

Connecting the dots: Rwanda's digital Healthcare Revolution

Dr. Rahamthulla Shaik PharmD, OpenHIE case study Intern, Global Health Informatics

Regenstrief Institute

Rwanda's healthcare system faced challenges with managing patient records. Patient records were scattered across various facilities, making it difficult for healthcare providers to access a complete view of a patient's health history. Inability to access a patient's history of care can lead to challenges in understanding the full picture of the patients' courses of treatment.

Challenges

- Duplicate tests
- Lack of care continuity
- Manual data entry

Solution

An innovative solution, known as the Rwanda Health Information Exchange (RHIE), was adopted by following the OpenHIE architecture and standards to bring all the scattered records together, creating a single, seamless network.

Imagine being able to see a continuous record of care, tracked seamlessly across different facilities and systems where a patient received treatment. This is the essence of the Health Information Exchange (HIE) solution. It supplied healthcare providers with up-to-date information, enabling informed decisions and personalized care through the introduction of interoperability:

- Centralized resources
- Interoperability layer
- Point-of-service applications

Benefits:

Patients also benefited from the introduction of Health Information Exchange. They could move from one healthcare facility to another without worrying about lost records or repeated tests.

- Unique ID
- Informed clinical decision making
- Continuum of patient care across facilities

Challenges in implementation:

While implementing this HIE system, challenges emerged in optimizing performance, ensuring scalability, and training healthcare workers. With perseverance and innovative solutions, they successfully navigated these challenges.

Solutions applied:

To address these challenges, optimization strategies were systematically implemented to enhance system performance and maximize resource utilization. This involved fine-tuning the system configurations, optimizing database queries, and implementing caching mechanisms to reduce data retrieval times. Additionally, robust deployment architectures were established, incorporating load balancing and failover mechanisms to ensure the system's resilience against increased demands and potential failures. To monitor and maintain system performance, advanced monitoring tools were deployed to provide real-time insights into system health and performance metrics (About the OpenHIM | OpenHIM, n.d.). Alongside these technical enhancements, comprehensive training initiatives were rolled out to equip healthcare professionals with the necessary skills and knowledge to confidently navigate and utilize the system effectively. These multifaceted approaches fostered widespread adoption, proficiency, and ensured uninterrupted service delivery (Mamuye et al., 2022).

Trends and progress:

Rwanda's Total Facilities targeted: 197, Total facilities deployed:150 (Crichton et al. (2013)

Rwanda is using [OpenHIM](#) as the interoperability layer, facilitating seamless data exchange between various electronic healthcare systems. It acts as a central hub, managing transactions, transforming messages to meet system requirements, and orchestrating the flow of data (Negro-Calduch et al., 2021). This tool helps the health care providers to track the transactions from Electronic Medical Records (EMRs) and other point-of-care systems to the Shared Health Record (SHR). With its user-friendly and visual dashboards, OpenHIM is a valuable tool and its strengths lie in supporting system administrators, enabling them to effectively monitor and resolve technical issues that may arise in the interoperability layer¹.

Occasionally, facilities face difficulties in transmitting data, which may arise from factors such as interruptions of internet connectivity, data loss, or incompatible file formats. In response, Rwanda utilized monitoring tools to systematically investigate and rectify these data transmission issues (Jembi Health Systems, 2016). This proactive approach ensures the integrity and completeness of the data submissions.

What are the Challenges and Benefits?

Sometimes patients visit healthcare practitioners and may not be able to convey all the details about their health. Healthcare providers rely heavily on the information provided by patients to diagnose and treat medical conditions. Accurate and complete information is crucial to avoid potential inaccuracies in treatment.

However, challenges can arise, such as duplicate tests, where the same information is entered more than once. This duplication poses challenges for everyone involved in the healthcare process and underscores the importance of accurate and efficient data management.

Rwanda:

Rwanda experienced similar challenges with data in their health care facilities.

This is how the interoperability architecture operates

In Rwanda, each person gets their own special ID number for their health data across the facilities. Due to this system, there is now just one health record and one basic information record that can be shared everywhere in the country. This unique health record promotes efficient data sharing, improving patient care, and enhancing safety. Additionally, it simplifies administrative processes, ensures data accuracy, and supports research and population health management, all while maintaining patient privacy and security.

For Healthcare providers, this is a game-changer. They can see a summary of the patient care. In Rwanda, the implementation of unique patient ID systems, namely NIDA, CRVS, and UPI, has been meticulously designed to ensure accuracy and reliability. NIDA is a national population registry which caters to each and everyone, and its validity is verified through the NIDA system. It is also integrated with the CRVS system which caters for the registration of all vital events including births, marriages, and deaths. This is validated through the CRVS system. The UPI, formatted as YYMMDD-FOSAID-RAND4, is generated by the UPI service connected to the client registry and undergoes validation by the client registry. These rigorous verification and validation processes ensure that the IDs are accurate and trustworthy, enhancing the integrity of the Health Information Exchange system (Mamuye et al., 2022).

Future Plans:

The following plans are underway to enhance the RHIE:

- Patient Empowerment- To provide patients with secure access to their personal health records.
- Enhanced Public Health Monitoring- To implement disease surveillance to track and analyze health data.
- Research and innovation support: To facilitate studies and innovations to advance healthcare quality and outcomes.

Summary

Rwanda's HIE architecture journey, from experiencing challenges in optimizing performance, ensuring scalability, and training healthcare workers to building and sustaining interoperability, serves as an example of the transformative power of technology in global health. By boldly confronting challenges and embracing implementing innovation, Rwanda has not only revolutionized its own healthcare landscape but also is now a real-world example for others who are hoping to do the same and face similar challenges.

References:

1. “About the OpenHIM | OpenHIM.” *Jembi.github.io*, openhim.org/docs/introduction/about.
<http://openhim.org/docs/introduction/about>
2. Mamuye, A. L., Yilma, T. M., Abdulwahab, A., Broomhead, S., Zondo, P., Kyeng, M., Maeda, J., Abdulaziz, M., Wuhib, T., & Tilahun, B. C. (2022). Health information exchange policy and standards for digital health systems in africa: A systematic review. *PLOS digital health*, 1(10), e0000118.
<https://doi.org/10.1371/journal.pdig.0000118>
3. Crichton, R., Moodley, D., Pillay, A., Gakuba, R., & Seebregts, C. J. (2013). An architecture and reference implementation of an open health Information mediator: enabling interoperability in the Rwandan Health Information Exchange. In *Lecture notes in computer science* (pp. 87–104). https://doi.org/10.1007/978-3-642-39088-3_6
4. Negro-Calduch, E., Azzopardi-Muscat, N., Krishnamurthy, R. S., & Novillo-Ortiz, D. (2021). Technological progress in electronic health record system optimization: Systematic

review of systematic literature reviews. *International Journal of Medical Informatics*, 152(1), 104507. <https://doi.org/10.1016/j.ijmedinf.2021.104507>

5. Mamuye, A. L., Yilma, T. M., Abdulwahab, A., Broomhead, S., Zondo, P., Kyeng, M., Maeda, J., Abdulaziz, M., Wuhib, T., & Tilahun, B. C. (2022). Health information exchange policy and standards for digital health systems in africa: A systematic review. *PLOS Digital Health*, 1(10), e0000118. <https://doi.org/10.1371/journal.pdig.0000118>

6. About the OpenHIM|OpenHIM (n.d.). Jembi.github.io.
<http://openhim.org/docs/introduction/about>