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Community of Interoperability Labs: Pragmatic Approach to Achieving Interoperability

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Abstract. To achieve interoperability of health data, stakeholders must overcome various socio-technical challenges. The "Mind the GAPS, Fill the GAPS" framework was created by the Asia eHealth Information Network (AeHIN) in 2017 to help countries with their challenges with interoperability. A year later, AeHIN formed the Community of Interoperability Labs (COIL), a group of labs from six countries to share knowledge and resources. Since interoperability requires data exchange between disparate entities, it is imperative to establish a trustworthy space where stakeholders can come together and solve their common problems. The networked learning approach of the COIL makes possible the potential for interoperability within and between countries contributing to national and international understanding.

Keywords. Digital health, interoperability, standards, governance, architecture

1. Introduction

The Covid-19 pandemic highlighted the importance of secure and timely data sharing to prevent the spread of the disease across borders. Unfortunately, there were no formally established protocols for such sharing prior to the pandemic [1]. The Asia eHealth Information Network, an informal peer learning network, was created by WHO in 2012 to help countries with their digital health development. AeHIN proposed that an interoperability laboratory is an effective way to build consensus and understanding on

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such protocols. A lab provides a central facility for government, private sector, and the academe to collaborate on the creation, testing, and connection of digital health tools. The first six labs were identified at the AeHIN General Meeting in Colombo in 2018. At the Asia Pacific Association on Medical Informatics (APAMI) 2022 conference in Taiwan, these labs, now numbering eight, agreed to send a powerful message to governments in Asia to invest in these interoperability labs to quickly build capacity for secure data sharing. These country-level efforts can then be pooled and used to source funding for pan-Asian investments in digital health infrastructure and in developing protocols for use in times of global emergencies [2].

2. Methods

The AeHIN convened the Community of Interoperability Labs (COIL) at the APAMI 2022 general conference in Taipei last October 15, 2022. The COIL members agreed to adopt and develop the AeHIN framework "Mind the GAPS, Fill the GAPS" as its message for governments to focus on their Governance, Architecture, People/Program Management, Standards and Interoperability [3]. COIL further expounded the GAPS framework by identifying four domains of cooperation for interoperability labs:

- Knowledge sharing on Governance - Document and formalize country health data governance standards and practices in line with local legislation (data custodianship & privacy legislation, indigenous data sovereignty, etc.) and their alignment to regional and global initiatives
- Knowledge sharing on Architecture - Identify and formalize reusable patterns (knowledge) between regions and communities (and between countries) relating to the International Patient Summary (IPS), health data governance, and healthcare delivery services [4]
- Knowledge sharing on Program Management - Document and formalize the healthcare service delivery landscape in each country, region, city, and local community (services, collaborations, staff, funding models, insurance/payment integration, etc.)
- Knowledge sharing on Standards and Interoperability - Develop localized protocols by extending internationally-agreed frameworks

3. Results

Eight interoperability labs participated and seven presented their current state and needs based on the GAPS framework and the four domains of cooperation. With regards to domain #2 (*Knowledge sharing on Architecture*) the HL7 International Patient Summary was selected as the AeHIN Core Regional FHIR profile. The discussions during the conference are detailed in Table 1.

Table 1. Summary of the COIL 2022 session: Capabilities and Needs of each interoperability lab.

Country / Lab	Capabilities/Contributions	Needs
HDIIL (Hong Kong)	Electronic Health Record Sharing System and eHealth program implementation experience	Funding support, tools, development and analysis talent, and healthcare users for the trial run of the model and platform developed from the Lab

SIL-Indonesia	FHIR profiling for certain use cases Training for health facilities on FHIR/HL7 for Satusehat and for students (graduate program)	Lab governance and dedicated interoperability team
SIL-Laos		Training on technologies and digital Frameworks such as OpenHIE, HL7-FHIR Infrastructure to host interoperability layer Guidance on setting up each building block in OpenHIE with currently existing systems. Guidance on steps to implement standards and interoperability
ANZIL (New Zealand)	Educational resources on e-Health interoperability for developers International Patient Summary in C# and Javascript versions	
SILab (Philippines)	Commercial FHIR Server Terminology Server license for regional use (Ontoserver)	Mapping ICD-9-CM to the national procedure code - Relative Value Scale (RVS)
SIL-LK (Sri Lanka)	Steward of a common registry of activities and capabilities in the different laboratories	Develop regional communities of practice around OpenHIE building blocks
SIL-Taiwan	Personal Health management platform mCode FHIR Profile and Implementation Guide for data exchange	International testing environment
SIL-Thailand	Primary Care FHIR Profile and Implementation Guide Can serve as a model on institutionalization	

4. Discussion

Based on the capabilities and needs of each country, the four knowledge-sharing domains and the connected use cases can be built with contributions from the members.

4.1. New *Zealand*

The Aotearoa New Zealand Interoperability Lab (ANZIL) adopts S23M's model-oriented domain analysis and engineering (MODA + MODE) methodology for evolutionary design, and leverages S23M's Care Platform, which provides a shared formal meta-model and terminology for these domains [5]. The resulting information structures (model instances) can be made freely accessible to all COIL labs and all AeHIN members via a suitable Open Source license. After an initial technology investment on the first stage of the initiative, expenses shift to operational costs for use of the Care Platform Software-as-a-Service (SaaS) subscription service.

4.2. Philippines

The University of the Philippines Manila Standards and Interoperability Lab (UPM-SILab) focuses on supporting the needs of the government (Department of Health and PhilHealth) by formulating a training program that enables policymakers to convert their narrative policies into their computable representations following the WHO SMART guidelines [6]. In 2022, UPM-SILab helped create the Fast Healthcare Interoperability

Resources (FHIR) for the national viral hepatitis initiative and its accompanying implementation guide. In 2023 and with support from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), UPM-SILab will implement Ontoserver to manage the Philippine terminology.

4.3. Thailand

The Standards and Interoperability Lab Thailand (SIL-TH) will be utilizing Ontoserver and together with UPM-SILab will explore different approaches for regional-level governance in terminology services. In addition, SIL-TH has been working on FHIR profiles for monitoring the active medications of patients.

4.4. Taiwan

The Standards and Interoperability Lab Taiwan (SIL-TW) will provide overall information architecture development experience, including information engineering, architecture design, and code adoption experience in the integration of health insurance and medical information. SIL-TW can create personalized information integration mechanisms and data connection application technology through an integrated information architecture. In addition SIL-TW can leverage Taiwan's strength in the collection, integration, cleaning and value-added applications of medical data.

4.5. Hong Kong

As a stakeholder in Hong Kong's e-health sector and the service partner of Hong Kong's electronic Health Record Sharing System (EHRSS) since 2013, eHealth Research Institute (EHRI) will partner with different experts and regional and international organizations to establish the Health Data Interoperability & Incentivization Lab (HDIIL), also a member of the COIL. Though Hong Kong has developed the Hospital Authority's Clinical Management System since 1990 and has developed and implemented a territory-wide public-private electronic Health Record Sharing System since 2016, numerous limitations and challenges remain. Certain health data between public and private sectors are inter-accessible but not interoperable.

4.6. Sri Lanka

Sri Lankan Standards and Interoperability Lab (SIL-LK) is working towards setting up a National Summary Electronic Health Record (NEHR) by making the three predominant Electronic Health Records in the state health sector institutions interoperable. Sri Lanka has already published the minimum dataset to be submitted to the NEHR by EMRs. In close collaboration with the Ministry of Health Sri Lanka, SIL-LK is developing the necessary Sri Lanka Core FHIR Profiles. Provider, Facility, and Client Register profiles have been already prepared. It is also working on setting up an Open Concept Lab as the Terminology Server in support of the NEHR objectives.

4.7. Lao PDR

The Standard and Interoperability Lab Laos (SIL-Laos) will play a pivotal role in driving forward the evolution of interoperability standards for digital health systems, fostering an atmosphere conducive to enhanced information exchange, and producing and sustaining interoperable digital health solutions. It will enable the implementation of the minimum electronic medical record (EMR), ICD10 standards, as well as the National Health ID. In the short term, SIL-Laos will facilitate the adoption of enterprise architecture through The Open Group Architecture Framework (TOGAF), establishing the necessary infrastructure, building capacity and validating data exchange between current systems like EMR, DHIS2, reimbursement, M-supply, and so on.

5. Conclusions

Interoperability, while desirable, is a very complex endeavor. To simplify the process, AeHIN developed the "Mind the GAPS, Fill the GAPS" framework for easy remembrance of the important components. Member labs of the newly created AeHIN COIL have adopted and extended the GAPS framework to guide collaboration and build trust among members in the region [7]. By creating a learning network of these country interoperability labs, knowledge dissemination is hastened and in turn, the potential for regional interoperability is made possible.

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