normal	Mild tachycardia	Tachycardia, tachypnea, hypoxia, hypotension, or hypertension
Physical exam	Does not always correlate with severity. Signs of fluid overload include distended neck veins, lung crackles, louder murmurs, hepatomegaly, ascites, and lower-extremity edema. However, can be intravascularly hypovolemic and still have signs of hypervolemia in lungs, extremities, and abdomen.				
Creatinine	Increased	Stable or decreased	Stable or decreased	Can be increased (due to hypoperfusion of the kidneys), stable or decreased.	
Diuretic adjustment	Stop all diuretics	Reduce or maintain dose (if starting beta-blocker, do not reduce diuretic)	Maintain or increase dose	Increase dose or add second agent	Start IV furosemide and prepare for transfer to hospital if possible

(Bukhman et al. PIH NCD Manual: Rwandan edition)

Signs of decompensated Heart failure

Vital signs	Blood pressure	Very low (SBP ≤ 80 mmHg) Very high (SBP ≥ 180 mmHg)
	Pulse	Very low (≤ 40 bpm) Very high (≥ 120 bpm)
	High respiratory rate	≥ 24 breaths/minute
	Low oxygen saturation	Saturation ≤ 90%
Symptoms	Inability to lie down flat Severe dyspnea at rest	

Post discharge follow up of patients with heart failure (From 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure)

It is recommended to have:

- One follow-up visit with a nurse within 7 to 10 days after discharge. Components of this follow-up visit should include:
 - Obtain a history- what happened that led to the hospitalization, how is the diet, exercise, medication management.
 - Monitoring of signs and symptoms of HF: a complete physical examination
 - Assessment of volume status- use diuretics as needed.

- VS: Heart rate, Blood pressure, respiratory rate, temperature
- Laboratory measurements including renal function, and electrolytes- required if any diuretic dose was changed.
- Nutritional status and education on good protein, iron, Vitamin C and Vitamin D

What are the most important points of HF you will use in your nursing practice?

Heart Failure References

Hollenberg SM et al. 2019 Expert Consensus Decision Pathway on risk Assessment, Management, and Clinical Trajectory of Patients Hospitalized with Heart Failure. J Am Coll Cardiol 2019;74:1966-2011.

Maddox TM et al. 2021 Update to the 2017 Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment. J Am Coll Card 2021;17:772.

McDonagh TA et al. 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal 2021;42:3599-3726.

Heidenreich PA et al. 2022 AHA/ACC/HFSA Guideline for the management of heart failure.

McDonald M et al. CCS/CHFS Heart Failure Guidelines Update. Canadian Journal of Cardiology 2021;37:P531-546

Appendix for Heart Failure

Know differential diagnosis: You will be assessing both children and adults who have HF. As a NCD nurse, you will need to use your nursing knowledge, clinical skills, and critical thinking skills to determine if your patient needs to be referred to cardiology. If you are uncertain-REFER!

Possible causes of new onset SOB, fatigue, decreased functional capacity, weakness...

• Rheumatic Heart Disease	• + hx of sore throat, ARF, or + echocardiogram
• HIV carditis (50% of HIV patients)	• + HIV test
• TB carditis (50% of TB patients)	• + hx of TB in household, +TB test
• Acute kidney injury	• Check kidney function test

<ul style="list-style-type: none"> Any pneumonia 	<ul style="list-style-type: none"> Fever, cough, difficulty breathing, abnormal lung sounds, abnormal chest x-ray
<ul style="list-style-type: none"> Acute respiratory distress syndrome Pulmonary embolism Cardiogenic pulmonary edema Pneumothorax 	<ul style="list-style-type: none"> Acutely ill appearing, difficulty breathing, low pulse ox, tachycardia, signs of low cardiac output. This is an emergency and needs transport to DH.
<ul style="list-style-type: none"> Interstitial (non-idiopathic) pulmonary fibrosis 	<ul style="list-style-type: none"> You will know only through advanced cardiopulmonary testing
<ul style="list-style-type: none"> Chronic obstructive pulmonary disease 	<ul style="list-style-type: none"> A previous diagnosis, or high risk of long-term smoking, or obesity, a history of asthma
<ul style="list-style-type: none"> Cirrhosis 	<ul style="list-style-type: none"> Liver function test, + hepatomegaly, + hepatitis test
<ul style="list-style-type: none"> Myocardial infarction- Heart attack, or active coronary artery disease 	<ul style="list-style-type: none"> EKG, echocardiogram, Labs- this is not for pediatric patients
<ul style="list-style-type: none"> Anemia 	<ul style="list-style-type: none"> Lab test- CBC
<ul style="list-style-type: none"> Malnourishment (Higher risk of cardiomyopathy) 	<ul style="list-style-type: none"> Exam, and Labs
<ul style="list-style-type: none"> Congenital Heart disease 	<ul style="list-style-type: none"> Abnormal echocardiogram
<ul style="list-style-type: none"> Eosinophilic cardiac fibrosis 	<ul style="list-style-type: none"> Elevated eosinophils, hx or risk of repetitive parasite infection Abnormal echocardiogram
<ul style="list-style-type: none"> Post-partum cardiomyopathy 	<ul style="list-style-type: none"> From last month of pregnancy to 5 MONTHS postpartum

Heart Failure may cause multiple complications:

- Arrhythmias: Atrial fibrillation can be a cause or a consequence of HF and may present in 10% to 50% of chronic HF patients. Malignant ventricular arrhythmias (like sustained monomorphic ventricular tachycardia, sustained polymorphic ventricular tachycardia, and torsades de pointes)
- Thromboembolism: Heart failure is a cause of stroke in 9% of patients. There is a high relative risk for deep venous thrombosis (DVT) and pulmonary embolism (PE) in patients with heart failure, especially those who were under 60 years of age.
- Gastrointestinal: liver cirrhosis, and cardiac cachexia due to decreases intestinal blood flow in patients with heart failure.
- Renal: renal function may get worse in both acute and chronic heart failure, and even a small transient rise in creatinine will be clinically relevant.
- Respiratory: pulmonary congestion, and rarely pulmonary hypertension

Risk factors for the development of heart failure and potential corrective actions (2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure)

- Sedentary habit: Regular physical activity – 30 minutes per day
- Cigarette smoking: Cigarette smoking cessation (Quit)
- Obesity: Physical activity and healthy diet (no potatoes and rice at same meal)
- Excessive alcohol intake: limit 1 drink per day
- Influenza: Influenza vaccination
- Microbes- bacterial infections (*Streptococcus pyogenes*) Early diagnosis, specific antimicrobial therapy for either prevention and/or treatment
- Chest radiation (women with breast cancer): Cardiac function monitoring
- Hypertension: Lifestyle changes (diet, exercise, no smoking), antihypertensive medication
- Dyslipidemia: Healthy diet, statins
- Diabetes mellitus: Physical activity and healthy diet, medication like SGLT2 inhibitors
- Coronary Artery Disease: Lifestyle changes, statin therapy

Classification of heart failure by LVEF (from 2022 ACC/AHA/HFSA guidelines)

- Heart failure with reduced ejection fraction (**HF_rEF**) includes people with LVEF $\leq 40\%$.
- Heart failure with improved ejection fraction (**HF_{imp}EF**) includes individuals with previous LVEF $\leq 40\%$ and a follow-up measurement of LVEF $> 40\%$.
- Heart failure with mildly reduced ejection fraction (**HF_{mr}EF**) includes people with LVEF 41-49% and evidence of increased LV filling pressures.
- Heart failure with preserved ejection fraction (**HF_pEF**) includes individuals with LVEF $\geq 50\%$ and evidence of increased LV filling pressures.

Module 6- Nursing Empowerment for RHD

Author: Tony GATEREGA MSN, RN

Editor: Maria Kidner DNP, APRN, FNP-BC, FAANP

It is proposed that the biggest gap in the control of Rheumatic heart Disease is the lack of provider and community knowledge on Streptococcus pyogenes infections, inability to diagnosis ARF and late entry into cardiology of RHD patients combined with the social determinants of low-resource countries where Streptococcus pyogenes is endemic. The result is poor implementation of knowledge and skills or ineffective implementation of primary and secondary preventive measures. These measures are supposed to be well-addressed by nurses. For prevention and proper management, nurses are expected to have full knowledge of rheumatic heart disease. Yet, in many countries around the world, RHD is endemic impacting millions and killing over 350,000 children and young adults per year. Clearly, as nurses we can make a change in in Rwanda. Rwandan nurses can save lives.

The countries of endemic Streptococcus pyogenes infections are mainly in low-resource income countries where hygiene is not optimal, houses have many people within one household, knowledge of Strep transmission, and the importance of proper antibiotic therapy for Strep Throat and impetigo are lacking. Yet, these statistics do not mean people do not care, or cannot save their children. It only means, that we, as nurses, have the responsibility to help parents know that untreated and undertreated Strep infections can cause an irreversible heart disease and early death of their children.

Can nurses make an impact on hygiene? YES NO

Can nurses make an impact on the knowledge of Strep Throat: YES NO

Can nurses (after education) assess, diagnosis, and treat Streptococcus pyogenes infections? YES NO

Can nurses make an impact in providing the proper antibiotic choice in healthcare facilities where nurses have prescriptive authority? YES NO

Are you willing to save lives and make a difference? YES NO

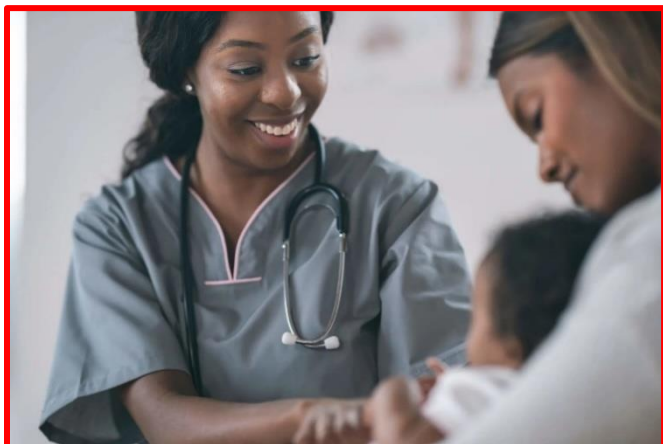
What can nurses do to save lives and decrease RHD in your community?

Why should nurses educate patients, families, and community?



It is important for the nurse to teach patients, families, and the community all information about Rheumatic heart disease. (Sanyahumbi, Chiromo and Chiume, 2019)

Who and where should nurses educate about ST, ARF, RHVD, and HF?



KNOWLEDGE & SKILLS

Nursing Ethics

Nursing ethics are moral principles that govern how nurses should behave or conduct themselves.

These ethical principles are based in values that nurses use around the world that drive our behavior as nurses.

The focus pertains to the right and wrong of our actions and ethics impact our critical thinking and decision-making process when we conduct assessments, diagnosis, and determine treatment plans/management of our patients.

Every person has their own set of personal ethics and morals. Both you and your patients are guided by our personal values.

Following are common world-wide nursing ethics:

1. **Respect for autonomy.** This means nurses have the capacity to determine one's own actions through independent choice. For our patients, nurses believe our patients have the right to choose, or refuse medical treatment. It is our responsibility to explain the diagnosis, treatment, and follow up clearly so the patient can make a good decision.
2. **"Beneficence"** which means "do good for others" Nurses use beneficence when they complete excellent history and physical exams, use our knowledge to determine the correct diagnosis and develop the treatment plan, and provide excellent education to others.
3. **"Nonmaleficence"** which means "do no harm." Nurses use nonmaleficence when they use the evidenced-based and proven correct antibiotics, or plans for heart failure, or prevention of autoimmune reactions through long-term PCN therapy.
4. **Justice for all.** Nurses have an ethical obligation to care to all patients with the same level of fairness despite their personalities or characteristics, such as financial status, cultural beliefs, religion, gender, or sexual orientation.
5. **Fidelity to nursing** which means we are responsible for providing competent nursing care and remaining up-to-date with evidence-based practice and implementing effective physical and mental health interventions. (This Rwandan Nurses Saving Lives is about fidelity to nursing.
6. **Veracity** which means **to tell the truth.** Veracity is directly related to patient care, especially in the education provided to the patient and families concerning diagnosis and treatment plan. It is also central to all informed consents in sharing risks and benefits to medications or procedures. Veracity is critical in all communications nurse-to-nurse and nurse to staff/team.
7. **Role of Caring** which means the foundational nursing concepts of holism and caring in a nurse-patient relationship is deeply rooted in dignity, respect, kindness, and compassion. Nurses use a client-centered, care-based, ethical approach to nursing care that focuses on the specific circumstances of each situation.

(<https://wtcs.pressbooks.pub/nursingmhcc/chapter/5-2-ethical-principles> accessed 3-19-24)

In addition to ethics, nurses apply common moral principles in providing care to their patients and communities around the world.

Moral Principle 1. The nurse practices with compassion and respect for the inherent dignity, worth, and unique attributes of every person.

Conference Application:

- We ask the patient to share their story, to gain an understanding of who they are as a person first.

- We obtain a comprehensive history to know the current symptoms, past medical history, and the social determinants impacting the patient.
- We treat all patients with the same respect.

Moral Principle 2. The nurse's primary commitment is to the patient, whether an individual, family, group, community, or population.

Conference Application

- We strive to provide Patient-Centered Care where we ask the patient about their level of knowledge of the disease process, treatment possibilities, their desires for their future, then we provide the education to the patient and family concerning Strep infections, ARF, RHD, and HF.
- For the community, we advocate and educate for the community to be active in improving health of the community.

Moral Principle 3. The nurse promotes, advocates for, and protects the rights, health, and safety of the patient.

Conference Application:

- To be an advocate is to be a supporter of that person. Nurses should advocate for nursing, our patients, our patient's families, our community, and our country to ensure patients have access to the correct evidenced-based medication and timely referrals.
- Nurses explain the risks and benefits of medications and procedures. We obtain consent before all procedures, even with our pediatric patients.
- We advocate for community health issues and safety including clean water, decreasing pollution, increasing access to healthy foods, hand washing, improved cooking facilities (no smoke).

Moral Principle 4. The nurse has authority, accountability, and responsibility for nursing practice; makes decisions; and takes action consistent with the obligation to provide optimal patient care.

Conference Application:

- As nurses we should be capable of advocating for our patients by early referrals for evaluation of possible ARF or RHD.
 - To improve their care through advanced screening by specialists and surgeries for better management of their conditions which brings better outcomes and save lives.
 - New cardiac murmurs, S&S of ARF or HF all need referral- this often occurs BEFORE a diagnosis is made.
 - We need to help decrease the stigma of a disease that requires a daily medication.
 - We need to be supporting patients who present with fatigue, Shortness of breath, edema, cough when resting.
 - We need to advocate for the correct medications to be available for you to use.
 - It is the nurses responsibility to use their knowledge and skills every day to improve skills and critical decision-making processes. Part of this responsibility and

accountability is sharing with nurses and physicians, reading articles, and attending conferences.

- When we are unsure, we are accountable to ask/consult with other health providers before acting on a treatment plan.

To be a good advocate, nurses need to understand their knowledge and assessment skills are important to their patients, community, and country.

APPLYING ETHICS: WHY SHOULD NURSES USE A STETHOSCOPE?



- Nurses around the world are the healthcare providers conducting the in-depth history of present illness (the patient's concerns), review of systems, past medical history, family history, living conditions history, and symptom analysis. Once we have this information- nurses are responsible for the physical exam of the patient.
- A comprehensive physical exam includes breath sounds, cardiac sounds, and abdominal sounds to complete HEENT, RESP, CARDIAC, ABDOMINAL, NEURO, and muscle-skeletal systems.
- In addition, we assess our patient's psychosocial status.
- **Breath sounds:** For ARF, RHVD, and HF the assessment of breath sounds with a stethoscope can identify pulmonary edema, fluid overload, respiratory wheezing, and add to the decision of viral upper respiratory (rhonchi that change with cough) versus Strep Throat (clear lungs).
- **Cardiac sounds:** Nurses should always use a stethoscope because it is important tool during assessment and early detection of murmurs which may indicate ARF, RHVD, HF, or valve disease from another process (Asmare *et al.*, 2021). The sooner the patient's murmur is recognized the sooner correct care can be provided, and the longer the patient's life may be.
 - A good murmur video is- <https://youtu.be/dBwr2GZCmQM>
 - Remember all abnormal heart sounds need an echocardiogram for diagnosis and determination of the proper treatment.
- **Abdominal sounds:** By using a stethoscope to hear bowel sounds, a nurse can be more accurate on diagnosis and recognition of emergent abdominal issues.

The nurse who promotes and advocates for their patients; protects their rights and provides means of increasing health and safety of the patient is an empowered nurse who can decrease deaths from RHD!

Rwandan nurses will be saving lives through nursing actions, ethics, and advocacy for their patients and communities.

KNOWLEDGE & SKILLS- RHD Disease Specific

HOW CAN NURSES SAVE LIVES?



Using a research model that guides nursing actions in community settings, our actions can be organized, researched, and proven to be successful. Concerning RHD, these four prevention levels have been studied and nurses are important to the success in decreasing RHD incidence and saving lives.

➤ **PRIMORDIAL PREVENTION:** prevention that applies to the whole population.

✚ **BRAINSTORM:** Involves strategies to avoid streptococcal infections that can be taught to the community.

✚ What can be taught to the community?

✚ _____

✚ What can be taught to students?

✚ _____

✚ Better access to knowledgeable nurses and physicians will result in improved population health through community education on the importance of diagnosing Strep Throat, ARF, RHD, and HF at the Health Center, a clinic, or hospital.

✚ Increasing access to specialty care through early referrals for abnormal histories and physical exams indicating possible ARF or RHD.

➤ **PRIMARY PREVENTION:** Primary prevention aims to prevent disease or injury before it ever occurs.

✚ Focus on the RHD the diagnosis and treatment of strep throat or impetigo to decrease the risk of ARF.

✚ Once the diagnosis of a streptococcus pyogenes infection has been established, treatment of 10 days is required to prevent an autoimmune reaction. Or IM Penicillin

- ✚ Intramuscular BPG remains the most widely used antibiotic for streptococcus pyogenes infections.
 - ✚ Educate and encourage all family members on good handwashing, dish washing, using a drop of Clorox/bleach to wash counters/dishes/toys/toothbrushes.
 - ✚ Assess all house members that are symptomatic and treat.
 - ✚ This approach prevents the development of rheumatic fever in many susceptible individuals, in addition to avoiding spread of the bacterium between contacts.
- **SECONDARY PREVENTION:** Secondary prevention involves the detecting and treating disease or injury as soon as possible to halt or slow its progress, encouraging personal strategies to prevent reinjury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems.
- ✚ For RHD this involves continuous antimicrobial prophylaxis to prevent additional streptococcus pyogenes infections in patients previously diagnosed with ARF or RHD.
 - Education on Penicillin (pills and IM injection)
 - Strep Throat and impetigo (skin) infections
 - What is ARF
 - What is RHD
 - ✚ Informing the community that streptococcus pyogenes infections can cause an autoimmune reaction with the long-term effect of destruction of the mitral valve will improve community understanding, support of those with monthly ARF/RHD antibiotic requirements.
 - STIGMA- Nurses can help decrease the stigma of monthly medications through excellent community educations.
- **TERTIARY PREVENTION:** Tertiary prevention involves the prevention of complications in people who have already developed a disease, and in whom disease prevention is no longer an option.
- ✚ Aims to prevent complications of established RHD, to reduce morbidity and mortality.
 - REQUIRED antibiotic therapy every 3-4 weeks
 - REQUIRED heart failure management
 - REQUIRED connection with the NCD/ Cardiology team
 - ✚ This entails nursing and cardiac team management of heart failure, control of arrhythmias, adequate monitoring of anticoagulation therapy.
 - ✚ Tertiary prevention requires a patient-centered care plan with knowledge of what the patient wants in the future and their current needs to improve the quality of life before making a treatment and management plan.
 - ✚ Prevention of endocarditis, management of complications related to pregnancy, and timely referral for heart surgery. (Leal *et al.*, 2019)

“HISTORY & ASSESSMENT” for providing patient education and advocacy



BRAINSTORM:

WHY SHOULD WE SAVE LIVES?

Does our knowledge and skills actually impact our community?

We and our patients/community should use the same language. Let us start our work.

Do you currently give health education to families or communities? If yes, on which topic?

BRAINSTORM: review the 4 prevention levels and answer the questions.

How are you going to save lives and impact our communities?

Why do you want to save lives through your nursing role?

Empowerment to seek continued education and develop nursing knowledge, skills, and role is critical to in decreasing RHD in your community.

Because each child... every person is worth every nurse doing their best to provide excellent nursing care to the top of our scope of practice!

Diagnosis and Critical thinking

Key Points – **How you make decisions?**

- ❖ Knowledge of the specific disease process
- ❖ A complete History of the illness
- ❖ A detailed review of systems
- ❖ Full vital signs with interpretation and understanding
- ❖ A comprehensive physical exam... with stethoscope
- ❖ Ability to understand potential causes of the symptoms + exam (differential diagnosis)
- ❖ Ability to critically think and determine the diagnosis
- ❖ Provide correct medication for correct disease process
- ❖ Empowerment to refer as soon as possible- Advocate for the patient
- ❖ Ability and desire to provide correct education to patient-family-community

Nurses should save lives in order to promote patients well beings through education, assessment, diagnosis, using proper treatments, early detection, managements of the side effects of the drugs, chronic HF management, follow-up post op patients, and advocacy (Techane *et al.*, 2022).

TREATMENT- Your patient education is to improve long-term management

- ❖ Please Always remember to use understandable terms while providing health education.
 - You will have a **flipchart** to help guide your education (your educational tool kit)
- ❖ Education needs to be practical, simple, easy to implement and sustainable.
- ❖ Answer the questions: What is the health concern? Why is it a problem? How can moms, dads, grandparents, aunts and uncles, teachers and churches help to decrease infection?
 - How to wash and dry hands -20 seconds
 - How NOT to share towels and wash cloths during Strep Throat times
 - How to clean toys, pens, pencils, doorknobs, and other items that are at risk for contamination if a person is positive for Strep Throat in the family
 - Remind families that sharing food or drink is an easy way to share Strep Throat
 - When to see healthcare for antibiotics
 - What signs & symptoms do they need to know to go to the healthcare center
 - What is ARF and RHD? When to go to the healthcare center... and why?



BRAINSTORM: What will you do different now that you have completed this day of educations?

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Skills Section



This Conference & Your advocate!

This conference is providing you with a personal advocate- your mentor!

My mentor is: _____

Contact information: _____

Your US Mentors are also available.

Dr. Maria Kidner +1-307-343-0282

Julie Carragher +1-443-745-4643

- This mentorship will last 2 months and will occur virtually via WhatsApp
- Hopefully your friendship will last a lifetime! Your mentor is there for you to ask questions, discuss a case, provide guidance, help build your confidence, share your successes and help you find solutions to your barriers.
- You will have group discussion and share cases
- Mentorship is only as good as the time and dedication you put into the process. If you do not reach out to your mentor, then your mentor has no idea of your needs and cannot support, advocate, or guide you.

Your Course requirements

- As discussed in the invite and conference beginning- You are part of a research project to assess the content and presentation of this conference to determine if it is worthy to repeat.
- You are responsible for the pre and post questionnaires now and at 2 months. We are seeking to understand your experience and to find ways to improve this conference so Rwandan nurses save lives.
- We greatly appreciate your time, dedication, wiliness to learn and hopefully change your practice through your stethoscope, your increased knowledge, and your new skills.

Thank you!

FOCUSED SKILLS FOR LIMITED ASSESSMENTS: HEENT, RESPIRATORY, CARDIAC, ABDOMEN

Author: Maria Kidner DNP, APRN, FNP-BC, FAANP

HEENT: HEAD, EARS, EYES, NOSE and THROAT with a focus on impact from Strep Throat



HEALTH HISTORY: for Pharyngitis Review Questions

- Presenting concerns: History of Present illness
- **Important Questions to Ask:**
 - Onset of sore throat (gradual or abrupt and date)
 - Fever (A key aspect of Strep Throat)- usually greater than 38.7
 - Severity of sore throat (0 to 10)
 - Any S&S of viral infections/congestion: congestions, runny nose, COUGH, face congestion pressure, pain in ears, pain when moving neck, swallowing problems
 - Any neck pain or stiffness
 - Any headaches
 - Dehydration (abdominal pain, swallowing difficulties)
 - Any family member with Strep?
- **Past Medical History**
 - Past history of Strep throat
- **Family history**
 - Strep Throat, HIV, TB, RHD
- Personal and social history
 - Stress
 - Medications
 - Nutrition (vitamin Deficiencies can cause significant changes)
 - Tobacco use

- Alcohol use

PHYSICAL EXAM: HEAD

1. Inspection-Head and facial features
2. Check eyes for redness or drainage (not associated with Strep)
3. Any sinus swelling/pain (not associated with Strep) Palpate/Percussion Sinuses (painful sinus is not associated with Strep)
4. Asses for a red or runny nose (not associated with Strep)- very common with VIRUS infections
5. **Check the mouth, uvula, tonsils**
6. Gently palpate lymph nodes (swollen, tender nodes indicate infection = Positive. Seen in Strep Throat)
7. Check the range of motion of the head (meningitis causes pain with ROM)
8. Auscultation- Back of neck for pharyngitis to listen for upper airway wheezing
9. Check tracheal location
10. Check the size of the thyroid
11. Check for Jugular vein distention- if present ALWAYS assume HEART FAILURE

PHYSICAL EXAM:

1. Inspection of Head and facial features
As you talk to your patient, look at their face for signs of congestion, swelling, or asymmetric appearances.

2.

For GAS Strep Throat, the face should have no signs of swelling, redness, or drainage

Check the eyes for redness or drainage

Strep Throat does not cause congestion of the eyes with drainage, redness, or swelling.

Those features are usually viral upper respiratory or related to an infection of the eye. In the Appendix of HEENT will provide you with more information on eyes.

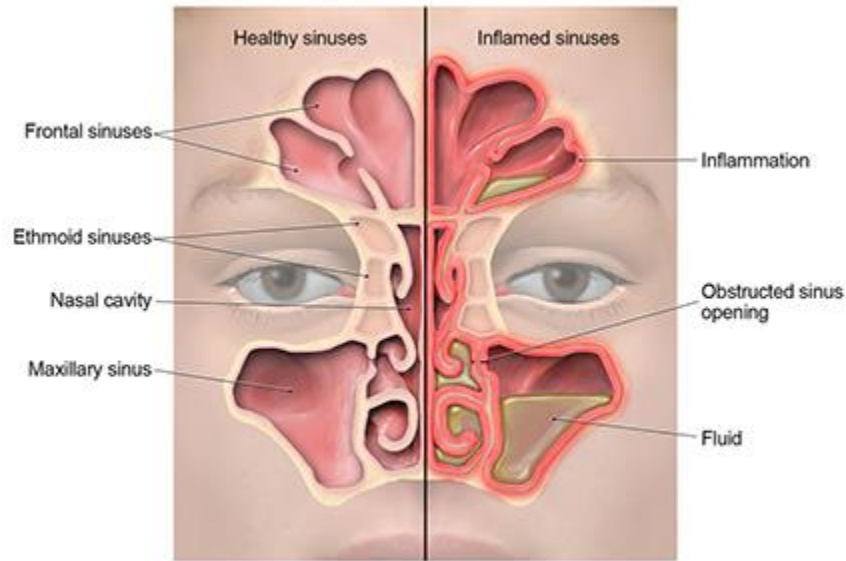
For GAS Strep Throat, the eyes should be clear.

3. Any sinus swelling/pain & Palpate/Percussion Sinuses
Sinus congestion, swelling/pain is common in VIRAL infections, sinusitis. A key physical exam is tapping on the sinuses, if there is pain- then there is inflammation.

SINUS ASSESSMENTS

- Frontal sinuses:
 - Palpate deeply just under the eyebrows in an upward direction.
 - Note tenderness.
- Maxillary sinuses:

- Palpate deeply just under the zygomatic bones in an upward direction.
- Note tenderness.



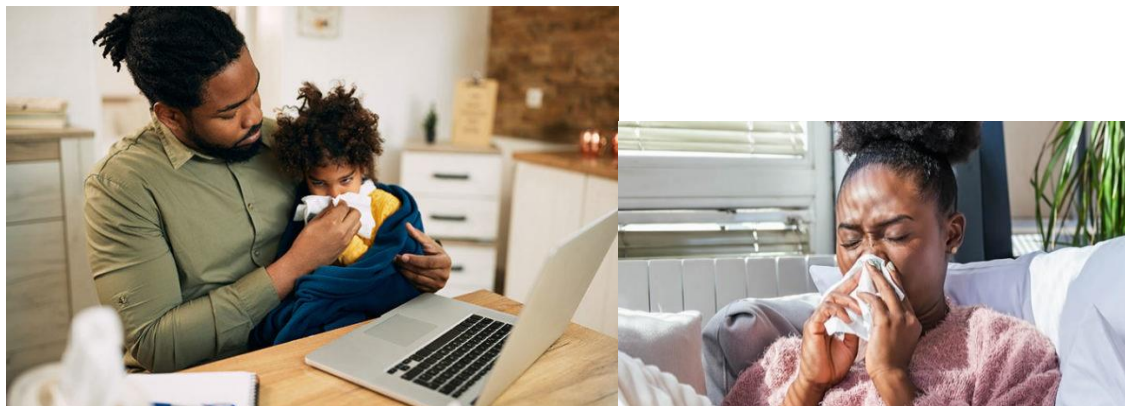
For GAS Strep Throat, the sinuses should be non-tender.

4. A
 Assess for red, or runny nose
 A key component to diagnosis GAS Strep on clinical exam is the absent nasal/sinus congestion.
 Viral infections can have clear and cloudy (yellow/green) mucous.

NOSE ASSESSMENTS

- Assess interior nasal vestibule with penlight, and nasal speculum.
 - Note edema, drainage, color (redness =viral; pale, red, or bluish = allergic rhinitis), lesions.
 - Nasal septum deviation or perforation.

- Polyps.
- Occlude one nostril at a time and assess for obstruction in nasal breathing.



5. **For GAS Strep Throat, the nose should be clear of drainage EXCEPT in young children under 1 year old.**

s

Assess the oral pharynx: the mouth, uvula, tonsil- the critical assessment for GAS Strep Throat

Have patient open their mouth and say "AHHHHH"

Use a tongue depressor and have good light

Wear a mask (if possible) when assessing the mouth to protect yourself

MOUTH ASSESSMENTS

- Inspection
 - teeth for signs of dental or gum infection (increases risk for cardiac disease)



- Hard and soft palate and **uvula**- looking for petechiae, exudate swelling, ulcers.

- Check lips for symmetry, color, surface characteristics, and moisture.
 - Oral Mucosa- look at color, lesions, infections.
 - Assess oral cavity, tongue, mouth, floor of mouth
 - Look for symmetrical elevation of the soft palate / uvula.
- TONSILS:

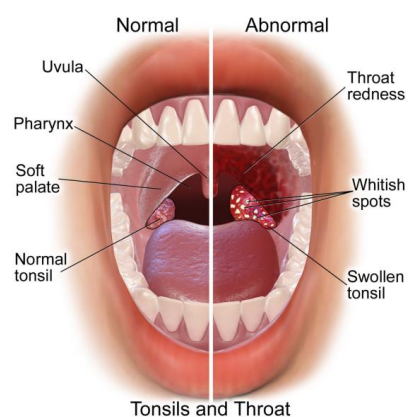
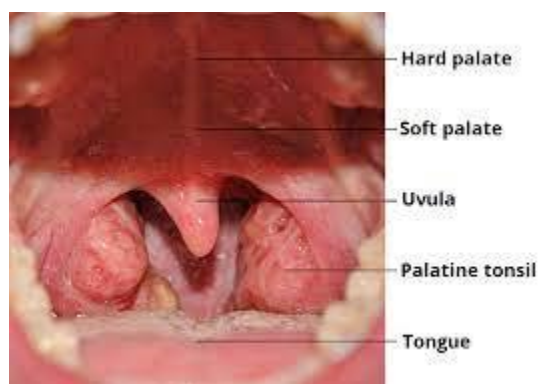
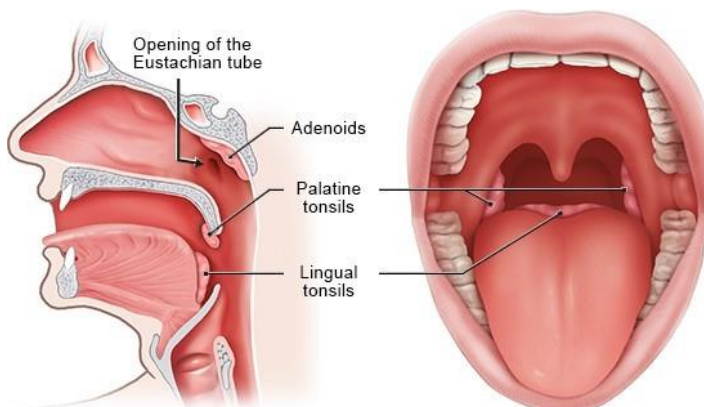


Image: <https://s31788.pcdn.co/wp-content/uploads/2018/01/Strep-Throat-Symptoms-Things-1440x1440.jpg>



Sore throat- most likely viral in etiology



<https://www.medindia.net/health-screening-test/images/sore-throat.jpg>



Image: https://en.wikipedia.org/wiki/Streptococcal_pharyngitis



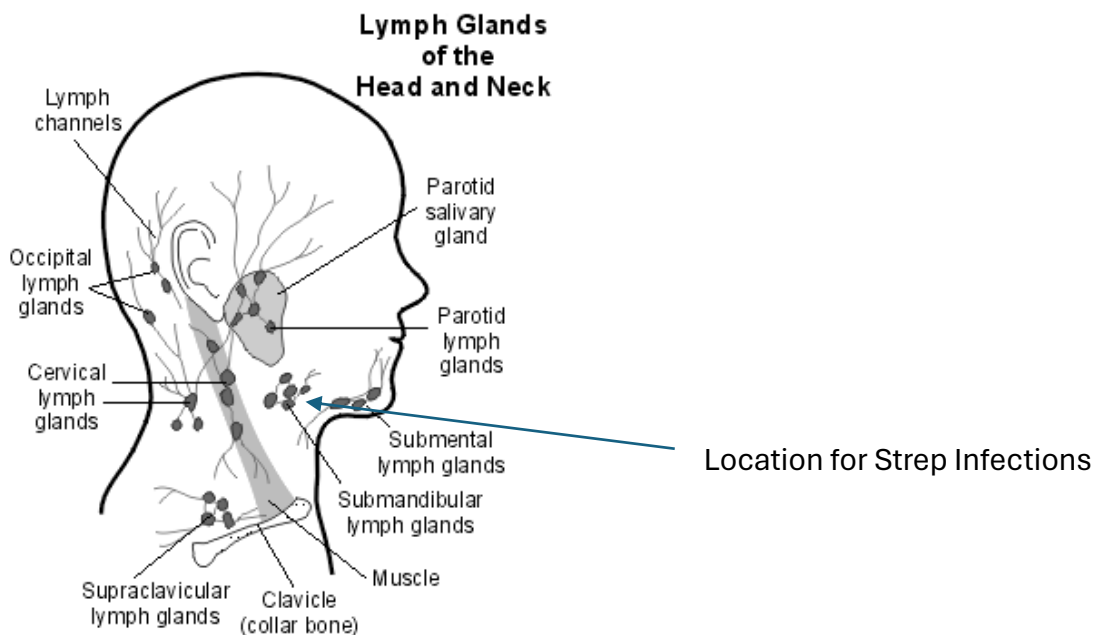
For GAS Strep throat, the oral pharynx will be POSITIVE for:
Swollen uvula
Large, swollen tonsils (the palatine tonsils)
Red petechiae or pus drainage (white on tonsils)

6. Lymph Node Assessment

A key component of the decision making for GAS Strep Throat is positive, painful, swollen submandibular lymph nodes.

All positive nodes mean infection. The location of the positive node will guide your decision-making.

Checking lymph nodes on every patient will help you diagnosis Lymph node abnormalities: especially cancer [the node will be hard and lumpy like a rock]



- **PALPATION OF LYMPH NODES:**

Image: <http://www.painneck.com/images/lymph-nodes.jpg>

- Some lymph nodes are not always palpable on adult unless there is some type of pathology that exists, or a history of multiple infections.
- HEENT nodes that are not palpable without pathology include: the pre and post auricular, some of the cervical chain, submental, and supraclavicular nodes.
- HEENT lymph nodes that are palpable tender and warm nodes indicate an infection such as pharyngitis (**Strep Throat**), mononucleosis, or otitis media
- As long as they are smooth, freely mobile and **non-tender** then they are “normal”
- Any lymph node that feels like a lumpy rock is cancer until proven otherwise.

7. **For GAS Strep Throat, the submandibular lymph nodes should be POSITIVE (swollen, painful to touch)**

e

check the range of motion of the head (meningitis causes pain with ROM)

ROM is easily checked by having your patient move their head: forward, backwards and side to side (called Active ROM without resistance)

You can place your hand and provide mild resistance and check the ROM (called Active ROM with resistance)

In severe neck, ear, or meningeal infections, the ROM of the neck causes pain.

Meningitis can be fatal, thus painful neck ROM in a patient who appears ill needs to be referred to a physician to assess for meningitis.

For GAS Strep infection, the ROM of the neck should be normal

8. Auscultation of the back of the neck for wheezing.
Upper airway inflammation is NOT a symptom of GAS Strep, however can be present in patients with upper airway infections.
To determine if the wheezing is in the lungs (asthma and COPD), or upper airway, you can listen to the back of the neck.

For GAS Strep infection, the neck should have no wheezing heard

9. Check the location of the trachea

The trachea is the windpipe and it is in the middle of the neck

The trachea deviates when a lung has collapsed, or is full of fluid.

These patients are in respiratory distress

A deviated trachea is a MEDICAL EMERGENCY- if possible, transport the patient by ambulance

Checking every patient will help you know normal trachea position and then you will recognize abnormal.

ALWAYS be gentle when checking the trachea

For Gas Strep Infection, the trachea should be midline

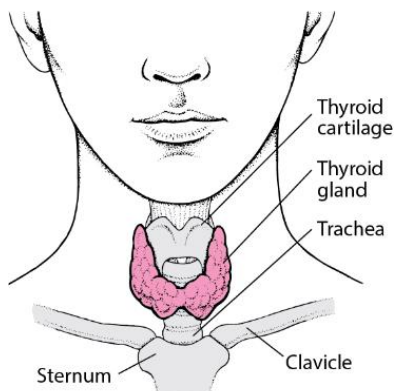
10. Check the size of the thyroid

The thyroid is not involved in Strep Throat

Assessing the thyroid may help you identify thyroid pathology

A large thyroid is very uncommon in young children

- Palpate the thyroid gently. Enlargement can be due to a mass or thyroid goiter which can be from hyperthyroid or hypothyroid.
- Palpate for:
 - Symmetry in contour/characteristics of tissue, tumors (rough small “rocks”)
 - Symmetry in movement during swallowing.



- Auscultate for bruit if enlarged.



For GAS Strep Infection, the thyroid should be normal. However, an enlarged thyroid should be evaluated as possibility of a chronic thyroid pathology being present.

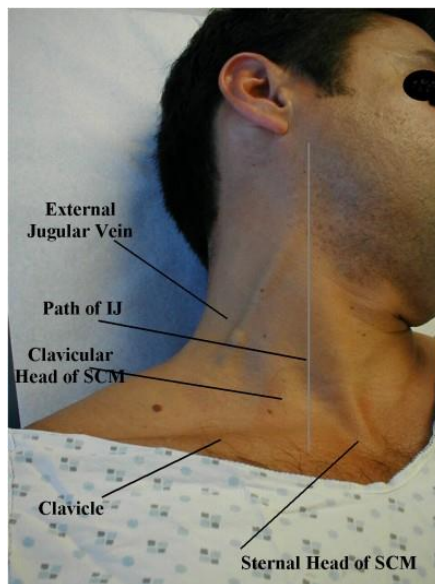
11. Assess for Jugular Vein distention

For Gas Strep infection, there should be no JVD

JVD is a classic finding in HEART Failure and significant liver disease.

JVD of heart failure is from the heart's inability to push the normal blood volume forward, thus blood is increased in the lungs. As HF continues, there is increased blood in the right ventricle, atrium, and venous system creating JVD.

https://emsbasics.com/files/2011/10/cardiac_neck2-400x533.jpg



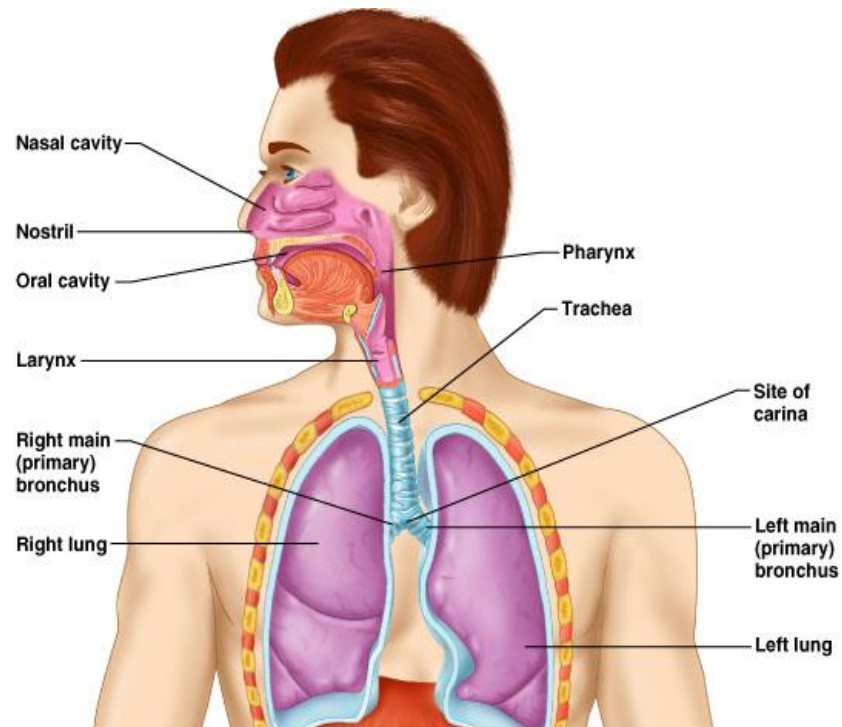
**For GAS Strep Infection, there is NO JVD
For Heart Failure, + JVD always means significant HF [LATE sign]**

Clinical diagnosis of Strep Throat check list

- ✓ The primary concern is a severe, painful sore throat.
- ✓ The patient has a fever.
- ✓ There is an identifiable family member, school friend or contact with similar S&S, or it is during an outbreak of GAS Strep infections.
- ✓ Absence (NO) runny nose, sinus pain, congestion.
- ✓ NO cough
- ✓ The tonsils and uvula swollen.
- ✓ There petechiae or white exudate (pus) in the tonsils.
- ✓ There are swollen submandibular lymph nodes, especially the tonsillar node.

SIMPLIFIED RESPIRATORY ASSESSMENTS

ANATOMY



FUNCTION OF RESPIRATORY SYSTEM

The primary function of the respiratory system is to supply adequate oxygen to the tissues and to remove the waste product carbon dioxide. This is achieved with the inspiration and expiration of air.

The comprehensive functions of the respiratory system are:

- ❖ gas exchange
- ❖ acid-base balance
- ❖ phonation
- ❖ pulmonary defense
- ❖ metabolism
- ❖ the handling of bioactive materials.
- ❖ its own defense against inspired particulate matter
- ❖ the storage and filtration of blood for the systemic circulation
- ❖ the handling of vasoactive substances in the blood
- ❖ the formation and release of substances used in the alveoli or circulation.

(Levitzky,2018)

NASAL PASSAGE'S FUNCTION:

- ❖ Provides airway
- ❖ Moistens and warms air
- ❖ Filters air
- ❖ Olfactory receptors

LUNGS and PLUERAL

- ❖ Right lung has 3 lobes and left lung has 2 lobes
- ❖ Around each lung is a flattened sac of serous membrane called **pleura**

PULMONARY PHYSIOLOGY

- ❖ Controlled by Central Nervous System
- ❖ Functions to exchange respiratory gases: Coordinated contraction of airway, intercostal, and diaphragm muscles is required to cause inspiration of gas into the lungs.
 - Inspiration brings Oxygen to alveoli
 - Expiration removes Carbon Dioxide from the body
 - Ventilation (air flow) and perfusion (blood flow) determine the efficiency of oxygen being delivered to the body.

Every day about 10,000 L of air is inspired into the airways and the lungs during normal respiration. This inspired air contains all of the local environment's dust, pollen, fungal spores, ash and other products of combustion; microorganisms such as bacteria; particles of substances such as asbestos and silica; and hazardous chemicals or toxic gases that are present naturally in the environment or added as pollution. In most places, the daily contact with potentially hazardous aerosol particles is 50 to 100 m² (Levitzky, 2018 Chapter 10).

PULMONARY REVIEW OF SYSTEMS AND HISTORY QUESTIONS

- Coughing or Shortness of breath

- onset, duration, type, pattern, severity
- sputum production (color: yellow, green, rust, clear)
- presence of blood: streaks, clots
- presence of mucus: thick
- Difficulty with breathing (dyspnea)
- Shortness of breath (with exertion, normal activities, bending over, sleeping, lying flat, or sitting in a chair at rest)
- Chest pain: onset, character, duration, any trauma, timing (at rest, with exertion or normal activities)
- Any previous thoracic traumas or surgeries
- Lung disease, heart disease
- Does patient use oxygen?
- Testing: pulmonary function tests, chest x ray, TB skin tests
- Immunizations: pneumonia, influenza, Covid
- Daily Medications patients take.
- Environmental Exposures: chemicals, animals, dust, allergens.
- Infections: influenza, TB, HIV, strep throat, repetitive parasite infections
- Nutrition- is there malnourishment? Is the diet lacking in variety, vegetables/fruits, or proteins?
- Tobacco use: patient smoke?
- Geographic location in Rwanda? Lake Kivu presents a high risk of heavy metal exposure
- Obesity, Exercise intolerance
- Family History of pulmonary disease: TB, lung cancer, cystic fibrosis, COPD, asthma, bronchitis
- Females: Increase risk of lung disease and heart failure related to wood/charcoal cooking

EXAMINING THE PATIENT

- Provide warm environment
- Sitting position to assess is preferred

INSPECTION

- ❖ Do the inspection part during your history taking-
 - General comfort and breathing pattern of the patient. Do they appear distressed, diaphoretic, labored? Are the breaths regular and deep?
 - Use of accessory muscles of breathing (between ribs, sternocleidomastoids). Their use signifies some element of respiratory difficulty.
 - Note the color of the patient, in particular around the lips and nail beds. Obviously, blue is bad!
 - The position of the patient. Those with extreme pulmonary dysfunction will often sit up-right. In cases of real distress, they will lean forward, resting their hands on their knees in what is known as the tri-pod position.

RESPIRATION RATE

- ❖ Normal rate for adults: 12-20 breaths/minute
- ❖ Children/Adolescents: 16-20 breaths/minute
- ❖ Toddler – 6 years: 20-30 breaths/minute
- ❖ infant: 25-35 breaths/minute

- ❖ Newborn: 40-60 breaths/minute

DEFINITIONS

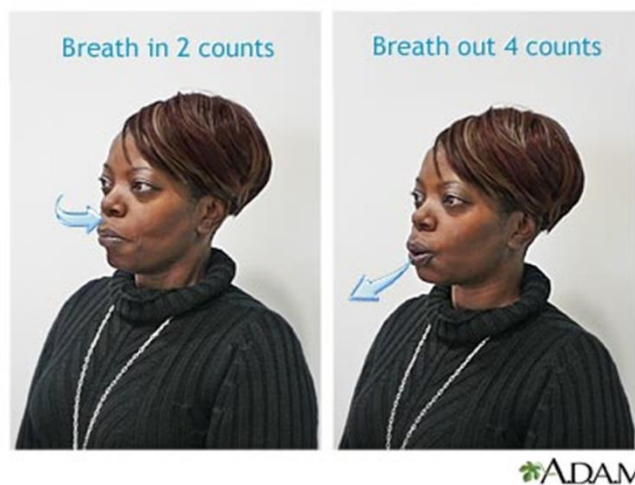
- ❖ **Dyspnea:** Difficult or labored breathing with shortness of breath
- ❖ **Orthopnea:** Difficulty breathing begins or increasing when lying down.
- ❖ **Bendopnea:** Difficulty breathing when bending over (such as putting on shoes). It indicates increase pressure in the lungs.
- ❖ **Tachypnea** is rapid RATE (depends on age). For an Adult it is over 20!
- ❖ **Bradypnea** is slow RATE (also depends on age). For an Adult it is less than 12
- ❖ **Apnea** is NO breathing for several seconds and can lead to respiratory arrest

PURSED LIP BREATHING: A breathing technique to slow and control breathing. Inhale to the count of two and exhale to the count of 4 through lips that are purse (touching) together.

EVERY NURSE & PROVIDER SHOULD KNOW HOW TO TEACH TO PATIENTS. USE WITH ANXIETY, RESPIRATORY DISTRESS, FOR CHILDREN THROUGH THE ELDERLY. THIS WILL DECREASE OXYGEN DEMAND and HELP CALM PATIENTS

Have them put their finger on their lips to increase resistance to help open air sacs in pneumonia, TB, Heart Failure and oxygen dependent patients.

Patients who are post-operative will often have a fever on Post op day 1-3 that is directly related to respiration. Purshed lip breathing and coughing is the most important treatment activity to improve post -surgical fever.

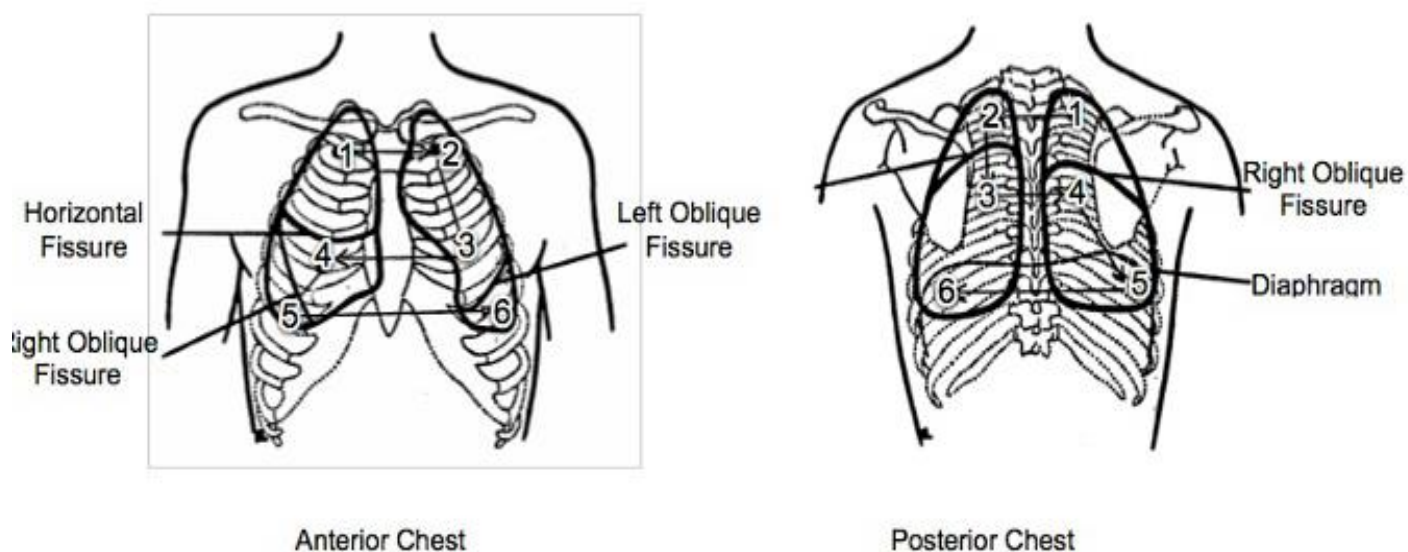


<https://medlineplus.gov/ency/patientimages/000267.htm>

AUSCULTATION- Listening

- Breath sounds – evaluating:
- Intensity

- Pitch
- Duration
- Quality
- Have patient sit upright if possible and instruct to breathe by taking a fast, deep breath and blow fast out through the mouth. If the patient takes long slow breaths, you will not be able to hear well.
- Place diaphragm of stethoscope firmly on skin to listen over intercostal spaces:
 - Posterior
 - Right lateral
 - Left lateral
 - Anterior
- Listen throughout entire inspiration/expiration cycle
- Compare side to side from apices to bases.



- Just a note: Not everyone can breath deep breaths as many times as we want to listen to the entire lung front and back!
 - Choose wisely
 - Go Slowly

NORMAL BREATH SOUNDS

- **Bronchial**
 - Heard over the trachea and mainstem bronchi

- Sounds are tubular and harsh.
- **Bronchovesicular**
 - Heard over the major bronchi below the clavicles in the upper chest anteriorly.
 - Sounds are medium-pitched and continuous throughout inspiration and expiration.
- **Vesicular:**
 - Heard over the peripheral lung.
 - Described as soft and low-pitched.
 - Best heard on inspiration.

ABNORMAL BREATH SOUNDS

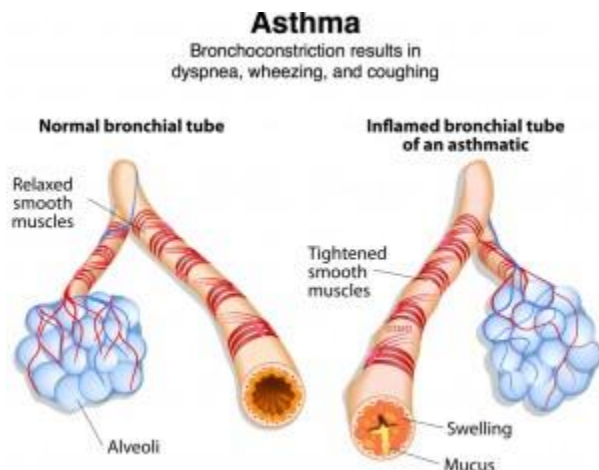
When you are just learning to breath sounds- learn what is normal by listening to every patient. For RHD- any wet fluid sounds are considered HEART FAILURE

Crackles = Rales

- Are crackling sounds that occur in association with processes that cause fluid to accumulate within the alveolar and interstitial spaces.
- The sound is similar to that produced by rubbing strands of hair together close to your ear.
- Pulmonary edema is probably the most common cause- A HEART FAILURE Finding
- Indicate fluid in airways or alveoli
- **Crackles that clear with cough are not associated with significant pulmonary disease (and are really rhonchi)**
- Can be FINE or COARSE

Classic finding in Heart Failure is Rales/ crackles. It is the sound of fluid in the lungs. This fluid causes a person to be SOB, have increased dyspnea or cough when the lay down (they will add pillows/ or blankets under their head to sleep better).

- **Rhonchi**
 - Continuous, deep, low pitched rumbling noises
 - Secretions that form/collect in larger airways, as might occur with bronchitis or other mucous creating process, can produce a gurgling-type noise, similar to the sound produced when you suck the last bits of a milk shake through a straw
 - Often heard in Bronchitis
 - **Clears with a cough!**
- **Wheezes**
 - Continuous, high pitched musical sounds
 - Indicated narrowed or partially obstructed airway (**Asthma, COPD, Bronchitis**)
 - With bronchoconstriction, wheezing will first be heard as expiratory
 - As the constriction gets worse, wheezing will occur in both the inspiratory and expiratory phases
 - If treatment to reverse the constriction is not given the patient will then develop a prolong expiratory phase. This is called prolonged I to E ratio. The longer the expiration the greater the obstruction



<https://www.pedilung.com/wp-content/uploads/2016/01/Asthma-Bronchoconstriction-dyspnea-wheezing-and-coughing-300x237.jpg>

- **Stridor**
 - Wheezing heard only on inspiration.
 - associated with mechanical obstruction at the level of the trachea/upper airway.
 - This may be best appreciated by placing your stethoscope directly on top of the trachea.
 - **True stridor come with severe respiratory distress and is an emergency**
- **No Breath sounds!**
 - Often with severe COPD patient you can see them breathing hard but cannot heard very much. This is common as the disease progresses.
 - NO breaths AND good breaths on the other side means pneumothorax!
 - Immediate referral

A FEW TIPS TO HELP YOU HEAR WELL

- Ask the patient to take fast, deep inhale- pause and exhale forcibly through their mouths while you are performing your exam. This forces the patient to move greater volumes of air with each breath, increasing the duration, intensity, and thus detectability of any abnormal breath sounds that might be present.
- If you hear something abnormal, have the patient cough a few times prior listening again This clears airway secretions (Rhonchi) and opens small atelectatic areas at the lung bases.

HEART FAILURE

As the heart fails, it cannot pump all the blood normally and blood gets backed up in the lungs. Pulmonary edema develops. You can hear that as rales (moisture that does NOT change with cough). The patient will have shortness of breath, fatigue, need extra pillows under their head to sleep, night cough. This patient needs to be referred immediately to cardiology for echocardiogram and medication management.

Cardiac Assessment

Author: Maria Kidner DNP, APRN, FNP-BC, FAANP

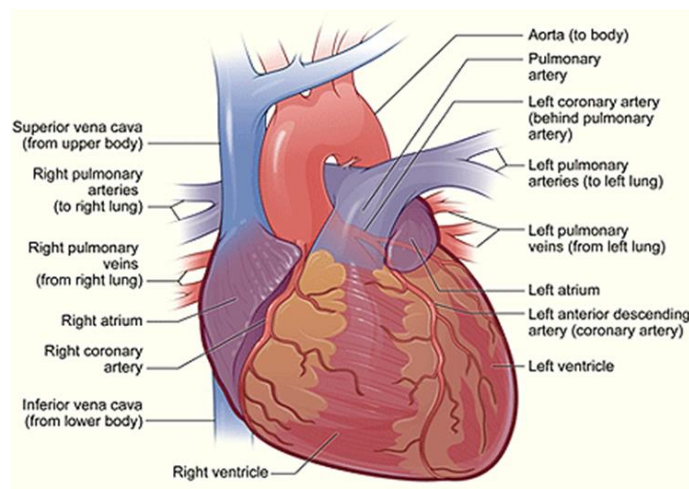
Understanding and completing a good cardiac History & Physical (H&P) takes time to learn and practice. This section is designed to give you basic education and the ability to say, “This is normal... or this is not normal.” All abnormal physical exams need an echocardiogram to help you diagnose the patient and develop the correct plan of care.

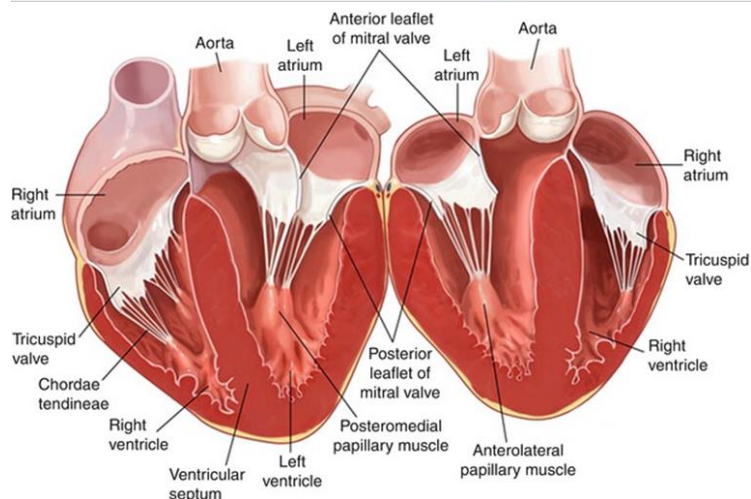
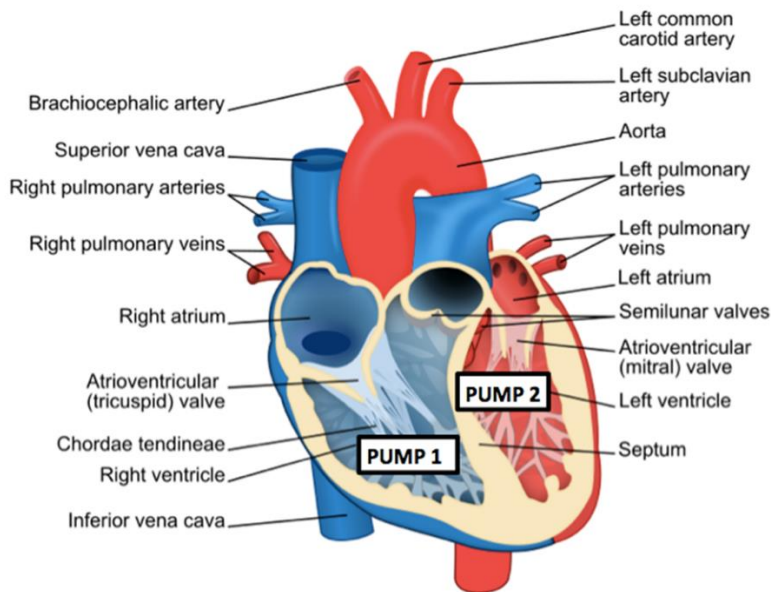
HISTORY QUESTIONS.

At the end of this section there is an appendix to provide you additional information on Coronary Artery disease (CAD) which causes heart attacks.

- Any chest pain/ pressure or heaviness (at rest or walking or exercising)?
 - Indications of coronary artery disease, inflection, or heart failure
- Over the past two months has there been a change in activity tolerance?
 - Coronary artery disease causes a rapid decline in activity as the artery becomes occluded
- What could you do last year that you cannot do now?
 - Heart Failure is a gradual decline of activity as blood becomes backed up in the lungs and venous system.... This is why HF is often missed until LATE in the disease process
- Does it take you longer to do your normal activities (walking to school/work or the market) than it did 6 months ago?
 - Assess for early heart failure
- Any dizziness or light headedness, fainting (what activities create dizziness?)
 - Many things cause dizziness- you will need to consider RHVD as a cause
- Any difficulty breathing at night or sleeping with several pillows to keep the head up
 - S&S of Heart failure
- Any cough
 - Clues for HF, TB, HIV cardiac involvement

Anatomy review



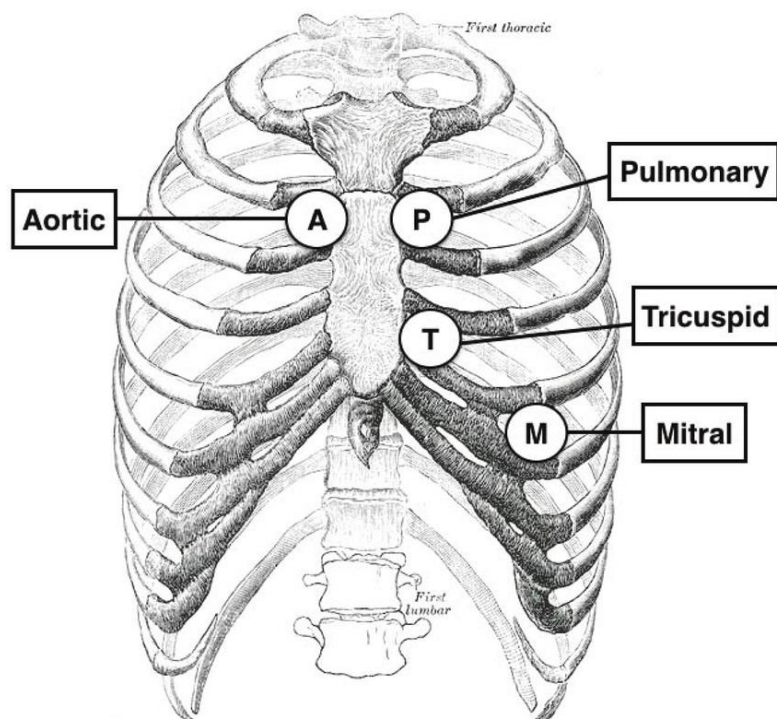


The Physical Assessment of the heart is done with a stethoscope to hear the heart and your hand to feel the heart.

THE STETHOSCOPE

- The diaphragm should be placed firmly against the chest wall
- The bell should only lightly touch the skin
- Touching the tubing will cause extra sounds
- Auscultation should be on skin when possible. (but a thin layer of clothing is OK **IF you hear well**)
- Keep your stethoscope clean.

You can listen in any position your patient is in, but if the patient can sit upright, that is the best. If you cannot hear well, then have the patient lean forward.



CARDIAC SOUNDS

- A normal functioning heart makes two basic sounds. They are called S1 & S2
- Changes in the sounds may indicate cardiac pathology or relate to the medical or emotional (fear, anxiety) status

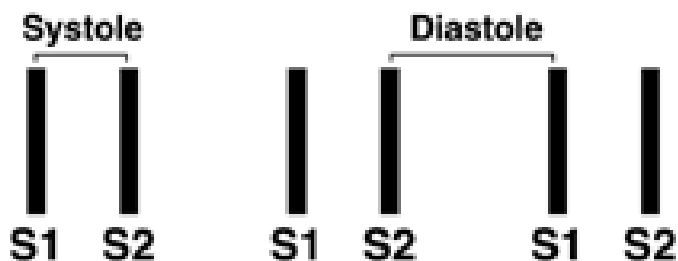
of the patient.

- S3 & S4 are created when there are changes in ventricular pressures, flow or compliance.
- These are abnormal sounds and indicate the patient has a cardiac problem.
- Always consider Heart Failure if you hear an extra sound from the normal “lub-dub, lub-dub”

AUSCULTATORY SEQUENCE

- Listen over all five auscultatory points on the chest wall TWICE: once with the bell and once with the diaphragm
- Start at the aortic site at the 2 intercostal space, right sternal border (2 ICS RSB), then to left sternal border 2 ICS (Pulmonic valve site).
- Then slide down left sternal border to 4ICS (tricuspid site)
- Then move left lateral to the point of maximal intensity (PMI)- this is typically 5ICS mid clavicular line (MCL)
- Last is mid axillary for a final check for mitral regurgitation

NORMAL CARDIAC CYCLE



S1 is the closure of the Mitral & Tricuspid valves stopping the blood flowing from the atria to the ventricles.

S2 is the closure of the Aortic & Pulmonic valves stopping the blood from flowing into the lungs from the pulmonic valve and blood flowing into the aorta (then to the body) from the aortic valve.

S3 and S4 are abnormal sounds that can be heard in heart failure

See the Cardiac Appendix for more information

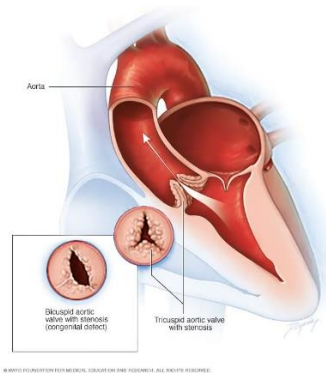
MURMURS: Just the Simple part

Murmurs are blowing sounds that indicate damage to a cardiac valve. **All murmurs need a refer to District Hospital NCD clinic/cardiology.** It takes a long time to gain excellent skills in listening to hearts. The more you practice the better you will become in understanding normal and recognize abnormal.

MURMUR TYPES: (Bold are the important murmurs that impact life significantly)

- **Aortic Stenosis**
- **Aortic Regurgitation**
- Pulmonic stenosis
- Pulmonic regurgitation
- Tricuspid stenosis
- Tricuspid regurgitation
- **Mitral Stenosis**
- **Mitral regurgitation**

Aortic Murmurs: very important to let the physician know if you hear a murmur 2ICS RIGHT of sternal border in aortic position. Harsh murmurs heard here are AORTIC STENOSIS until proven otherwise.

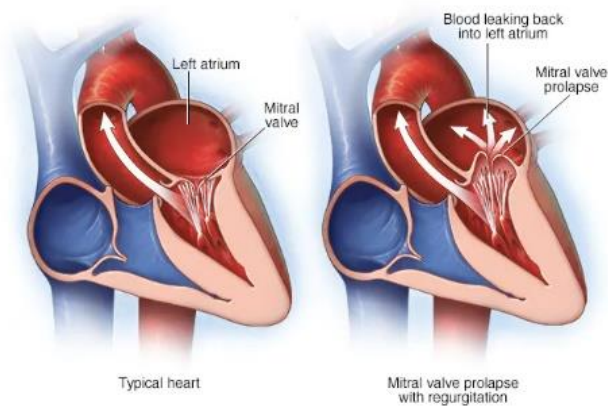


https://www.mayoclinic.org/-/media/kcms/gbs/patient-consumer/images/2014/09/08/15/22/r7_aorticstenosis.jpg

Symptoms of AS: dizziness, syncope (because blood cannot move well into aorta), fatigue, decline in functional capacity (the ability to walk/ exercise)

Mitral Murmurs are heard best at 5ICS left of sternal border and radiating left lateral to mid axillary. Can even hear on the backside of the chest.

Symptoms of severe MR/MS: Heart failure: Short of breath, orthopnea, edema, jugular vein distension, signs of fluid overload.



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https://www.mayoclinic.org/-/media/kcms/gbs/patient-consumer/images/2013/08/26/10/53/hb7_mitralprolapse.jpg

COMPLETE CARDIAC ASSESSMENT

HISTORY.

What question do you want to ask when assessing for ARF, RHD, or HF?

WITH ANY POSITIVE RESPONSE YOU WILL THEM COMPLETE A SYMPTOM ANALYSIS

INSPECTION:

- Odd skin color: Dusky, Grey, Pallor, bruising
- Clammy skin, diaphoresis (sweating)
- Obvious jugular vein distension
- edema
- discoloration to lower extremities with or without ulcer formation (venous stasis ulcer)
- Clubbing (widening and rounding) of fingertips

PALPITATION of heart

Heart: palpating the PMI

- PMI: Should be at 4-5 ICS MCL. Deviation from location, size (about 1 cm), or intensity indicates a change.

Abdomen:

helps to determine if N/V from gastritis vs cardiac

Asses for epigastric pain as a source for CP

Assessment for ascites

Check hepatojugular reflux

Check liver and spleen size

Pulses: Check both left and right at a minimum of three of the below sites

- Carotid (be gentle as you can cause bradycardia or syncope if you are too rough or check both at the same time)
- Radial
- Femoral (should learn to find as this is used in CPR)
- Posterior tibialis
- Pedal

AUSCULTATE the heart

- Use both diaphragm and Bell at all five sites
- Change patient position if you cannot hear and patient can move

COMMUNICATION

- Give immediate verbal report and request referral to cardiology
- new murmur or gallop if detected
- and/or rales (crackles) if detected
- chest pain/pressure or sensation of “doom” is expressed by the patient
- development of jugular vein distension

CRITICAL S&S THAT NEED IMMEDIATE ATTENTION & REFER TO DISTRICT HOSPITAL NCD CLINIC/CARDIOLOGY

VITAL SIGNS

- Pulse: less than 40 bpm or greater than 120 bpm
- B/P: systolic BP less than 80 mmHg or greater than 180 mmHg
- Resp: greater than 24 for adult
- Pulse Oximetry: less than 90% (unless a congenital heart failure patient, then less than 87%)

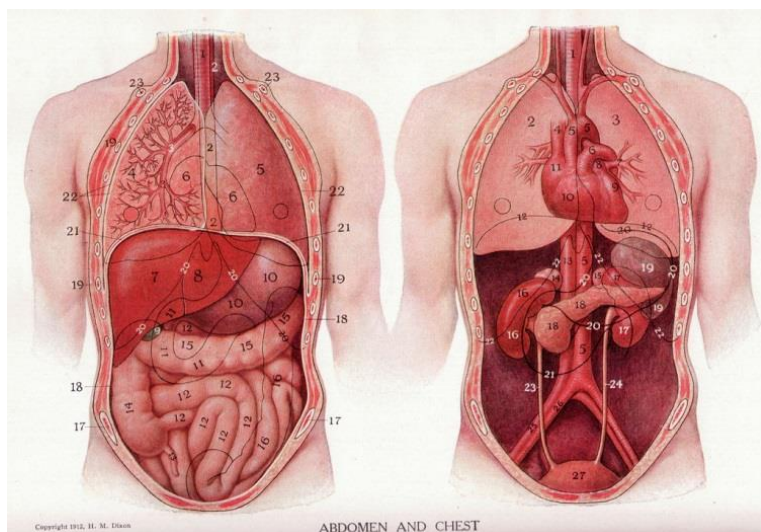
GENERAL APPEARANCE CRITICAL SIGNS

- Difficulty breathing at rest
- Cannot lie flat
- Lethargy/ hypotonia
- Heart Failure signs and symptoms

PHYSICAL EXAM CRITICAL FINDINGS

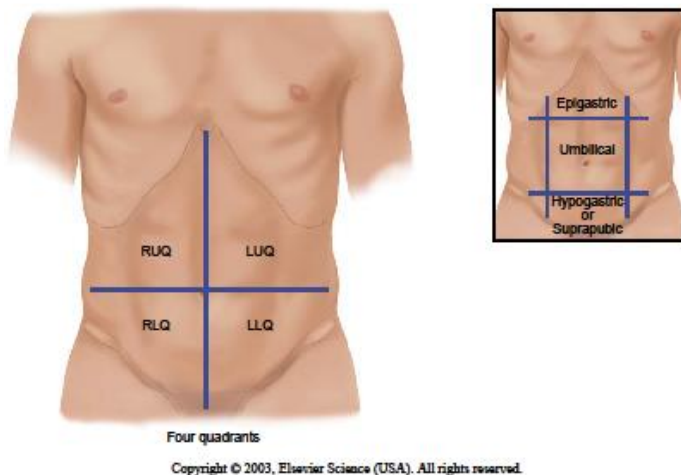
- Increased weight greater than 2 Kg in 4 days
- Bilateral rales (crackles meaning pulmonary edema)
- Edema- Ascites-Anasarca (there is 3 liters of fluid overload BEFORE you can actually see edema!)
- Distended neck veins (noted sitting up or at a 45 degree
- New or loud murmur
- Gallop S3 or S4
- Cyanosis

FOCUSED ABDOMINAL ASSESSMENT- HEART FAILURE



LANDMARKS

- Used for documentation
- Guide for visualizing the "sections"



HISTORY TAKING FOR ABDOMINAL ASSESSMENT

- Appetite
- Anorexia (does not want to eat)- common with advanced HF
- Early satiety (feels full quickly)- common with advanced HF
- Pain with swallowing (pharyngitis)- Hallmark for Strep Throat
- Abdominal pain (onset, when and fast or slow, full symptom analysis)
- Pruritus (itchy skin- changes in liver function can make the skin itch!)
- Change in skin color
- Nausea, Vomiting,
- Diarrhea (a component in viral infections)
- Does the abdomen feel "swollen"- ascites can be present in significant HF
- Past abdominal history
- Urinary frequency, urgency and nocturia (urinating at nighttime)

Cardiology & Abdomen

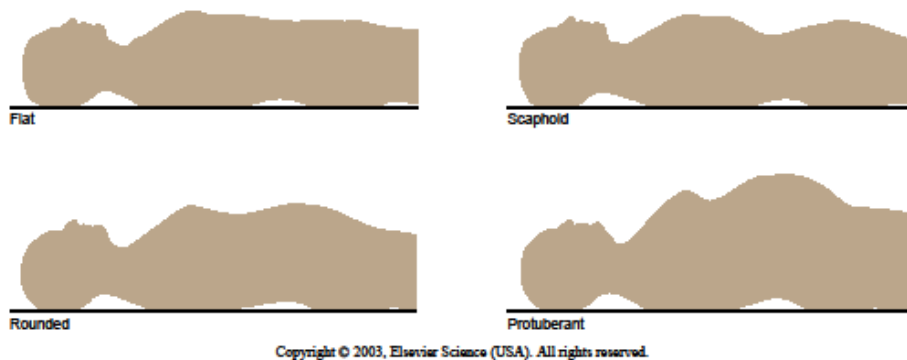
Liver involvement is common in chronic heart failure patients

- Right side fluid overload (#1 cause of right sided failure is left sided failure)
 - + JVD
- + liver engorgement causing:
 - SOB
 - Pain
 - Swollen Abdomen (ascites)
 - Nausea/Vomiting

The EXAM

INSPECTION

- Contour
- Symmetry
- Umbilicus
- Pulsation
- Peristaltic wave (GI obstruction)
- Skin
 - Lesions, scars, striae, turgor, trauma, color changes, texture changes

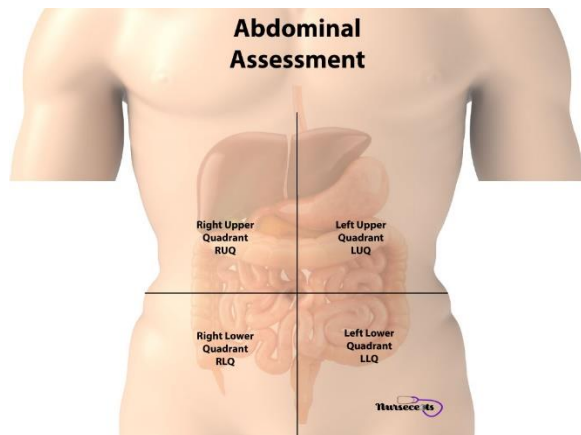


AUSCULTATE: Note the sequence change. **You should listen to the abdomen before palpating as you will stimulate the bowel once you palpate.**

Although, listening to the abdomen rarely adds to your cardiac assessment- the use of a stethoscope will help you diagnose and properly treat patients who arrive with concerns of abdominal pain or GI S&S.

- **Bowel Sounds**
 - Originate from the movement of air and fluid through the small intestine.
 - Describe as normal, hyperactive, hypoactive.
 - Borborygmus refers to "growling stomach"
 - It is normal to hear sounds every few seconds to one sound every 4-5 MINUTES!! You will need to use your clinical judgment to determine if "No BOWEL SOUNDS" as that would be a clinical emergency and the patient would be very ill.

- The Sound by pitch indicates “normopitch” or High –pitched (often heard with pending obstructions. SPLASHES can also be heard in acute abdomen such as twisted gut or obstruction.



CHANGES HEARD	SEEN IN....
<ul style="list-style-type: none"> ○ Increased bowel sounds ○ Decreased then absent bowel sounds ○ High-pitched tinkling bowel sounds ○ High-pitched rushing bowel sounds with cramping ○ Hepatic bruit (vascular sounds) ○ Arterial bruits (vascular sounds) 	<ul style="list-style-type: none"> ○ Diarrhea; early obstruction ○ Ileus, Peritonitis ○ Intestinal fluid; air under tension in a dilated bowel ○ Obstruction ○ Carcinoma of the liver; Alcoholic hepatitis ○ Partial obstruction of the aorta or renal arteries

PERCUSSION

KIDNEY: COSTOVERTEBRAL ANGLE: percussing the kidneys is an easy way to assess for kidney infection as infected kidneys are very painful when percussed!

○ Technique

- Place hand over 12th rib at the costovertebral angle on the back
- Thump hand with the ulnar edge of your other fist
- **Sharp pain occurs with inflammation of the kidney or in the paranephric area.**

ABDOMINAL PALPATION: Always start with a light palpation and start AWAY from the site of pain.

- Begin with light palpation then deep palpation.
- Identifies area of tenderness, muscle resistance and superficial organs
- Technique
 - Use one hand (washed and warmed, first four fingers), depress the skin approximately 1 cm gently
 - Make a gentle rotary motion, sliding the fingers and skin together; move in clockwise direction
 - For obese patients use both hands

DEEP PALPATION

- Determines presence of masses
- Findings should correlate with percussion

HEPATO-JUGULAR REFLUX

Have patient lay down with head of bed 30 to 45 degrees

Stand on patients' right side

Push upwards under right rib and watch for jugular vein distension

SPLEEN PALPATION

- Technique: ALWAYS be gentle as deep palpation of the spleen can cause rupture!
 - Start in the right lower quadrant and proceed diagonally toward the left upper quadrant.
 - Attempt to feel spleen with a light palpation technique
 - With each step, ask the patient to take a deep breath.
 - Feel for the tip of the spleen. It should feel soft and round. However, if the patient complains of pain STOP IMMEDIATELY as a swollen and inflamed spleen can rupture and the patient dies!

SPECIAL PROCEDURES

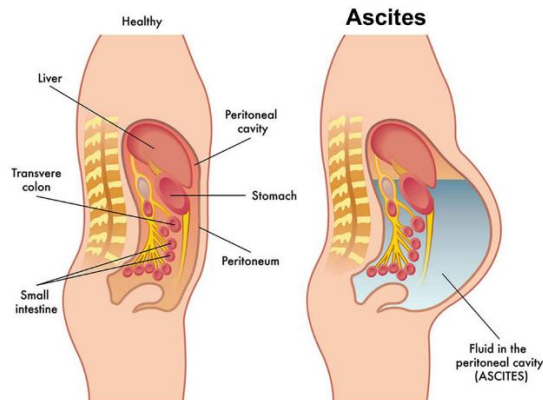
- **Fluid Wave**
 - Technique: one hand midline; left hand on patient's right side; right hand gives left flank a firm strike.
 - If ascites (fluid) present, strike will generate a fluid wave.
- **Rebound Tenderness**
 - Technique – Choose site away from painful area. Hold hand perpendicular to abdomen; push down slowly and deeply; then quickly lift up.
 - If pain is present = Blumberg's sign
 - Indicate inflammation of underlying organ. Common test for appendicitis
- **Murphy's Sign**
 - Positive if pain is elicited when palpating the liver. Person will abruptly stop inspiration midway.
 - Indicative of cholecystitis



- **Iliopsoas Muscle Test/ The Psoas test**
 - Technique – with patient supine; lift right leg straight up flexing at hip; push down over the lower part of thigh as person continues to lift up.
 - Positive if pain is felt; due to inflammation of the iliopsoas muscle
 - Indicates acute abdomen and physician/surgeon should be notified immediately, especially if fever or other abnormal signs
- **Obturator Test**
 - Technique – With the person supine, lift the right leg, flexing at the hip and 90° at the knee. Hold the ankle and rotate the leg internally and externally.
 - Positive test if pain is elicited.
 - Indicates acute abdomen and physician/surgeon should be notified immediately, especially if fever or other abnormal signs
- **Heel thump test**
 - The legs extended, thump the patient's foot with the heel of your hand in a brisk and firm fashion.
 - A positive test is if there is pain.
 - A Heel-thump test can be done in the standing patient by having them rise on their toes and then abruptly drop flat footed.
 - The jarring causes pain if the psoas muscles are inflamed. Indicates acute abdomen and physician/surgeon should be notified immediately, especially if fever or other abnormal signs

PERITONEAL SIGNS

- Rebound tenderness
- Positive Psoas, obturator, and/or heel thump sign
- Rigidity
- Involuntary guarding
- High pitched bowel sounds or absent bowel sounds
- Nausea/vomiting/ pain/fever
- **All indicative of peritoneal inflammation**



HEART FAILURE and Abdominal assessments- Signs and symptoms

- ✓ + ascites
- ✓ + decrease appetite and early satiety
- ✓ +H-J reflux
- ✓ Edema
- ✓ Itchy skin

EDEMA/ASCITES IN HEART FAILURE

- ❖ Cardiac ascites represents 5% of all causes of ascites.
- ❖ Diuretics and salt restriction remain the cornerstone of management.
- ❖ Ascites in the setting of heart disease occurs most frequently in patients with tricuspid valve disease and constrictive pericarditis.
- ❖ Initial insult is a decrease in the heart's ability to pump well with a decreased Ejection Fraction caused by valve damage, ischemic heart disease (a past heart attack), or a past viral insult to the heart muscle.
(Aisenberg GM, 2013).

Physical Examination for Acute Rheumatic Fever

General appearance

- Patients can appear tired
- Reports of odd behavior and emotions
- May have odd body movements that go away when the patient is asleep (chorea)

Vital signs

- Fever
- Normotension or Hypotension (if pericardium is involved)
- Tachycardia
- Tachypnea (if heart valves, pericardium or myocardium are involved leading to cardiac dysfunction)

Skin

- A rash can be present: Erythema marginatum is a pink-red rash frequently located on trunk, limbs, and seldom on the face, appearing as non-pruritic macules or papules extending centrifugally outwards with central clearing and raised outer margins

HEENT

- Epistaxis (usually accompanying severe carditis)
- Streptococcal pharyngitis (may or may not be present, yet a + history of recent sore throat)
- Dysphagia

Heart

Cardiac involvement is the second most common complication of rheumatic fever. Signs include

- Tachycardia
- Jugular venous distension, S3 or occasionally a summation gallop may be noted if the patient demonstrates congestive heart failure secondary to valvular or myocardial involvement
- Parasternal heave
- Cardiac murmurs if heart valves are involved; commonly regurgitant murmurs in acute rheumatic fever and valve stenosis in chronic rheumatic fever
- Pericardial friction rub and low intensity heart sounds (if pericarditis or pericardial effusion are involved)

Lungs

- Dull on percussion in presence of pleural effusion
- Decreased breath sounds may be noted in presence of an accompanying pleural effusion
- Basilar crackles may be heard on auscultation, suggestive of pulmonary edema

Neuromuscular

- Sydenham's chorea (St. Vitus' dance, occurring very late in the disease for at least three months from onset of infection)
- Spooning sign (flexion of the wrists and extension of the fingers when the hands are extended)
- Pronator sign (turning outwards of the arms and palms when held above the head)
- Inability to maintain protrusion of the tongue
- Milk maids sign (intermittent increase and decrease of hand grip pressure)

Abdomen

- Ascites (if heart failure and hypervolemia are present)

Extremities

- Arthritis, often large joints of lower limbs (knee and ankle joints) and upper limbs (elbow and wrist joints), and can be migratory in nature, affecting multiple joints at one time[8]
- Affected joints may be swollen, erythematous, warm, and tender
- Subcutaneous nodules in approximately 10% of rheumatic fever patients, usually appearing on extensor surface of limbs, and over bony prominences such as elbows, knees, ankles and knuckles, and are generally painless[1]
- Pedal edema possible if congestive heart failure and hypervolemia are present

Appendix for H&P

Physiology related to symptoms

Shortness of breath (SOB)/dyspnea on exertion (DOE)?	As fluid shifts from a failing heart, there is more edema in the myocardium and blood back up into the pulmonary system creating SOB, DOE, fatigue.
Change in functional capacity?	Increasing heart disease decreases one's ability to be active. Heart disease decreases activity at a faster slope and is noticeable in a few months.
SOB/cough when lay flat?	The supine position increases pulmonary congestion creating an increase in cough or SOB when flat.
Wake up during night with SOB?	A common symptom during acute flairs of fluid shifts
Chest pain/pressure/heaviness/other feelings that wax and wane?	Acute Coronary Syndrome and angina have a wide set of symptoms. It is important not to use "chest pain" as "pain" could be pressure, heaviness, discomfort, dull, or vague. Rarely is coronary pain described as sharp, stabbing, or zapping.
Any associated symptoms?	Associated symptoms can include nausea, sweating, weakness, shortness of breath, jaw pain, elbow pain.
Palpitations	Often irregular beats can be felt and cause symptoms of dizziness, SOB, pressure.
SOB when you bend over	When you bend over you change the pressure in the cardiovascular system and can create SOB
Edema to feet/legs/ abdomen	Fluid shifts and accumulates in lungs, abdomen (right sided failure) and legs/feet

HEENT Appendix

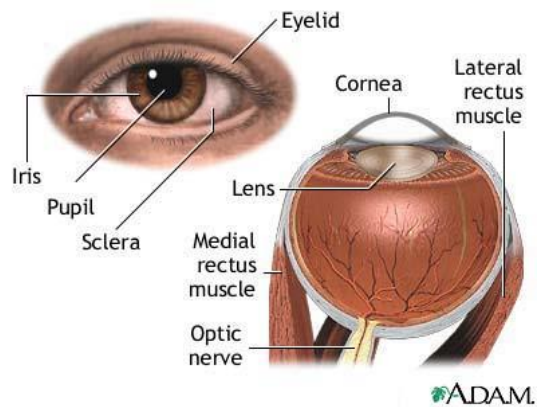
HEAD and NECK EMERGENCIES

If there is an HEENT emergency, it is your responsible to notify the physician in charge of the patient.

Notify the Doctor Immediately if:

- Patient describing acute onset of visual changes
- Patient complaining of sudden onset of severe headache and/or accompanied by vomiting
- Patient has swelling to face, lips, mouth
- Patient has onset of speech deficits, drooping of one side of face.
- Any bleeding from ears particularly after a fall or trauma to affecting head.
- Any bruising around ears and under eyes after trauma or fall affecting head
- Pain movement of neck with an upper respiratory infection and high fever
- Inability to swallow with a severe sore throat

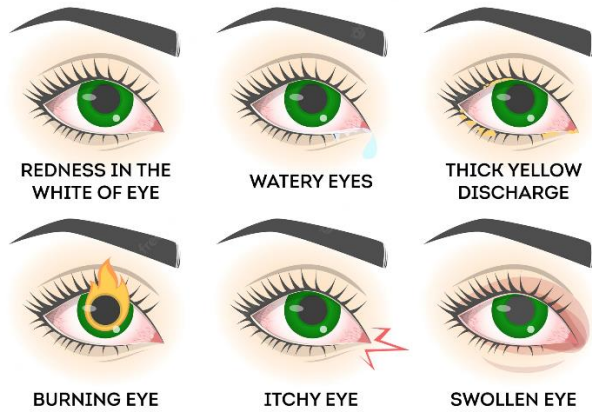
THE EYE ANATOMY



INSPECTION: EXTERNAL AROUND THE EYE

- Eyelids -
 - Characteristics of the skin (redness / edema)
 - Blepharitis - inflammation along the lid margins; drainage / crusting common.
 - Entropion - inward turning of the lid margin, with irritation of the cornea by the lashes.
- Eyelashes:
 - Sty - hair follicle infection

CONJUNCTIVITIS SYMPTOMS



- Position/contour
 - Protrusion of the eye
 - Exophthalmos (bilateral -Grave's disease (Hyperthyroidism); unilateral - ocular tumors)



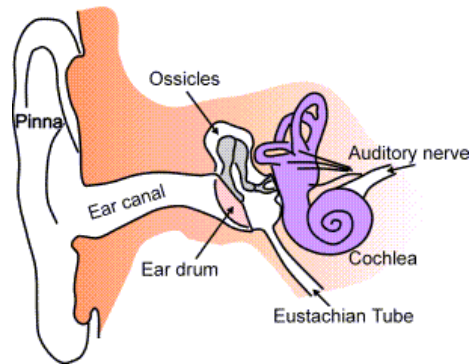
Image: <https://www.nidirect.gov.uk/conditions/exophthalmos-bulging-eyes>

- Lacrimal apparatus:

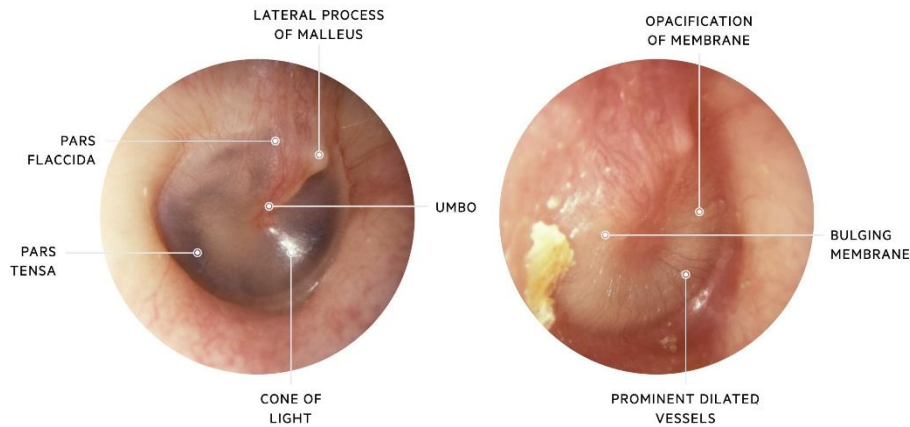
- Tearing and/or dryness of the eyes.
 - Increased tearing associated with inflammation and corneal irritation.
 - Assess for nasolacrimal duct obstruction.
- Sclera:
 - White, milky color
 - Vascular pattern
 - Assess for subconjunctival hemorrhage; jaundice; redness / inflammation - conjunctivitis.
- External ear:
 - Drainage, redness / inflammation.
 - Symmetry and setting in relation to eyes.
 - Assess for pain
 - **Movement of the auricle up and down, and pressure on the tragus (otitis externa).**
 - Palpation over the mastoid process (otitis media).

ANATOMY OF

EAR:



<https://app.pulsenotes.com/surgery/ent/notes/acute-otitis-media>



Cardiac Appendix

Additional Questions for Coronary Artery Disease Assessment

- Hypertension (HTN)?
 - HTH is a big risk for the development of coronary artery disease
- Diabetes
 - Diabetes is a big risk for the development of Coronary artery disease
- Smoker
 - Smoking is the number 1 risk of coronary artery disease
- Any family member with a heart attack
 - The development of plaque and CAD, can have a significant genetic component.

More information on Cardiac sounds, S1 S2 S3 S4

HEART SOUNDS:

The primary heart sounds are the first and second sounds, usually abbreviated as S₁ and S₂. Each sound is created when blood changes direction due to the closure of a valve

S1: THE MITRAL AND TRICUSPID

S1 is best heard at the apex of the heart at the point of maximum intensity (PMI) or 5th intercostal space midclavicular line

LOUD S1

- If the AV valves are wide open at the onset of ventricular systole, then the sound is LOUD. This is seen with a short PR interval
- Mitral stenosis (thick leaflets)
- Exercise, anxiety, fear
- Tachycardia
- Fever
- Anemia
- Hyperthyroidism
- Pregnancy

(Meyer, Gersh, & Yeon, 2021)

An interesting bit of knowledge:

S1 is very soft or absent when mitral regurgitation (MR) results from fibrosis and destruction of the valve leaflets (as in patients with rheumatic valve disease), which prevent effective M1. In contrast, MR due to perforation of the valve leaflets from bacterial endocarditis may not be associated with a reduced intensity of S1. (Meyer, Gersh, & Yeon, 2021).

S2 = AORTIC AND PULMONIC

- The sound(s) are created by the abrupt deceleration of blood flow associated with the closure of the Aortic valve (A2) and the Pulmonic valve (P2)
- The 2nd intercostal spaces both right and left are the locations to hear S2

ABNORMAL SOUNDS: S3 & S4

- In heart failure, or a change in the heart's ability to stretch and contract, extra sounds can be heard. There is a specific pattern
- Lub-dub...dub
- Dub...lub-dub
- All S3S4 need refer to District Hospital NCD clinic/cardiology

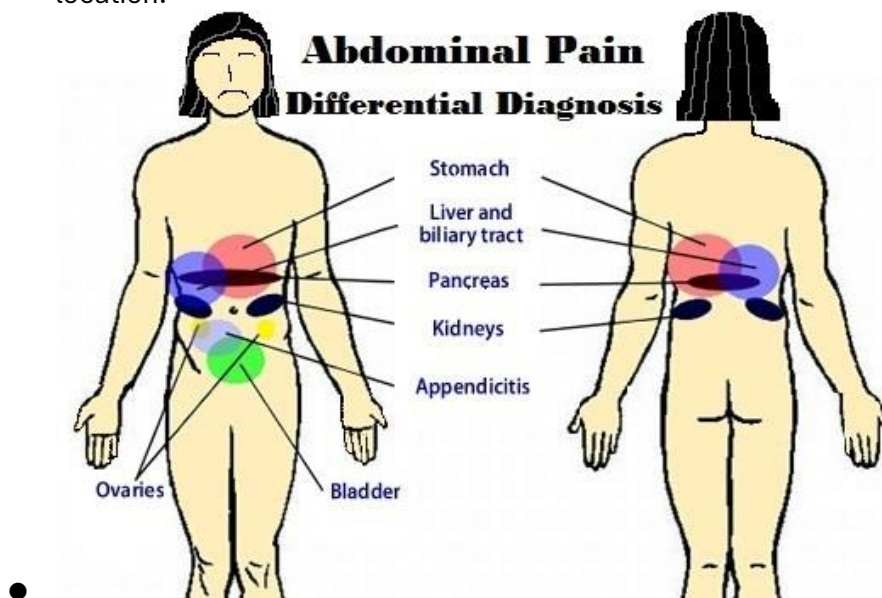
Physical assessments in cardiac pathological states

What	Rationale
Perfusion of Skin/mucous membranes	Dusky, cyanosis, or pallor can indicate a change in perfusion
Juglar vein reflux/distention	Provides a good assessment of fluid overload to right-side failure.
Carotid palpation and auscultation	People who are at risk, or have CAD are at higher risk for stroke. Check for a bruit.
<i>Cardiac assessment</i> Palpitation- thrill/heave/lift PMI location and size Cardiac sounds Does Apical pulse = radial pulse	Thrill/heave and lifts indicate increased pressure or cardiac size PMI deviation can indicate cardiomegaly S3S4, murmurs, rubs all provide valuable information If the Apical pulse and radial pulse are not equal, then an arrhythmia is present.
Abdominal assessment: hepato-jugular reflux	Positive hepato-jugular reflux indicates an engorged liver from right-sided failure and fluid

Spleen	<p>overload.</p> <p>An enlarged spleen can hold a significant amount of blood creating anemia with tachycardia and hypotension.</p>
Lower extremity edema/perfusion/clubbing	<p>Heart Failure and cardiomyopathies can result in lower extremity edema.</p> <p>Long term poor perfusion results in clubbing of the fingers and toes</p>
EKG: rhythms and 12 leads	<p>Rate: HF and cardiomyopathy often create tachycardia</p> <p>Rhythm: a common change in rhythm in HF is atrial fibrillation. It is the irregular-irregular rhythms and carries a high risk of clot (stroke)</p> <p>Heart attack: the 12 lead EKG has characteristic changes when there is ischemia or infarct.</p> <p>Hypertension. The EKG changes when the heart gets thicker due to HTN.</p>

ABDOMINAL PAIN: PAIN CAN BE REFERRED

- Abdominal organs are hollow, thus the pain location can be referred to another location.



ABDOMINAL EMERGENCIES

- Abrupt onset acute pain, especially if with vomiting
- No bowel sounds
- Abdominal Pain with hypotension and tachycardia
- Positive Psoas test with either positive heel thump and/ or Obturator Test

- Bright bleeding from mouth or rectum

HISTORY & PHYSICAL REFERENCES

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Skills Lab Checkoff

HEENT

Skill	Success	Needs work	Signature
Verbalizes inspections			
Oral pharynx inspection technique Has patient open mouth wide Uses a good light source Protects self and patient (gloves & handwashing) Proper use of a tongue depressor Verbalizes findings and what to expect in RHD			
Range of motion assessment and verbalization of next step with a painful ROM			
Palpation of the thyroid			
Check of trachea for midline and verbalization how a patient would present if trachea was deviated			
Assess for JVD Knows difference between semi fowlers and upright assessments Verbalizes positive findings for Heart Failure			

RESPIRATORY

Skill	Success	Needs work	Signature
Verbalizes general inspection			
Proper use of the stethoscope anterior, posterior, and RML			
Reports what they heard, and what to expect if it was a HF patient			
Has some understanding of wheezing			

HEART ASSESSMENT

Skill	Success	Needs work	Signature
Verbalizes general inspection of what to anticipate in patients presenting HF or RHVD that would indicate poor perfusion			
Can properly place a stethoscope in 4 spots Aortic 2ICS R sternal Border Pulmonic 2ISC L SB Tricuspid 4ICS LSB Mitral 5ICS MCL			
Can verbalize hearing S1 S2			

Can verbalize what a murmur sounds like and what is the NCD responsibilities when a murmur is heard (refer- echo/labs)			
Can find the PMI by palpation and knows what a left lateral deviation means			

Abdominal Assessment

Skills	Success	Needs work	Signature
Can verbalize the general assessment and contour			
Palpates appropriately- states always starts away from the pain			
Demonstrates technique for ascites assessment			
Uses the stethoscope appropriately and describes findings			
Can complete at least one test that indicates a potential surgical abdomen Heel thump Psoas abduction-adduction Leg lift against resistance			

