White Paper

Healthcare interoperability on FHIR

Collaborative Open Source Project for Teleconsultation during COVID pandemic

NCII

NATIONAL
COLLABORATIVE
INITIATIVE FOR
INTEROPERABILITY

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1.0 Background :
Indian Healthcare IT

1.1 The common root cause

When it comes to IT adoption, Healthcare globally has at times picked up behind other industries, in comparison with manufacturing, banking/ finance and other mature service sectors. India is not an exception. Private sector health insurance is struggling and bleeding over a decade and Government health insurance is just making a debut, targeting BPL population. It is not a surprise that the Care providers work in silos and have own priorities ahead of larger good for the community as a whole.

1.2 Who will pay for the healthcare automation: Struggle for Informatics vendors

A large number of players in this unregulated sector, Indian healthcare informatics solution providers need mature and organised Payer to steer automation within the provider sector to manage the Herculean task of integrated Care delivery using digitisation. In the absence of the Payer, the Care providers in India have a very minimalistic IT budget (if at all they have a budget!) and many Indian providers are still scratching the surface of internal digital transformation. Patient and community centric Care ecosystem, on the contrary, needs a holistic view enabled by interoperable systems to prioritise and manage with limited resourced and get the optimal outcomes. So the vicious cycle continues.

1.3 Dormant pool of health informatics experts in export business

Developed economies have more than 5% spend on IT and more than 80% of the population covered by insurance through the governments or the employers. Interoperability use cases that go well beyond the internal digital transformation are identified and standards that facilitate interoperability are adhered to.

India ironically has not only the awareness but also the necessary technical skills but also the expertise on account of massive IT /ITES industry that caters to healthcare informatics needs of these mature ecosystems. However, we have no clue how to apply the same for benefit of the Indian counterpart.

1.4 Need of repeating 'Project Mangal Yaan' (Mission Mars) in healthcare :

Considering the delay that has already taken place and increased burden of care with the onset of the pandemic, India cannot probably afford to learn from the mistakes while transforming the Care ecosystem and needs to do it right, the very first time. Be innovative and simultaneously very pragmatic.

2.0 Problem definition :

Healthcare Interoperability and India

2.1 Mindset of IT industry

Usually internal digital transformation and interoperability with external systems evolve simultaneously. But without the Regulators actively endorsing and the Providers not insisting on the interoperability, typical mindset of the vendors is not to invest or work proactively on interoperability features, unless a very strong use case is encountered that justifies the efforts commercially. In unregulated sector, standards / accreditation, are likely to create entry barriers for new entrants that makes the situation worse. Tender specifications in public sector undertakings / government many times over specify the standards to create unfair advantage for a few. This destroys the original intention of the standards of making it all inclusive.

It is not that the interoperability is non-existent in India. HIS-RIS/PACS integrations have been implemented using HL7 2.x and DICOM 3.x and well documented, way back since 2004-05. There is no shortage of technical skill sets and ability to adopt the standards by Indian vendor community but it has been more reactive than proactive. The above use case (RIS / PACS / HIS interoperability) was compelling enough and did not need collaboration of the vendor community for it needed very little or no localisation of the standards / international profiles.

However, for the rest of the Care delivery and associated interoperability, the vendor community remained fragmented, ignorant and rather in a competitive than a collaborative mode.

2.2 Role of the regulatory and delay in laying down the framework

In the past four years, we have seen many regulations that have been rolled out by various government bodies. Prof. Supten in his introductory remarks about the Connectathon 2020, told us about the ITIH, 2003 – that talked about a Legal Framework, Standards & Education. In 2013, we had the first draft of the EHR Standards which was then updated again in 2016. In 2017 we had the National Health Plan, 2017, laying out the roadmap to the use of technology in the delivery of healthcare in India. For a brief while we had the DISHA - Draft Act on Information Security, sometime in 2018 and finally the ministry pulled that draft back for the data security and privacy to be governed by the Draft Personal Data Protection Bill, 2018 and the outcome of the recommendations of the Srikrishna Committee delivered a report and a draft bill. Most recently, we have the MoHFW, Government of India rollout the National Digital Health Blueprint that spoke about using FHIR Standards as a Healthcare Information Interoperability Standard and talked about setting up of the National Digital Health Mission which will oversee the rolling out of these standards in India.

The approach by the regulatory, swerved from a centralised model of EMR repositories / data exchanges under government control to a distributed / federated data model just like Banking sector; keeping only the consent management for data access under the radar of the regulatory bodies. This left the vendor community in a perpetual sense of uncertainty and exclusion.

2.3 Limited role of Standards organisation / informatics associations

There is a large proportion of export business of Indian ITES sector, that needs formal training of healthcare interoperability standards, as applicable to the developed market, especially the USA. This has been the focus of the Indian chapters of the standards organisations such as HL7. Therefore, the localisation of the standards and activities like India specific profiling of the data models, are still in progress. Nodal agencies like NRCeS are creating awareness and drive for participation of Indian vendor community.

There are associations promoting medical informatics, and a number of associations representing clinicians, consultants for protecting their rights and voicing their concerns but none was able to facilitate medicolegal validity of telemedicine until COVID pandemic created a sense of urgency within the Regulator to bring in the change.

2.4 Localization of the standards

Standards are not universal. Owing to variation in the Care ecosystems across the geographies, the standards vary, depending on the local needs. However, there are many common aspects of the standards, that are universal. There are common 'best practices' adopted in other geographies that deserve notice and evaluation for replicating in other geographies as well. Lack of inclusivity of local vendors creates a smaller group working on localization out of either academic interest or myopic view of commercial interest.

2.5 Incorrect priority of the use case and interoperability: Patient data privacy and Consent Management

Sometimes, a quicker success in other business verticals of interoperability may mislead the healthcare interoperability. A typical example is the financial transactions through payment gateways and the associated authentication or consent management by the data owner. This is a good candidate for rapid adoptions of interoperability in banking sector, but applying the same to healthcare might prove to be a costly mistake. The consent, for access to the health records, that pertains to the data privacy aspect, if pushed ahead of addressing accessibility/ affordability of Care and improving clinical quality /outcomes, might prove disastrous.

This precisely seems to be happening in India and urgent course correction is needed.

3.0 The solution

3.1 Initiative- by the Community, for the Community

Some problems do not have a quick fix. Problem such as interoperability needs standards to be followed by different systems that interoperate to create substantially meaningful outcome. Standards are evolved by collaboration that brings together players who otherwise compete but come together for the larger good.

The programmers and health informatics technocrats in India have been at the farthest end of this change and are involved only for implementation of the policies that are driven by the Bureaucrats or the Hospital administration. This community in India, however, has a big advantage of gaining exposure to the Care ecosystem, processes and standards of the other countries mainly the US and European markets. They additionally have witnessed the process of evolution, including failures of some of the standards and long-term benefits that interoperable systems offer to the community at large. Some of them also have exposure of Indian ecosystem that managed with little or no standardisation / regulatory framework. The strength of this community was neither acknowledged / leveraged in India.

Passion and perseverance are key ingredients of the success and there is always a small beginning for every change. National Collaborative Initiative for Interoperability (NCII) was just a small group that took a different route to solve this multifaceted riddle. It unleashed the strength of the tech-community or the geeks, and dared them to challenge themselves with this riddle.

3.2 Need of a compelling use case

COVID pandemic has some positive side effects too. The regulation and legal framework in India have been the main hurdles for adoption of telemedicine by practitioners. The pandemic facilitated the necessary regulatory changes in a very short time, that the leading association - Tele-medicine Society of India, struggled to influence for years. Telemedicine is and will be one of the key solutions that would bridge the gap in Care demand and supply during and post COVID era.

Telemedicine in India owing to the above restrictions, remained as a tool only for the follow up cases where the patient discharged from the hospital need not travel long distances to have follow up consultations. Such sessions are typically integrated with the Appointment Schedule of the Consultant seldom have on- demand-access to the doctor when needed. Some of the applications that are intended for doctor's appointment have not made substantial progress in terms of effective telemedicine, despite access to large funds.

NCII redefined the problems by pooling the demand and pooling the supply that increases possibility of instantly matching the two.
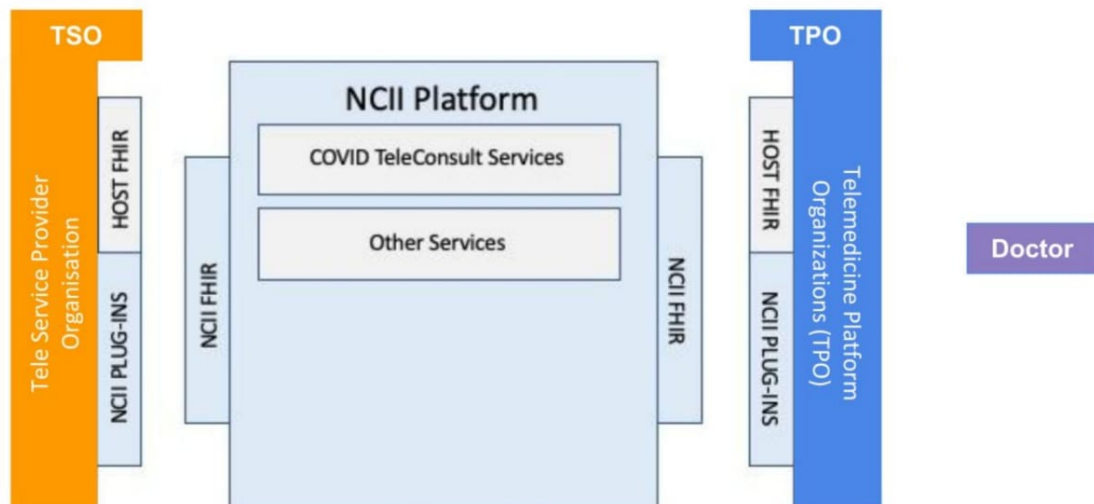
This was a classic case of interoperability wherein there are more than 350 Apps / telemedicine platform organisations or TPOs in India, that facilitate remote interaction / examination by doctors. Many of them face a bottleneck of finding a doctor when the patient needs an urgent Consultation.
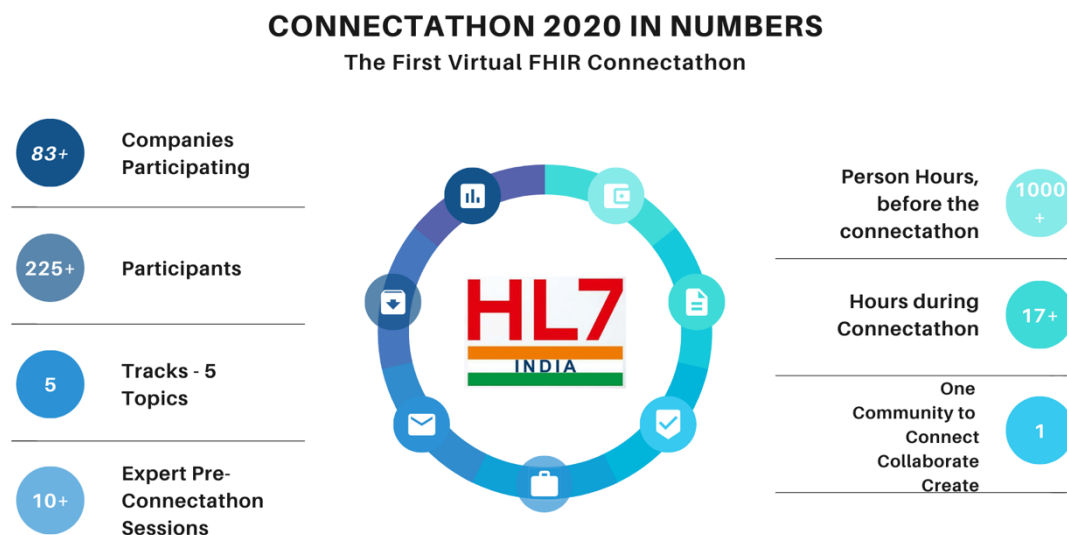
At the same time, there are many COVID hospitals / Fever Clinics, Quarantine centres, Home quarantined population, that struggle to instantly connect to a qualified clinician for assessing the patient that may lead to sudden COVID 19 complication especially with co-morbidities. These are represented by TSOs in the schematic above.

3.3 Timely launch-pad : FHIR connectathon by HL7 India

HL7 India planned the first FHIR virtual Connectathon in India and the technical committee considered the use case, that NCII has been already working on, as an exclusive Track for the event namely: 'COVID teleconsultation Track', along with the Learner's Track. The Learner's Track is a common track in Connectathons. This combination provided a blend of challenge along with awareness and learning.

FHIR standard typically suited the use case proposed by NCII and the response exceeded expectations of HL7 India and NCII, both.

3.4 Channelling the positive energy of the geeks

CONNECTATHON 2020 IN NUMBERS
The First Virtual FHIR Connectathon

83+ Companies Participating
225+ Participants
5 Tracks - 5 Topics
10+ Expert Pre-Connectathon Sessions

1000+ Person Hours, before the connectathon
17+ Hours during Connectathon
1 One Community to Connect Collaborate Create

In order to achieve the goal we designed the connectathon to have three phases.

- Pre-Connectathon – Started from 30 May, 2020 until 2nd July 2020
- Connectathon – 3rd to 5th July 2020
- Post Connectathon – Steps Ahead shared by the HL7 India Team here (https://confluence.hl7.org/pages/viewrecentblogposts.action?key=HIN

As part of the COVID19 Teleconsultation Track, a team of 25+ participants who registered for the track endeavoured to work on two aspects:

A] Identify and Elaborate the Scenario:

- Identify the scenario that we could work on during the connectathon. This activity was done in the pre-connectathon sessions with the participants
- Identify the FHIR resources that would be relevant and most apt for the identified scenario
- Identify the transactions that can be worked on by all the participants during the connectathon days

- Create the postman collection of the transaction bundles that will be used by the participants to showcase the completion of the workflow steps, in each of their respective contexts (as a TSO or a TPO)
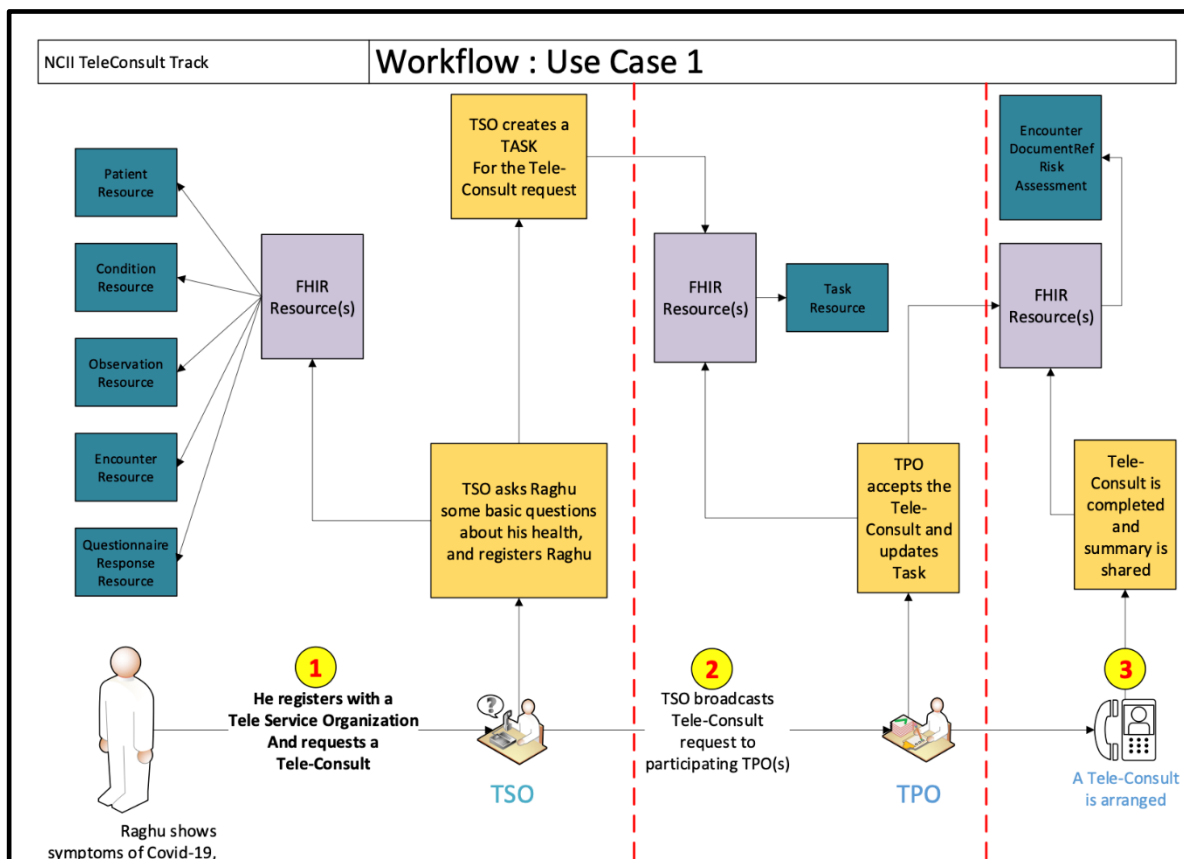

B] Showcase the Workflow by creating a Working PoC:

- On the First Day of the connectathon, we asked the participants to work towards creating a working application that will be able to replicate the steps we had identified as part of our workflow shown above.
- On the Second Day, we started the development of the PoC based on the workflow.
- Our Participants, in partnership with the track leads spent close to 14 hours to put together a working Prototype of the COVID19 Teleconsultation Track
- During each of the days and even leading up to the Connectathon, our team members reached out and collaborated with the Track Leads and Participants from each of the other Tracks like the Terminology Track and the India Profiling Track and the FHIR Starter Track so they are able to get an understanding of

the collaborative nature of the Interoperability problem we were trying to solve and most importantly showcase.

The outcome of the application was validated against the flow sequence diagram shown below
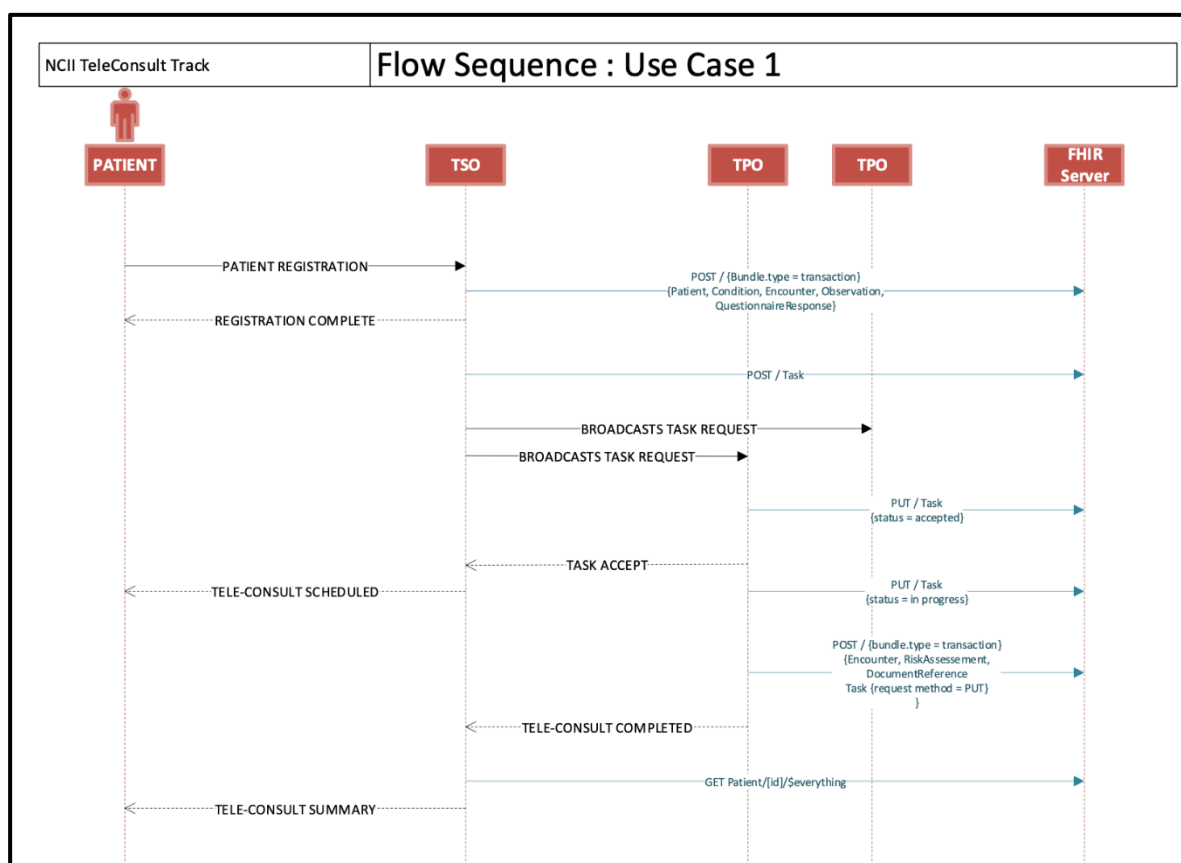
At the end of the Day 2 of the connectathon, the participants were able to validate the workflows on the two aspects we focussed on.

Based on the Postman collection that they validated by enacting the transactions against the Server that had been setup for the purpose of the connectathon.

Creating a PoC application that was able enact a patient who required a COVID19 Teleconsultation from a TSO and the task was picked up by a TPO application, and the "Doctor" was able to provide the risk assessment to the patient and send the report back to the patient.

The Demo Application mapping the 7 Steps identified for the PoC
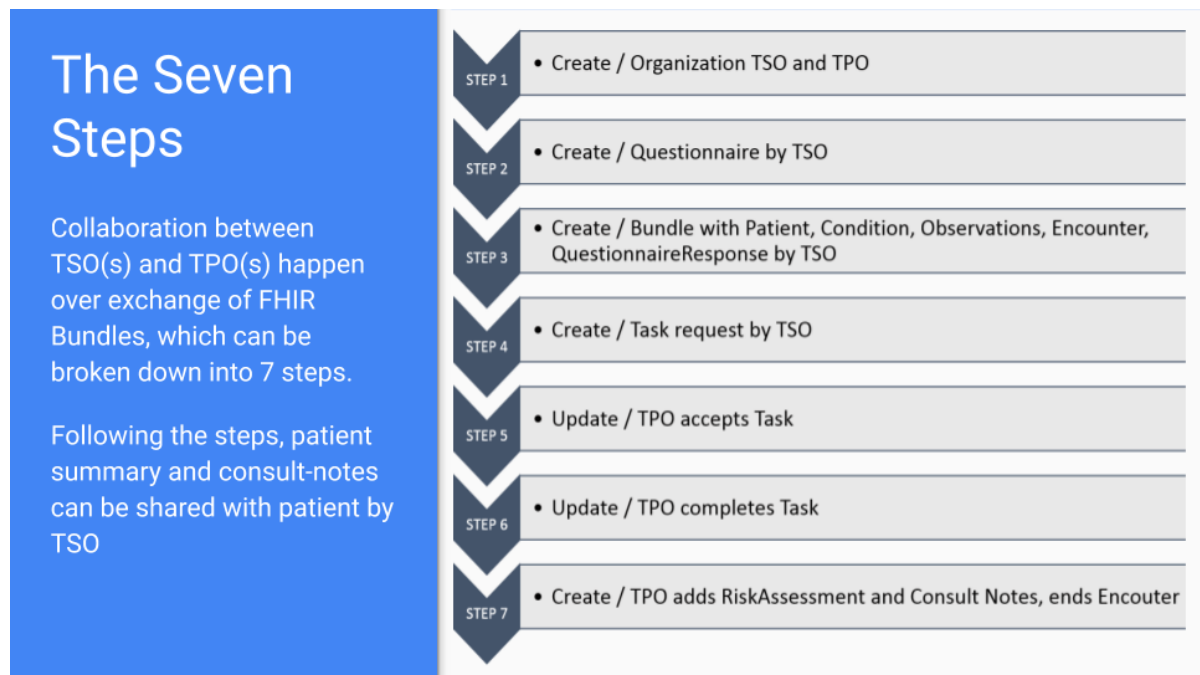
The Service Ticket gets accepted by the TPO and the Task is now available for the TPO to report and provide the risk assessment to the patient.
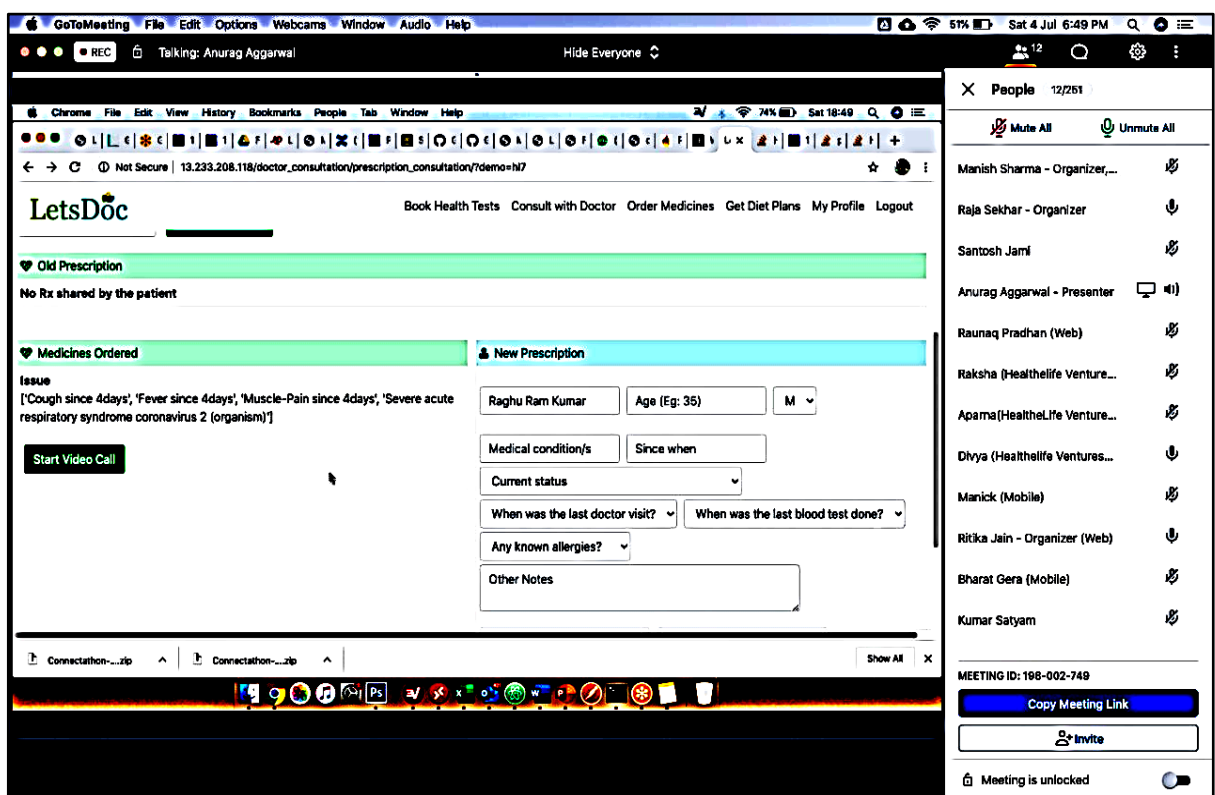
Spontaneous reaction of the track lead.

> ⟲ You Retweeted
>
> **Ritika Jain**
> @ritikajain192 ⌄
>
> What a day it has been! Elated to demonstrate 'NCII TeleConsultation Service Aggregator' to the 'Father of FHIR' @GrahameGrieve
>
>
>
> 👤 You and 3 others
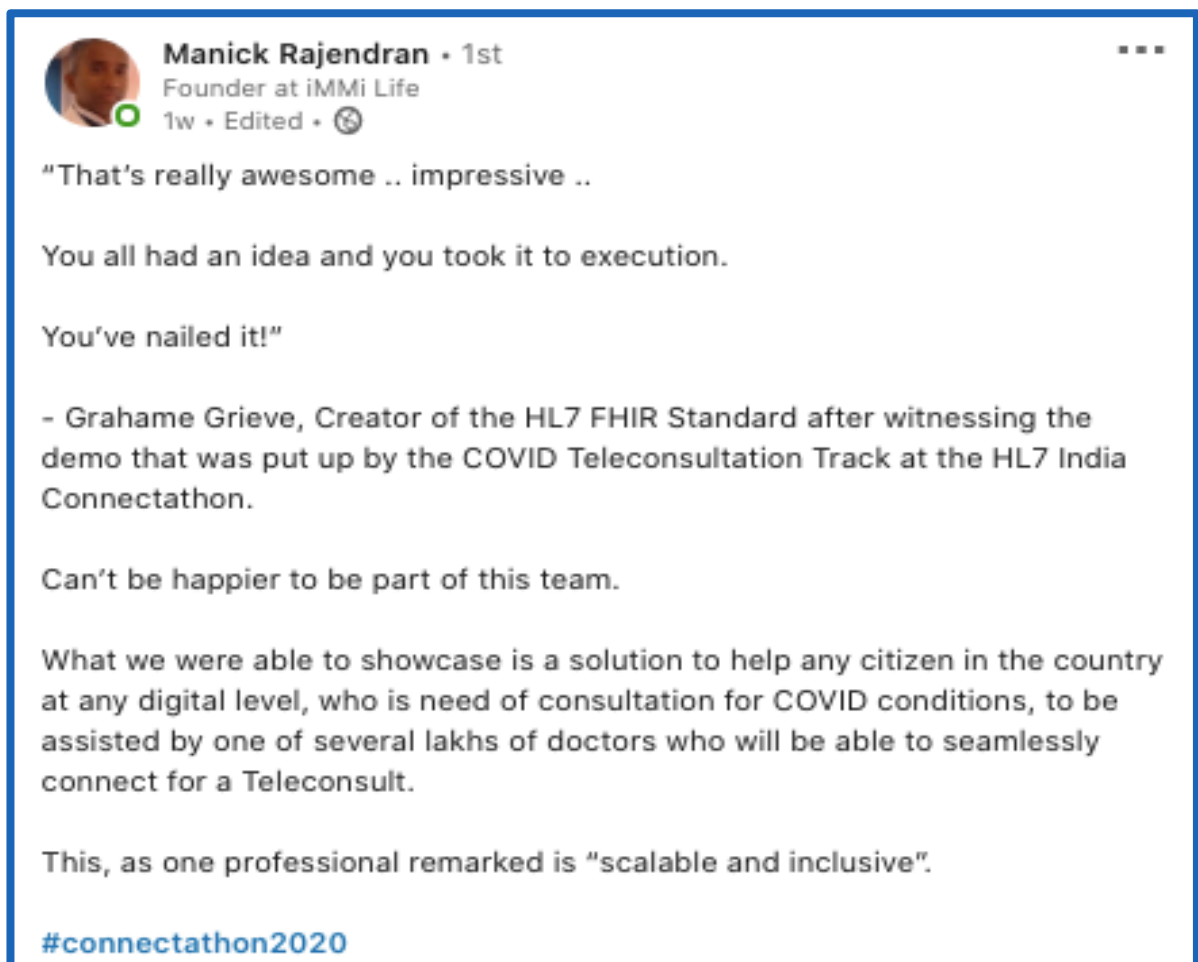> 11:41 AM · 05 Jul 20 · Twitter Web App
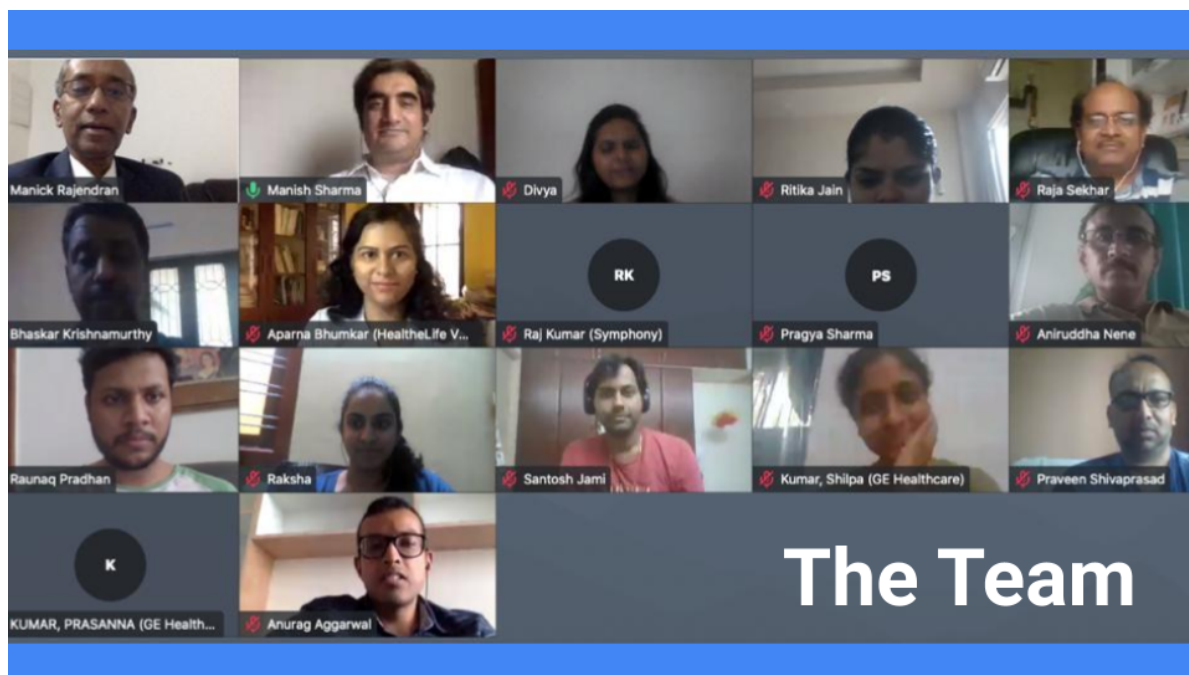>
> **3** Retweets **12** Likes

And we have a selfie with Grahame Grieve who was gracious to have listened to our presentation by our Track Participants.

His Statement on our work was very beautifully captured by Manick Rajendran, in his LinkedIn post here :

> **Manick Rajendran** · 1st   ···
> Founder at iMMi Life
> 1w · Edited · 🌐
>
> "That's really awesome .. impressive ..
>
> You all had an idea and you took it to execution.
>
> You've nailed it!"
>
> - Grahame Grieve, Creator of the HL7 FHIR Standard after witnessing the demo that was put up by the COVID Teleconsultation Track at the HL7 India Connectathon.
>
> Can't be happier to be part of this team.
>
> What we were able to showcase is a solution to help any citizen in the country at any digital level, who is need of consultation for COVID conditions, to be assisted by one of several lakhs of doctors who will be able to seamlessly connect for a Teleconsult.
>
> This, as one professional remarked is "scalable and inclusive".
>
> #connectathon2020

The Team

Teleconsultation Track

Track Participants

Divyaratna Chiniwal	Ritika Jain
Aparna Bhumkar	Gokul Raj R
Raksha R	Harilal
Aditi Verma	Astha Rai
Raj Kumar	Shilpa A
Chinmay Athaley	Suyash Choudhary
Bhaskar Krishnamurthy	Mohammad Ali
Manish Sharma	Srinivasa Rao P
Jayakanth Kesan	Santosh Jami
Praveen Shivaprasad	Shilpa Kumar
Anurag Aggarwal	Debabrata Parida
Raunaq Pradhan	Aditya Kumar Singh
Siriram Kailasam	Raja Sekhar Kommu
Kumar Satyam	Satya Itharaj
Manick Rajendran	Aniruddha Nene

4.0 The outcomes

4.1 A serious blow to the myth.

The participants of the track represented diverse backgrounds. Some from an export-oriented company worth a Billion US dollar to a startup in India curious to know the full form of FHIR. Some of them were aspiring TPOs or some were a large corporate group entering into the Indian health insurance segment with ambition to become numero uno. The track unified all into a monolithic think tank of domain experts and a pool of programmers. As participants, originally they planned to demonstrate only the messaging with NCII FHIR server; as per the use case / scenarios.

The confidence of the team reached its peak during the pre-connectathon sessions and the team challenged itself to develop a prototype app within 24 hrs. The team met the timeline working round the clock with support from the track leads to present the working prototype, running end-to-end demonstration of not only the interoperability but the applications that each Actor would deploy!

It took only a passionate team and 24 hours to blow the myth that the adoption of standards is a sizable overhead that delays implementation of digital healthcare systems.

4.2 Déjà vu experience:

It was a boon to have the international expert on interoperability and the father of FHIR standard, Mr Grahame Grieve, as a mentor to the event. NCII philosophy reflected prominently through one of the slides shared by Mr Grieve.

NCII started with community building by putting together the people involved in the Care ecosystem and took a bold and innovative approach of running a track in Connectathon where a compelling **clinical use case** was at the centre. This was in contrast with other initiatives of emulating transformation in banking / finance world.

No doubt the success in case of interoperability within banking and finance is one of the fastest anywhere in the world in terms of the volume of the transactions, but
The NCII core members were always skeptical, about treating Care transaction and financial transactions at par and 'hiding or ignoring' (point 2. In the slide below) the complexity to conveniently put Patient Consent as the foundation of the transformation to achieve Connected Care.

The key note speech by Mr Grieve highlighted three laws of interoperability. This could not have been more timely for the Indian Care Regulators to plan a course correction. Third law of interoperability warned that India may get a cheap and flexible framework taking a page away from the success story of the financial domain; but 'healthcare' aspect (that is inherently complex) will be missed out all the way, let alone interoperability.

Three Laws of Interoperability

1. Interoperability: It's all about the people

2. You can hide the complexity, or make it worse, but you can't make it go away

3. Cheap, flexible, and interoperable: when developing healthcare software, you can have two of these
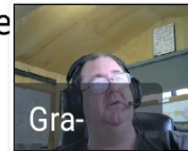
5.0 The next steps

5. 1. Future directions

NCII received an overwhelming response requests to continue the initiative beyond connectathon. NCII pool of volunteers is growing and the volunteers are proposing more and more use cases and willingness to contribute on long term basis. Clarity is emerging within the community for long term benefits for the community at the cost of the short-term sacrifices by the community.

5.2 Aligning the political views

NCII shall present the case to the regulatory authorities including the Ministry of the Public Health and Family Welfare and the Niti Ayog, the Central body influencing the policies of national interest. Movements like NCII are inherently collaborative and inclusive in nature that makes it easier to amalgamate with the regulatory and the ecosystem.

5.3 Leveraging the opportunity for the vendor community

Interoperability opens up new opportunities and a level playing field especially for the Indian Startups, much needed ingredient of the transformation. NCII will strive to create visibility for collaborative efforts through social medial, various events and forums and evangelise within the Care ecosystem for optimal implementation.

5.4 Maturity of the model

This will eventually lead to firm anchoring of India specific scenarios (ISS) or prioritised use cases and development of localisation of aspects pertaining to FHIR standards such as India specific data / FHIR resource profiling, incorporation of terminologies followed by the implementation guides. Hopefully this could prove to be the fastest adoption of Interoperability in emerging economy in a sustainable manner.