Rwandan Nurses Saving Lives
GG2459030 Final Report
Core Team- Country Expert level

The Core Team- Country Expert

The Nurses Saving Lives (NSL) project is structured as a Vocational Training Team (VTT) initiative focused on high-level knowledge and skill transfer. The educational design is grounded in Patricia Benner's *Novice to Expert* nursing theory, which describes progression through the stages of novice, advanced beginner, competent, proficient, and expert practice. Within this framework, the Core Team was intentionally developed to function at the *country expert* level for NSL content. Accordingly, the Core Team knowledge questionnaire was designed to assess advanced clinical reasoning, requiring critical thinking, differential diagnosis, and applied knowledge of pathophysiology and pharmacology relevant to the project.

The education and mentorship of the Core Team was conducted by the Lander Rotary club VTT. The original request was for 5 days of training. However, the Core Team felt they could achieve the training in 3 days. The Core Team had been participating in monthly zoom discussions with one module per month presentation. Thus, an agreement for 3 days for the Core Team was made. This decision became a valuable Lesson Learned. The recommendation is a Core Team training of 6 days.

The Core Team members are responsible to being the primary presenters of all conference modules, mentoring to the CCP, leading the virtual mentorship, reviewing submitted questionnaires, assisting in data management, participating in after action discussions after each conference, and being a project advocate.

Rwandan Nurses Saving Lives Core Team

1 Cardiologist and member of the Rwanda Biomedical Centre

1 Physician and District Hospital Director

1 Nurse, NCD nurse specialized in Cardiology and Echosonographer

1 Nurse, Master prepared, Executive Secretary of Private Clinics

1 Nurse, Master prepared, University of Rwanda School of Nursing Faculty

1 Nurse, Master prepared, NCD lead and echosonoghraper

1 Nurse, Echosongrapher and lead for nurse training, Team Heart

Core Team Questionnaire requirements:

1. Pre-post Core team training Knowledge
2. 18 month post training knowledge
3. Post skills

4. Virtual Mentorship after each Phase

Knowledge Questionnaire

Phase	# respond	Category	Instrument name	Data Type	Date
VTT training	7	Core team	Knowledge: Country-Expert Level	Quantitative	July 2024
18 months post	6	Core team	Knowledge: Country Expert Level- revised	Quantitative	December 2025

Summary: Core team Knowledge: Country Expert Questionnaire

Project Component

The Nurses Saving Lives (NSL) project is structured as a Vocational Training Team (VTT) initiative focused on high-level knowledge and skill transfer. The education for the Core team included expanded knowledge concerning the Streptococcus pyogenes pathogen, cellular changes in the autoimmune response, and pathophysiology of cardiac valve damage.

Project Component Evaluation

Evaluation consisted of a single quantitative knowledge questionnaire administered pre and post Core Team training. Following completion of the first District Hospital (DH) training in Phase 1, a comprehensive review was conducted comparing Core Team knowledge assessment results with observed teaching performance and the knowledge assessments of Certified Conference Presenters (CCPs) and Health Center Nurse (HCN) participants. This analysis identified specific content areas where additional education and mentorship were necessary to strengthen Core Team expertise. The mean score for the Core Team was 19.2 in Phase 1. In response, the VTT provided targeted supplemental education and ongoing support throughout Phase 1. Marked improvement was demonstrated in Phase 2 outcomes. The Country Expert Knowledge Examination was subsequently updated to include these identified areas to further evaluate knowledge retention.

At 18 months following the initial VTT training, Core Team knowledge scores ranged from 27 to 30 out of a possible 30 points, with a mean score of 28.7. These results demonstrate strong long term knowledge retention consistent with the country expert level.

Instrument Description

The country expert knowledge questionnaire consisted of 30 multiple choice questions, each with four response options. The instrument assessed key concepts across all six NSL educational modules, with particular emphasis on *Streptococcus pyogenes* infection, acute rheumatic fever (ARF), and the clinical assessment of heart failure.

(See Appendix: Knowledge Questionnaire)

Lessons learned and Recommendations

1. The Core Team successfully acquired the advanced knowledge and teaching skills required to deliver complex conference education independently and effectively.
2. A minimum of six days of Core Team education is recommended to allow sufficient time for in-depth discussion, practice presentations, and progression from proficient to country expert levels of practice.
3. Establishing an ongoing process for advanced scientific engagement with the Core Team is recommended, such as structured literature reviews or advanced clinical scenario discussions, to further support sustained expertise.
4. Country expert content and evaluation should remain context specific to the host country to ensure continued clinical relevance and applicability in daily practice.

Appendix: Results-Core Team Country-expert Knowledge Questionnaire

Highlighted answer indicates correct answer

1. A mother brings in her 14-year-old daughter and reports she is concerned because the child has been tired, complaining she cannot carry food home from the market because she is short of breath, and she does not sleep well. Her mother thinks she is depressed. The young lady says it is because she is getting "fat" and shows you her legs that are swollen. These are signs and symptoms of _____.
    a. A cardiac arrythmia
    b. Anxiety/depression
    c. **Heart failure**
    d. Vit B 12 deficiency

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
100%	100%	100%

    e.

2. Which treatment is appropriate for Streptococcal sore throat for prevention of acute rheumatic fever and rheumatic heart disease?
    a. **Penicillin**

b. Augmentin

c. Lidocaine

d. Gentamicin

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
100%	100%	100%

e.

3. Heart failure is a clinical diagnosis, what is the best diagnostic test to support the diagnosis of heart Failure?

    a. Chest x-ray

    b. **Echocardiogram**

    c. EKG- electrocardiogram

    d. Laboratory tests: CRP, H&H, T4, Troponin

    Note: Question changed in final exam to reflect what is available in Rwanda. **100% correct answer.**

4. The potential complications of Streptococcus infection include both suppurative (eg, peritonsillar abscess, otitis media, sinusitis) and inflammatory, nonsuppurative conditions. The inflammatory, nonsuppurative condition(s) can include:

    a. Acute rheumatic fever (ARF)

    b. Scarlet fever

    c. Acute glomerulonephritis (AGN)

    d. **All of the above**

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
71%	100%	100%

e.

5. Your patient with history of RHD and HfrEF (Heart Failure with reduced ejection fraction) has improved on medical therapy and her Left Ventricular ejection fraction is now normal. She wants to come off medications as they are expensive. You advise her to:

    a. Stop the most expensive medication

    b. Decrease doses of all her medications

    c. Cut her diuretic and after load reducer dose in ½

    d. **Make no change in her medications**

    NO ANSWER I

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
71%	86%	83%

6. A normal cardiac ejection fraction (the amount of blood squeezed to the body with every heart beat) is:

    a. 30-45%

    b. 40-55%

    c. **55-70%**

    d. 70-85%

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
71%	86%	100%

    e.

7. Streptococcus pyogenes, is the most common cause of bacterial pharyngitis in children and adolescents. Where is Streptococcus pyogenes normally found?

    a. The reservoirs are in cold, wet locations in the environment during cold months

    b. The reservoirs are found on poorly washed object like pens, pencils, or toys

    c. **The only known reservoirs are the skin and mucous membranes of humans**

    d. There are multiple reservoirs in man, animals, and environment

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
29%	100%	100%

e.

8. Polyarthritis is the major musculoskeletal manifestation in ARF, which joints are most affected?
    a. Fingers and toes
    b. **Elbows, wrists, knees, and ankles**
    c. Back and Hips
    d. All of the joints

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
86%	86%	100%

e.

9. Which valve is mostly affected by RHD?
    a. Aortic
    b. Pulmonic
    c. **Mitral**
    d. Tricuspid

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
100%	100%	100%

e.

10. RHD occurs from an immunologic response from the streptococcus pyogenes to cardiac tissue and production of inflammatory cytokines from an autoimmune response. This process is called, _____.

a. **Molecular mimicry**

b. Myosin carditis

c. Antigen crossover

d. Antibody tweaking

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
71%	100%	100%

e.

11. Carditis is a major cardiac manifestation of acute rheumatic fever, occurring in 50% to 70% of first episodes, and is associated with valvulitis. What physical findings would aid your diagnosis of acute rheumatic fever in a child?

    a. A rapid heart rate over 100

    b. Rhonchi that change with a cough

    c. **A faint radiating murmur**

    d. Unequal thoracic excursion

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
43%	71%	100%

    e.

12. When assessing for a potential Strep Throat, which of the following symptoms would make you consider this sore throat is NOT strep throat?

    a. A child who appears ill with a severe sore throat with red spots instead of white pus on tonsils

    b. **A child who appears ill with a severe sore throat and persistent cough and runny nose** IIIII I

    c. A child who appears ill with a sore throat and has been nauseated and vomited

    d. A child who appears ill with a severe sore throat and a very high fever

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
57%	100%	100%

e.

13. Which skin manifestations would indicate severe carditis due to ARF?

a. Painful, raised, red lesions that have a clearing in the center, uniform size of 1 centimeter

b. **Painless, firm, variable in size (typically between a few millimeters and 2 centimeters in diameter), and usually found over joint extensor surfaces.**

c. Painful and pruritic (itchy), flat lesions, red and irregular shape that are usually clumped together

d. Painless tiny (1-2 millimeters) red lesions scattered on back and chest.

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
0%	14%	100%

e.

14. Which of the following is NOT a function of the respiratory system?

a. Acid-base balance, initial response to bio active material, metabolism

b. Storage and filtration of blood for systemic circulation, phonation (speaking) IIII

c. **Activation of the respiratory lymph, mitochondria oxygenation, mucous production** II

d. Moistens and warms air, handles vasoactive substances in the blood

Pre VVT Training %correct	Post VTT training % correct	After 18 months %correct
		33%

e.

Note: This question was changed in final test to remove an all of the above" answer. This question was not understood well in the Core, CCP and HCN. 33% correct. At the country-expert level, should the Core Team know the full function of the respiratory system? In future Nurses Saving Lives project a better understanding of the Core Team Country Experts for RHD should be clarified.

15. Which valve open simultaneously to allow blood to flow from the atrium to ventricles?

    a. **Tricuspid and Mitral** II

    b. Tricuspid and Atrial

    c. Atrial and pulmonic

    d. Pulmonic and Mitral

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
86%	100%	100%

    e.

16. A mother brings a 9-year-old child to your clinic with reports of abrupt, purposeless, non-rhythmic, involuntary movements. She is also concerned of the child's emotional lability. The child reports muscle weakness. What is it and what exam do you want to do?

    a. **This is Sydenham chorea, and an EKG and echocardiogram are indicated to assess for carditis**.

    b. This is Vascular chorea, and a full mental and neurological exam is required to help determine if meningitis is developing.

    c. This is Infectious chorea, and full muscle-skeletal exam is required to assess for septic arthritis.

    d. This is Ballism chorea, and a psychological evaluation is required to determine if a psychosis is present.

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
43%	100%	100%

    e.

17. Which physical findings would be supporting the diagnosis of heart failure?

    a. Rales (crackles) in the left lung field and opening snap of the cardiac cycle

    b. **Decrease breath sounds in the bases and deviated PMI (point of maximum intensity**)

    c. A respiratory stridor and elevated jugular vein distention

    d. Rhonchi that do not change with cough and cardiac murmur

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
29%	29%	100%

    e.

18. Which symptoms should you ask about to help clarify if a child may have heart failure?

    e. Headaches, fever, shortness of breath

    f. **Not wanting to lay flay, swelling, fatigue**

    g. Sore joints, chest pain, cough

    h. Wheezing, dizziness, left sided pain

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
71%	71%	100%

    i.

19. What could the sound be like in a RHD mitral murmur and where on the chest do you hear it?

    a. A high squeaky sound heard 2nd intercostal space on left

    b. A high squeaky sound heard down the sternum 3rd and 4th intercostal spaces

    c. **A low-pitch muffling sound heard between the heart sounds heard at the point of maximum intensity**

d. A low-pitch muffling sound heard between the heart sounds heard down the 2nd and 3rd intercoastal spaces

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
43%	57%	100%

e.

20. What non-respiratory physical assessment can you do to assess fluid overload in a patient suspected of heart failure?

    a. Check the spleen size

    b. **Check for hepato-jugular reflux**

    c. Do a heel-thump for abdominal inflammation

    d. Check egophony for fluid sound transmission

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
86%	100%	83%

    e.

    Note: Both the abdominal assessment of H-J reflux and egophony were new skills taught to the Core Team. This question is seeking and understanding of pulmonary versus abdominal assessments. It was felt the country-experts should be able to differentiate.

21. You are sharing with a colleague about Mitral valve surgery options for RHD. Which is the correct statement:

    a. **A mechanical valve is best because the autoimmune response impacts the chordae tendae as well as the valve structure.**

    b. A mechanical valve is best because the removal of all scar tissue will prevent it from returning.

    c. A bioprosthetic valve is best because it lasts the longest.

    d. A mitral valve repair is best because only the annulus is impacted by the autoimmune reaction.

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
43%	43%	100%

e.

22. Why does the Streptococcus pyogenes M protein cause an autoimmune response in some people exposed to the bacteria?

    a. **M proteins share a structural homology with cardiac myosin, tropomyosin, keratin, laminin, vimentin, and valvular proteins.**

    b. M proteins are highly antigenic and cause an over response of T-cells which trigger massive inflammation.

    c. M proteins bind with proteins from the red blood cells creating a new large protein causing the antibody release of cytokines.

    d. M proteins respond to the M antibodies allowing the M proteins to break into smaller components that embed in the collagen throughout the body.

Pre VTT training %correct	Post VTT training % correct	After 18 months %correct
57%	86%	100%

e.

23. What is the most effective way to prescribe and administer the correct antibiotic every 3-4 weeks for long term treatment of Rheumatic heart Disease**?**
    a. Oral: once daily for 7 days
    b. Oral: twice a times a day for 7 days
    c. Oral: four times a day for 10 days
    d. **Intramuscular shot 1 every 3 -4 weeks**

    Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **100% correct.**

24. What is required for a clinical diagnosis of Strep Throat by the South African Strep Throat Tool?

a. Cough, sore throat, red throat, sore neck, runny nose
b. Fever, cough, sore throat, swollen lymph glands, swollen tonsils
c. **No cough, No runny nose, sore throat, swollen and pus on tonsils**
d. No cough, fever, sore throat, red throat, sore neck

Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **100% correct.**

25. How long after a streptococcus infection can acute rheumatic fever occur?
    a. 2-6 days
    b. **1-8 weeks**
    c. 3-4 months
    d. 1-2 years

Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **100% correct.**

26. The most important class medication for **all** heart failure patients is _____.
    a. Antiarrhythmic (Amiodarone)
    b. Antibiotic (Penicillin)
    c. **Diuretic (Furosemide)**
    d. Calcium Channel Blockers (Nifedipine)

Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **100% correct.**

27. What is the nature of ARF and RHD?
    a. Infectious diseases
    b. Congenital diseases
    c. **Autoimmune diseases**
    d. Neoplastic diseases

Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **100% correct.**

28. Which history question would provide the **best** information to assess for heart failure in a pediatric patient?
    a. Has your appetite changed?
    b. When you sleep at night, do you ever wake up gasping for air?
    c. Have you had any chest pain?
    d. **Tell me about your walk to school and playing sports**.

    Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **100% correct.**

29. The correct length for oral penicillin for the treatment of a streptococcus pyogenes infection is:
    a. 5 days
    b. 7 days
    c. **10 days**
    d. 12 days

    Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. 100% correct.

30. The newest literature concerning long-term monthly penicillin for children with severe heart failure reveals the safest practice is:
    a. **IM PCN every 3 weeks due to the ½ life of IM PCN**
    b. IM PCN every 4 weeks to keep HF clinic monitoring consistent with medication
    c. PO PCN every 3 weeks for ½ life management and consistent autoimmune suppression
    d. PO PCN every 4 weeks because of potential anxiety-induced vasodilation with IM injection

    Note: New question added from review of the CCP and HCN knowledge Questions with commonly missed question. Education and mentorship was provided to the core team to ensure correct education was provided to the CCP and HCN participants. **83% correct.**

Core Team- Country Expert level

Skill Questionnaire

Phase	# respond	Category	Instrument name	Data Type	Date
VTT training	7	Core team	Skills Questionnaire	18 Quantitative	July 2024

SUMMARY

The *Rwandan Nurses Saving Lives* initiative is a capacity building program designed to strengthen the clinical skills of frontline nurses serving as primary care providers within Rwanda's health centers. Consistent with Rotary's Areas of Focus in Disease Prevention and Treatment and Maternal and Child Health, this project emphasizes sustainable skill transfer, local professional development, and measurable improvements in clinical practice. The Core Team represents country level experts whose role is to ensure high quality training, mentorship, and long term knowledge retention throughout all program phases. Although the initial skills training scores were lower than expected, through direct observation leading to mentorship, education, and support from the VTT the Core Team Members become proficient in their ability to conduct and teach physical assessments.

Project Component:

This Nurses Saving Lives VTT is designed to provide education and training to frontline nurses working as primary care providers in health center of Rwanda. Both knowledge and skills needed to be transferred. This project component focused on the transfer of essential clinical examination skills required for the early identification and management of streptococcal infections, acute rheumatic fever, rheumatic heart disease, and heart failure. Training was delivered through a structured *Vocational Training Team (VTT)* process with emphasized hands-on, practical learning.

The Core team is comprised of 2 physicians and 5 mastered-prepared nurses. All were working with RHD patients and conducting physical exams. All voiced good to excellent physical exam skills. Thus, a modified training was implemented with small group, hands on scenario-driven skill practice. The physical exam components are based on a patient presenting with heart failure symptoms: HEENT, Respiratory, Cardiac, and abdominal. Direct observation of the VTT noted some members having difficulty, especially with the abdominal exam. The VTT then provided hands-on education and mentorship. The skills testing was completed by 1) a practicum exam: a direct observation of a scenario-driven physical exam; and 2) the written skills questionnaire,

Tool Component Evaluation

A single questionnaire utilizing a quantitative data format conducted pre and post Core Team training. After the completion of first DH training in Phase 1 and review and correlation of the Core Team's knowledge test, the observed teaching and the knowledge tests of the CCP and HCN participants, several areas were noted to require education and mentorship of the Core Team. The VTT provided additional education and support throughout Phase 1. Phase 2 showed great improvement in Core Team skills and ability to teach those skills to the CCP and HCN.

Program outcomes were evaluated using a standardized quantitative skills questionnaire administered pre and post training. Early Phase 1 evaluation identified specific gaps in Core Team skills and teaching confidence. These findings informed targeted mentorship and additional educational support provided by the VTT throughout Phase 1.

By Phase 2, measurable improvements were observed in both Core Team clinical skills and their capacity to effectively teach and mentor Certified Conference Presenters (CCPs) and Health Center Nurses (HCNs). This adaptive, data driven approach demonstrates Rotary's commitment to monitoring, evaluation, and continuous quality improvement.

Instrument description

The skills assessment instrument consisted of 18 standardized questions and was administered uniformly across all participant categories—Core Team members, CCPs, and HCNs. Using the same assessment tool across all training levels allowed for consistent measurement of skill acquisition, comparative analysis across cadres, and identification of system-wide educational priorities.

Results and Outcomes

Evaluation results demonstrated consistent improvement in physical examination skills among Core team across two VTT observed phases. While the Core Team entered the training with higher baseline knowledge compared to the CCP and HCN nurses, the initial Skills test supports the need to provide consistent education and mentorship of skills to all participants of this Global grant. After mentorship and practice the Core Team members proved to be excellent clinicians, highly skilled in physical exams, and excellent in providing education and support to nurses seeking to gain skills. In addition, the Core team members were paired with CPPs at every conference to

support and mentor their knowledge and skills gained. Post-conference experience questionnaires support the direct observation of the Core Team members as country experts in both knowledge and skills.

Key outcome themes from the skills questionnaire and direct observation included:

- Improved accuracy in identifying normal and abnormal respiratory and cardiac findings
- Increased competence in auscultation techniques
- Strengthened understanding of structured physical examination processes

Sustainability and Impact

By building advanced clinical skills in Core Team members, the project establishes a locally led, peer-to-peer education model that extends beyond the life of the grant. Core team members serve not only as educators during conferences but also as mentors of the District Hospital Certified Conference Presenters (CCP), reinforcing learning and promoting consistent standards of care which can be shared outward to other nurses. The Core team are advocates of the RNSL project as the country experts in the full spectrum of RHD and how nurses can save lives through using skills that aid the diagnosis of streptococcus infections, acute rheumatic fever, and rheumatic heart disease.

This approach supports long-term sustainability by:

- Reducing dependence on external trainers
- Strengthening district level clinical leadership
- Encouraging knowledge transfer within the existing health system
- Building project support with the Ministry of Health and Rwandan Biomedical Center

The measurable improvement in Core Team skills demonstrates progress toward Rotary's goal of creating durable, community owned solutions.

Recommendations:

Based on evaluation findings and observed outcomes, the following recommendations support sustainability and scale:

1. **Expand Core Team training** to include formal instruction skills, teaching methodology and peer mentorship for skill acquisition.
2. **Implement longitudinal evaluation**, including pre and post VTT assessments and follow-up evaluations at 12–18 months, to measure long-term skill retention.
3. **Continue professional support and mentorship** for CCPs and HCNs by the Core team through the *Rwandan Nurses Saving Lives* program, guided by skills assessment data to ensure targeted, needs based education.

Appendix: SKILLS QUESTIONNAIRE- Core Team Results

KEY:YELLOW = correct answer

1. When assessing for a potential Strep Throat, which of the following symptoms would make you consider this sore throat is NOT strep throat?
    a. A throat with red spots instead of white pus on tonsils
    b. A child with a persistent cough and runny nose
    c. A child who has been nauseated and may have vomited

	Results	% Correct
CORE TEAM	A=1; B=5; C=1	72%

RATIONALE: runny nose and cough are highly suggestive of viral infections and not related to strep infections. The South African Criteria included no runny nose or cough as requirements for a clinical diagnosis of Strep Throat. Children with strep with severe swelling can have nausea and vomiting. The red spots are petechiae which indicate Strep.

2. What HEENT physical finding would indicate an emergent need to refer to a physician to rule out meningitis?
    a. Fever greater than
    b. Pain with passive or active range of motion of the neck
    c. Ringing in the ears

	Results	% Correct
CORE TEAM	A=0; B=6; C=0=1;	86%

RATIONALE: simple ROM of neck causes pain because it moves the spinal column and is a medical emergency.

3. You are checking a child for Strep throat, but when inspecting the oral cavity, you cannot see well, what should you do?
    a. Have patient cough while you look
    b. Use a tongue depressor
    c. Hyperextend the neck

	Results	% Correct
CORE TEAM	A=0; B=7; C=0	100%

4. To listen to the breath sounds you need to use the _____ side of the stethoscope.
    a. Diaphragm
    b. Bell
    c. Either one will work well

	Results	% Correct
CORE TEAM	A=6; B=1; C=0	83%

5. To help you hear breath sounds better have the patient _____.
    a. Breathe slowly through the nose
    b. Breathe slowly through the mouth
    c. Breath forcibly through the mouth

	Results	% Correct
CORE TEAM	CORE TEAM: A=2; B=2; C=3	43%

RATIONALE: slow breathing allows fluid sounds to be faint. A forceful expiration allows sounds to be magnified.

6. The right middle lobe of the lung is heard _____
    a. At the middle of the back, right side
    b. Under the arm about breast level, right side
    c. At the middle of front chest, right side

	Results	% Correct
CORE TEAM	CORE TEAM: A=0; B=3; C=3; BLANK=1	43%

RATIONALE: The right lung has three lobes. The middle lobe is only exposed mid-axillary line and heard about the 4-6 intercostal spaces, or breast level. This is a critical landmark.

7. Which of the following are functions of the respiratory system?
    a. Acid-base balance
    b. Storage and filtration of blood for systemic circulation
    c. Inspiration, expiration, and ventilation
    d. All of the above

	Results	% Correct
CORE TEAM	A=0; B=0; C=0; D=7	100%

RATIONALE: these are the primary functional of the lung.

NOTE: Although, this bit of knowledge is important and the skills station is where the nurses learn this information, does this information impact the clinical work of RHD? This question was changed to remove the "all of the above" as it was learned that is, by tradition, the preferred answer. Changing the question reveal a gap in knowledge.

8. Fluid congestion in the lungs is common in Heart Failure patients. What does this HF fluid (pulmonary edema) sound like?
    a. Fine crackles like rubbing hair together.
    b. Water bubbles like blowing air in a straw in your drink.
    c. Louder wet sounds like fine rain hitting the roof.

	Results	% Correct
CORE TEAM	CORE TEAM: A=6; B=0; C=1	86%

9. You are listening to a patient and you hear abnormal breath sounds, what technique do you use to determine whether the fluid is in the lung versus the bronchial-tracheal tree?
    a. Have the patient cough and relisten, pulmonary edema will stay the same
    b. Have the patient take deeper breaths while listening, the fluid in the bronchial-tracheal tree will go away.
    c. Have the patient stand up and bend over 3 times to move the fluid and reassess, the pulmonary edema will go away.

	Results	% Correct
CORE TEAM	A=3; B=3; BLANK=1	43%

    d.

RATIONALE: Fluid in the can be fine or coarse. Coarse pulmonary edema sounds similar to rhonchi. However, having a patient cough will clear rhonchi. **This is an important skill to understand to complete a god resp exam and it impacts critical decision-making.**

10. When listening to the heart, which part of the stethoscope will allow the best sound transmission for murmurs?
    a. The diaphragm
    b. The bell
    c. The equalizer
    d. All parts are equal

	Results	% Correct
CORE TEAM	A=3; B=4; C=0; D=0	57%

RATIONALE: the sounds of murmurs are low pitch and heard best with the bell LIGHLTY placed on the chest. **This is a critical skill in the cardiac exam**.

11. When listening to the heart, which part of the stethoscope do you use to hear the normal (lub-dub) heart sounds best?
    a. The diaphragm

b. The bell

c. The equalizer

d. All parts are equal

	Results	% Correct
CORE TEAM	A=4; B=1; C=0; D=2	57%

e.

RATIONALE: The pitch of the sounds created from blood changing direction when valves open and close are high-pitched and are best heard with the diaphragm firmly placed on the chest in proper location**. This is a critical skill of the cardiac exam.**

12. When listening to the heart, how many different locations do you need to listen to for a complete assessment?

a. 2

b. 3

c. 4

d. 5

CORE TEAM NOTE: Both C and D are correct
NCD: A=0; B=0; C=3; D=3 NOTE: Both C and D all are correct
RWAMAGANA: A=0; B=3; C=0; D=41
BYUMBA: A=1; B=0; C=1; D=32; BLANK=3

	Results	% Correct
CORE TEAM	A=0; B=0; C=2; D=5	100%

RATIONALE: You need to listen as a minimum to every valve: Aortic, pulmonic, tricuspid, and mitral (4 locations). However, you can add the Erb's point where "lub" and "dub" sound the same (5 locations).

Note: This question became problematic as the Core Team, as country-experts, was taught the 5 points. However, in teaching HCN participants who needed to learn only normal versus abnormal required a simple version. The 4 location points are only required. In future Nurses Saving Lives project, teach only 4 locations.

13. You are having troubles hearing the heart sounds clearly, what can you do so you can hear better?

a. Have the patient cough before listening to the heart

b. Have the patient lean forward while listening to the heart

c. Have the patient run in place to increase the heart rate before listening

d. Have the patient hold their breath while listening to the heart

	Results	% Correct
CORE TEAM	A=0; B=3; C-0; D=4	43%

e.

RATIONALE: If you cannot hear the heart sounds well, you can have the patient lean forward bring the heart closer to the chest wall and therefore louder. **This is a critical skill to improve the ability to hear heart sounds.**

*If you cannot determine if a rubbing sound is from the heart or lungs, then have the patient hold their breath.

Note: This gap in knowledge/skill of the Core Team clearly influenced the skill and knowledge development of the HCN participants concerning this topic.

14. What physical exam supports the diagnosis of an enlarged heart and heart failure?

a. You can feel for an enlarged point of maximum intensity- it will be big and deviated left

b. You can assess for jugular vein distension

c. An abnormal cardiac exam with a loud murmur in the mitral location

d. All of the above

	Results	% Correct
CORE TEAM	A=2; B=0; C=0; D=5	29%

e.

RATIONALE: A heart that is both enlarged and in failure will always have a left lateral deviated PMI that is big. However, JVD is related to fluid overload and well treated HF patients with an enlarged heart can be well managed on medications and have no JVD. Likewise, not all enlarged hearts or HF have loud murmurs.

NOTE: This gap in knowledge/skill of the Core Team clearly influenced the skill and knowledge development of the HCN participants concerning this topic.

15. When you are making a referral to the District hospital NCD clinic for a cardiac murmur, what do you need to communicate to the NCD nurse concerning the murmur?

a. Location: NOTE FOR HC NURSES THIS IS THE ONLY REQUIREMENT

b. Intensity

c. Radiation

d. All of the above: ALSO CORRECT IF LEARNED AND MENTORED (EXPERT LEVEL)

Note: A and D are correct from different perspectives

NCD: A=1; B=0; C=0; D=5 Note: A and D correct from different perspectives
RWAMAGANA: A=2; B=0; C=0; D=42
BYUMBA: A=11; B=0; C=0; D=25; BLANK=1

	Results	% Correct
CORE TEAM	CORE TEAM: D=7	100% Expert perspective

RATIONALE: for a CORE TEAM, or a trained NCD nurse, then correct grading of a murmur should be provided. However, for a HC nurse the location (indicating valve), soft/loud (intensity), and if it is also heard in the neck or back (radiation) is sufficient.

NOTE: Both A and D are appropriate for HC nurses depending upon their knowledge, skills, and confidence levels. This should be discussed and supported during the mentorship as a distinct topic.

16. You suspect that your patient has carditis, what can you do to confirm the sound is from the heart?
    a. Have the patient cough before listening to the heart
    b. Have the patient lean forward while listening to the heart
    c. Have the patient run in place to increase the heart rate before listening
    d. Have the patient hold their breath while listening to the heart

	Results	% Correct
CORE TEAM	A=0; B=0; C=0; D=5; BLANK=2	71%

e.

RATIONALE: The rubbing sounds of pericarditis and the pleural friction rub are similar in character. However, one is heard with breathing and the other by the heart contracting. If you cannot determine if a rubbing sound is from the heart or lungs, then have the patient hold their breath. Thus, if the sounds are still heard, then it is the heart.

Carditis is a common finding in ARF and the primary time of the autoimmune process that involves the entire pericardium. As ARF becomes RHD the impact isolated in the valves. Thus, this is an important physical exam skill.

Note: This skill did not get transferred well to the HCN participants.

17. Which abdominal assessment can be done to help your decision concerning fluid overload?

    a. Check for an enlarged spleen

    b. A heel-thump test

    c. Check for hepato-jugular reflux

    d. All of the above

	Results	% Correct
CORE TEAM	A=0; B=0; C=4; D=3	57%

RATIONALE: Hepato-jugular reflux is related to fluid: if the heart cannot handle the excess fluid, it can be pushed backwards to the liver. If the liver is compressed and there is fluid overload, then the fluid will be pushed into the jugular and can be seen. The heel-thump test is for inflamed intestines, and an enlarged spleen is related to past infections.

18. You are caring for a child with complaints of abdominal pain. You what to rule out a surgical emergency. What assessments can you do?

    a. Listen to bowel sounds

    b. A heel-thump test

    c. A Psoas test

    d. All of the above

	Results	% Correct
CORE TEAM	D=7	100%

    e.

    RATIONALE: A full exam is needed to determine the level of emergency- listening to bowels sounds to abnormal (amount, pitch, none) aid critical thinking; the heel-thump and Psoas test are simple test that indicate inflamed intestines and are highly indicative of an abnormal emergency.

Core team- Virtual Mentorship

Phase	# respond	Category	Instrument name	Data Type	questions
1	6	Core team	WhatsApp Evaluation	Mixed	9 Likert 2 open ended
2	4	Core team	WhatsApp Evaluation	mixed	22 Likert 2 open ended
3	5	Core team	Virtual Mentorship	mixed	20 Likert 10 strengths 3open ended

Executive Summary

This novel Virtual Mentorship has proven highly effective and has been well received by the Core Team, Certified Conference Presenters (CCPs), and Health Center Nurses (HCNs).

Phase 1-Byumba, Rwamagana, and Kagabaga
Category: Core
Dates: Sept 1-Nov 1
Locations: Virtual via the WhatsApp platform.
Phase 2- Kabguyi and Kabogora
Dates: Feb 1-April 1
Locations: Virtual via the WhatsApp platform.
N=4 [2 are missing (1 nurse and 1 physician)]
Phase 3- Nyagatare and Gatunda
Dates: Dec1-March 15
Locations: Virtual via the WhatsApp platform.

Project Component: The Virtual Mentorship component was designed to provide continuing education and support to the Health Center Nurses (HCNs) while promoting the Certified Conference Presenters (CCPs) as knowledgeable and enabling presenters to review skills, provide mentoring, and encourage continued application of the knowledge and techniques taught. The WhatsApp platform was used to deliver this Virtual Mentorship. WhatsApp is widely used in Rwanda and is a primary tool for text-based communication. This novel approach provided two months of post-conference support via personal mobile phones, with the intent of helping HCNs maintain active use of conference skills and reinforce good clinical habits during the immediate post-training

period. The Core Team designed the content and delivery approach for the Virtual Mentorship. For implementation, each Core Team member was paired with a CCP to co-lead mentorship for a group of six HCNs. These WhatsApp groups (one Core Team member, one CCP, and six HCNs) were established during the skills training to initiate relationships prior to the virtual component. Given its near-universal use in Rwanda, WhatsApp was recommended by the Core Team as the platform of choice.

Project Component Evaluation: A single questionnaire utilizing a mixed data format. Submission was after the completion of the mentorship.

Summary of Phase 1, Phase 2, and Phase 3

Review of the Likert-scale domains indicates that the Virtual Mentorship has the capacity to continue building trusting relationships after the conference. It is important to note that teams (one Core Team member, one CCP, and six HCNs) were established during the conference. After reviewing Phase 1 Virtual Mentorship results, it was apparent that relationships were improving. Therefore, in Phase 2, teams were intentionally established at the beginning of the conference based on table groupings (chairs arranged in groups of six) and color-coordinated name tags. This process allowed participants to complete interactive aspects of the conference within their established WhatsApp groups. The intent of this approach was to strengthen relationship building and increase participants' sense of belonging before the conference ended.
In Phase 1, the Core Team rated empowerment related to stethoscope use at 3.34, whereas in Phase 2 it increased to 5.0. The domain of critical thinking also improved. The Phase 3 form has only been completed by two Core Team members to date; however, these data will be valuable to obtain in future Nurses Saving Lives projects.

Conclusion: The WhatsApp-based Virtual Mentorship process is effective; with continued implementation, mentors are expected to become increasingly effective.

Lessons Learned and reccomendations:

1. The Virtual Mentorship appears to be a novel tool that can be implemented easily, and all three groups (Core Team, CCPs, and HCNs) reported positive experiences.
2. Develop the Virtual Mentorship 8-week modules during Core Team training to allow Core Team members to create country-specific scenarios with technical oversight from the VTT for accuracy and completeness (building scenarios and providing the evidence-based rationale and discussion points for critical thinking is complex).
3. In addition to knowledge and skills, the Virtual Mentorship appears to have fostered relationships, communication, and confidence among all participants.
4. Use the Phase 3 form in the future.

Appendix- Compiled data All Phases Virtual Mentorship

Phase 1 Quantitative Data Analysis
Instrument description – this questionnaire was developed to assess how the Core team members felt the impact of a virtual mentorship to the nurse participants. The quantitative data was limited to a Likert scale 0 (no impact) to 5 (high impact).
See appendix for instrument.

P1 Results

1.Building trust relationships = **4.5**
2.Improving communications = **4.3**
3. Increasing knowledge = **4.0**
4. Remembering key concepts = **4.3**
5. Discussing scenarios = **4.6**
6. Mentoring critical thinking= **3.88**
7. Sharing successes/cases = **4.5**
8. Encouraging use of stethoscopes = **3.34**
9. Empowering Nurses = **4.5**

Phase 1 Qualitative Data Analysis
It was important to gain an understanding of the potential of using a post-conference WhatsApp platform in the virtual mentorship component. This is important information for the Rwandan MOH and the Rwandan Biomedical Center to consider virtual mentorship for remote nurses in maintain and increase knowledge and skills via a highly accessible platform. Two open-ended questions were posed.

P1 Results:

1. Do you think the WhatsApp mentorship is a good tool for Rwanda?
   All six Core Team members reported the Virtual Mentorship was important and should continue both in NSL and be considered for other educational opportunities in Rwanda. Common themes were low cost effective, time saving and time management, and easy accessibility for Health Center Nurses (HCNs). Yet, it was also noted as a platform to build relationships:

   "Because WhatsApp mentorship helps to share the experience, knowledge and skills with the team members, the cost is not too much."

2. What would make it better? The common theme to improve was to add face-to-face visits (this is a component of the On-site Mentorship by the CCP to a select group of HCN participants). The physician acknowledged that the entire on-site component should be done by nurses to promote nurses using the stethoscope.

   One Core Team member shared, “It is a better communication method, but can be improved by close coordination and setting suitable time and hours for chatting.”

Phase 2

Rationale for Questionnaire change: After Phase 1 where all respondents (Core, CCP, and HCN) had the same evaluation it was felt that individualizing each group to better understand the mentorship process would be beneficial. Questions concerning confidence before and after the mentorship were added.

Phase 2 Quantitative Data Analysis

Instrument description- The tool expanded to 22 unique Likert scale questions from 0 to 5.

Results

Likert #1: How did mentoring health center nurses using WhatsApp benefit you?

1.Building trust relationships 4.5
2.Improving communications 4.5
3. Increasing knowledge 4.5
4. Remembering key concepts 4.5
5. Discussing scenarios 5.0
6. Mentoring critical thinking 4.75
7. Sharing successes/cases 4.5
8. Encouraging use of stethoscopes 5.0
9. Empowering nurses 4.75
10. Gain confidence in understanding the pathology of disease processes 4.5

Likert #2: How did your confidence level change over the course of your training and mentoring of Health Center Nurses (HCNs)?

11. Before training 3.0
12. After training, providing instruction, and mentoring Health Center Nurses (HCNs) 5.0

Likert #3: Please indicate/rank which areas are your strengths as a mentor for Rwandan Nurses Saving Lives.

13. Building trust relationships 5.0
14. Improving communications 5.0
15. Increasing knowledge 5.0
16. Remembering key concepts 5.0
17. Discussing scenarios 5.0
18. Mentoring critical thinking 5.0
19. Sharing successes/cases 5.0
20. Encouraging use of stethoscopes 5.0
21. Empowering Nurses 5.0
22. Frequently and readily available 5.0

Phase 2 Qualitative Data Analysis

Instrument description: The first question was kept the same to determine whether Core Team members had additional insight into the platform or process in Phase 2 as their experience and comfort with this novel Virtual Mentorship increased. The second question sought to understand how each Core Team member supported HCN participants during the 8-week post-conference period.

P2 Results

1. Do you think the WhatsApp mentorship is a good tool for nurses? Why? Although time and cost were mentioned by all, improved communication was mentioned by the Core Team members included: Easy Communication; Anytime, Anywhere; Promotes Continuous Learning; Builds a Strong Support System; Cost-Effective and Accessible; Enhances Patient Care; Strengthens Teamwork & Networking; Allows for Documentation & Resource Sharing; and Flexible & Inclusive Learning.

2. How do you think you helped an HCN gain knowledge or skills during the eight weeks after the conference? 100% of the respondents did not answer the question; Yet they answered the follow up question: What would make it better? All mentioned increasing the length of the virtual component, providing clearer objectives and guidelines, and recognized the challenges of the busy clinician.

   P2CORE2 ""To increase the period of WhatsApp mentorship because both mentee and mentors are always busy in their daily work, the time of exchanging ideas was somehow challenging."

Phase 3

In reviewing the Virtual Mentorship delivered via the WhatsApp platform, we assessed the availability of Core Team members to support CCPs and evaluated reported strengths after implementation across three phases. Unfortunately, only five of the original seven Core Team members completed a questionnaire, and two respondents completed the Phase 2 form instead of the Phase 3 form. As a result, only two Core Team members completed the intended Phase 3 instrument.

Rate the following 0-5 on impact: "0" is none, "3" is average, "5" is high impact

Using a 05 scale (0 = no impact; 3 = average; 5 = high impact), please rate the extent to which the WhatsApp mentorship promoted the following outcomes:

	Avg score	1 = Low Impact	2	3 = Average	4	5 = High Impact
1.Building trusting relationships between Certified Conference Presenters (CCP) and Health Center Nurses (HCN)	4.4				III	II
2.Improving communications, between CCP and HCN	4.6				II	III
3. Increasing knowledge of the Health Center Nurses	4.4			I	I	III

4. The Health Center Nurses ability to remember key concepts	4.5				II	II
5. The CCP and HCN ability to discuss meaningful scenarios	4.0			I	III	I
6. The CCP ability to encourage and mentor critical thinking of the HCN	4.0				IIIII	
7. Sharing successes/cases between CCP and HCN	4.2				IIII	I
8. The ability of the CCP to encourage the use of stethoscopes by the HCN	4.0			I	III	I
9. The ability of the CCP to empower the HCN	4.6				II	III

10. Were you frequently available to mentor CCPs or HCNs? Frequently Sometimes Rarely

- N=2 on the correct form. 3 responded on Phase 2 form

FREQUENTLY	SOMETIMES	RARELY
	II	

-

Mentorship challenges: Indicate any difficulties you experienced during the WhatsApp mentorship (mark Yes" for all that apply).

- Only 2 used correct form

Barrier to my availability to mentor	YES	NO
11. Family commitments decreased the time I had to devote to this mentorship		II
12. I am too busy at work to add WhatsApp mentorship during the workday	II	

13. I can only respond at nighttime after work		II
14. No CCP or HCN ever asked me for help or mentorship		II
15. I did not have internet access		II
16. I did not think there was a need to reach out to the CCP or HCN to check on their progress		II
17. Scenarios are too difficult to mentor		II
18. Other: NO COMMENT	II	

-

How did your confidence change over the course of your training and your mentorship of Certified Conference Presenters (CCPs) and Health Center Nurses (HCNs)?

- N=2

Rate the following 0-5 on how much the mentorship increased your confidence level. “0” is none, “3” is average, “5” is high benefit

19. Before training	3.0
20. After training, providing instruction, and mentoring health center nurses	4.5

Please indicate which areas were your strengths as a mentor:

- N=2

Areas of Strength	**Place a check mark in this column if this was a strength of yours**
21. Building trust relationships	II
22. Improving communications	II
23. Increasing knowledge	II
24. Remembering key concepts	II
25. Discussing scenarios	II

26. Mentoring critical thinking	II
27. Sharing successes/cases	II
28. Encouraging use of stethoscopes	II
29. Empowering Nurses	II
30. Frequently and readily available	II

-

31. Do you think the WhatsApp mentorship is a good tool for nurses?

100% reported “Yes”

32. Why?

P3CORE1. “WhatsApp mentorship works successfully in Rwanda because it employs a platform that people are familiar with, trust, and use on a regular basis. It lowers barriers such as travel costs, facilitates the exchange of opportunities and advice, and makes mentorship more consistent and scalable.”

P3CORE4. “High Accessibility: The Rwandan use smart phone and the networks is available. Improved Engagement of the participants. It is not expensive compared with other methods.”

33. What can make this WhatsApp mentorship better?

P3CORE1. “Understand mentorship objectives and planned discussion subjects. Smaller targeted groups to improve participation, periodic live sessions or voice notes to strengthen connection, tracking impact (skills obtained, jobs secured, enterprises created), and inclusion of mentors from different sectors and areas. Share memorable anecdotes from your threads. Members started peer-mentoring one other, demonstrating that the approach fosters community rather than providing one-way guidance.”

P3CORE3. “Learn mentorship goals and structured discussion themes, Smaller focused groups to improve engagement, Periodic live sessions or voice notes to deepen connection, Tracking impact (skills gained, jobs secured, businesses started),Inclusion of mentors from different sectors and regions Share impactful stories from your threads.”

34. What process do you think Team Heart, RBC, or the MOH should use to apply the WhatsApp model to other healthcare education projects?

P3CORE2. “ Develop standardized content guidelines; train healthcare staff and educators.”

P3CORE5. “Create a national digital health education framework; develop standardized content guidelines; train healthcare staff and educators.”